

Tom Erik Julsrud

Trust across Distance

A network approach to the development,
distribution and maintenance of trust in
distributed work groups

Doctoral thesis for the degree of Philosophiae Doctor

Trondheim, June 2008

Norwegian University of Science and Technology
Faculty of Social Sciences and Technology Management
Department of Sociology and Political Science



NTNU

Norwegian University of Science and Technology

Doctoral thesis for the degree of Philosophiae Doctor

Faculty of Social Sciences and Technology Management
Department of Sociology and Political Science

© Tom Erik Julsrud

ISBN 978-82-471-1087-4 (printed version)

ISBN 978-82-471-1088-1 (electronic version)

ISSN 1503-8181

Doctoral theses at NTNU, 2008:202

Printed by NTNU-trykk

Acknowledgements

There is always a story linked to research projects and dissertations. The story that frames this dissertation began one autumn day in 2003, when my colleague, John Willy Bakke, and I rang up Professor Per Morten Schiefloe at the Norwegian University of Science and Technology (NTNU) in Trondheim. He was one of our “weak ties” and we wanted to find out if he would consider participating in writing an application for a new research project. The application was written, and we received support to carry out the project “Identitet og Tilhørighet i et Mobilt Arbeidsliv” (I-TEMA) (Identity and Belonging in a Mobile Working Life) under the Norwegian Research Council’s KIM (Communication, ICT and Media) program. This dissertation is written as a part of that program, which in addition to Telenor Research and Innovation (R&I), also involved students and employees from Studio Apertura at the Norwegian University of Science and Technology (NTNU) and the Department of Informatics at the University of Oslo (IFI).

The dissertation work has in many ways been carried out in accordance with the project’s main themes: distributed and mobile. The I-TEMA project was for the most part a well-functioning distributed group that linked researchers and students from different parts of the country. For my part, I constantly worked in a nomadic fashion, partly in an open office area at Fornebu, partly in a home office (in the living room!), and partly in random workspaces in Studio Apertura, and other places. In many ways, this has been a challenging way of working. Still, it has provided me with a certain understanding of what conditions are important for making working across distances from one’s co-workers successful. My experiences suggest that being certain that one is trusted by key persons within one’s disciplinary environment constitutes a necessary condition in order to succeed. In this way, this work form has perhaps helped me to get on track of that which eventually became the dissertation’s main topic: trust and social networks.

This dissertation would not have been possible to write without inspiration, support, and advice from colleagues and friends. I want to first and foremost thank my advisor Per Morten Schiefloe, who inspired me to investigate the possibilities linked to analyses of social networks, and who has in every way been an inspiring, friendly, and knowledgeable mentor. Next, I want to thank Kristin Braa at Telenor R&I, who made it possible for me to begin the dissertation, and who later has demonstrated great confidence in me and my project. A special thanks is merited by my colleague, John Willy Bakke, who has been a unique supporter and devoted co-author in several of the articles, along with my superiors, Birgitte Yttri, Kristin Thrane and Marianne Jensen, for patience and understanding. Petter Nielsen, Richard Ling, Roar Bovim, Jo Herstad, Karianne Skovholt, Ola Berge, Sjur Larsen, Arne Krokan, Douglas White, and Wanda Orlikowski have all provided good advice that has strongly influenced sections of the work, though none of these people should be held responsible

for potential mistakes or shortcomings in the text. I also want to thank Sjur for loaning me his lovely corner office at Dragvoll on several occasions.

Gunnhild Luke deserves a big thanks for her tireless effort in helping with proofing the work, as well as Åse Årdal og Gro Kvamme Johnsen for helping me transcribe the interviews among other things. Thanks also goes to Lars Hafskjær, Arve Årdal, and Kjell Olav Mathisen who have done all they could to assist with practical and administrative matters. I also want to direct thanks toward managers and employees at Telenor Mobile, Statoil and If... who have demonstrated great benevolence and obligingness during the fieldwork.

Throughout the three years I have worked with this, I have benefited greatly from presenting articles at different conferences and seminars, along with participating in discussions within different research networks. This pertains to professional work groups within the European Group for Organizational Studies (EGOS), International Network for Social Network Analysis (INSNA), First International Network on Trust Research (FINT), International Workshops on Telework (ITA), among others, along with seminars held by the Norwegian Research Council's KIM program. I also want to draw attention to Thomas Schøtt's course on social network analysis at the University of Aarhus as especially enjoyable and valuable.

The dissertation was entirely financed by Telenor R&I, who in this way also contributed to the I-TEMA project, and I want to thank them for the goodwill and generosity they have shown me in granting me the time and opportunity to finish this.

Finally, I want to direct a big thank you to my wife, Hilde, and the two apples of our eyes, Thale and Axel, for the continuous and unconditional support you have shown me during the last three years. You are my most valuable social network!

Tom E. Julsrud, December 2007

Abstract

Work groups that consist of members localized in different geographical places, but maintain contact via electronic media, have become a widespread phenomenon within modern organizations. These are generally referred to as *distributed work groups*. Trust is increasingly considered to be a key characteristic for distributed groups, which can help improve the quality of the work, increase the effectiveness of the group, and prevent conflicts. At the same time, trust is a characteristic that can be difficult to develop within the frameworks where such groups often operate. This dissertation examines the opportunities that exist for such groups to establish and preserve trust, using an empirical study of four cases linked to an international Norwegian company as its basis. The dissertation builds upon a network-based analytical perspective, in which the distributed groups are understood to be dynamic relational networks, supported by different types of information and communication technologies (ICT). In accordance with this perspective, trust is primarily understood to be a characteristic of the social relations that exist within the groups, and a quality of the structural configurations of trust-bearing networks. In this field, the network perspective opens up for more detailed analyses than what has previously been done, with greater focus on the “structural aspects” of trust.

The dissertation explores three main processes linked to the following: 1) establishing trust within distributed groups; 2) the distribution of trust in relation to ICT-based communication; and 3) the significance of structural configurations for preserving trust within groups. The results indicate first that trust in groups is established and reinforced in situations where certain coworkers actively build trust over geographical and cultural barriers. These relational processes are described in the dissertation as *trust brokering*. Trust brokering involves a gradual building up of trust relations through regular interactions, and it can be developed along a cognitive and an affective dimension. Second, the results demonstrate that affective and cognitive trust networks follow different structural patterns within the groups, and they are supported by different types of ICT; while the affective networks are especially supported by face-to-face communication and text messages, the cognitive networks are especially supported by voice telephony and email. This indicates that the quality of the social relations affects what technology is used to initiate or maintain a relation. Third, the results reveal that the groups with high levels of group-based trust have developed *integrated cores* consisting of trust-bearing relations, involving key actors in the group. This suggests that the groups’ structural configuration of trust-bearing relations influence on how well trust is developed and maintained in these cases.

Preface

The dissertation is submitted as a partial fulfillment of the requirements for the degree Philosophiae Doctor (PhD) at the faculty of Sociology and Political Science, Norwegian University of Science and Technology, Trondheim, Norway.

The work has been partly funded by Telenor Research & Innovation, and conducted as a part of the project "Identity and belonging in a mobile work life" partly funded by The Norwegian Research Council.¹

The dissertation consist of six papers and an additional introductory part that present the research questions, a theoretical background, review of existing works, main results and implications of the work for organizations and further academic investigations.

Table i. List of papers

A	Julsrud, Tom E., and Per M. Schiefloe. 2007. "The development, distribution and maintenance of trust in distributed work groups. A social network approach." <i>International Journal of Networking and Virtual Organisations</i> 4 :351-368
B	Julsrud, Tom E., and John W. Bakke. 2007. "Building Trust in Networked Environments: Understanding the Importance of Trust Brokers." Pp. 117-138 in <i>Computer-mediated Relationships and Trust: Organizational and Managerial Effects</i> , edited by Linda Brennan and Victoria Johnson. Hershey PA: Idea Group Publ.
C	Julsrud, Tom E. 2008. "Flow, bridges and brokers: exploring the development of trust relations in a distributed work group." <i>International Journal of Networking and Virtual Organisations</i> 5:83-102.
D	Julsrud, Tom E., and John W. Bakke. 2008. "Trust, friendship and expertise: The use of email, mobile dialogues and SMS to develop and sustain social relations in a distributed work group." in <i>The mobile communications research annual: The reconstruction of space and time through mobile communication practices</i> , edited by R. Ling and S. Campbell. New Brunswick, NJ: Transaction.
E	Julsrud, Tom E., and John W. Bakke. 2008. "Interpersonal trust and mobile communication: a social network approach." in <i>Trust and New Technologies: Marketing and Management on the Internet and Mobile Media</i> , edited by Teemu Kautonen and Heikki Karjaluoto. London: Edward Elgar.
F	Julsrud, Tom E. 2007. "Core/periphery structures and trust in distributed work groups: a comparative case study." <i>Structure and Dynamics :eJournal of Anthropology and Related Science</i> 2 Vol. 2: No. 2, Article 1. http://repositories.cdlib.org/imbs/socdyn/sdeas/vol2/iss2/art1 http://repositories.cdlib.org/imbs/socdyn/sdeas/vol2/iss2/

¹ The Norwegian title of the project was: "Identitet og tilhørighet i et mobilt arbeidsliv" (I-TEMA).

Table of contents

Acknowledgments	III
Abstract	V
Preface	VI
Table of contents	VII
List of table and figures	X
1. Introduction	1
1.1 The distributed aspects of work	1
1.2 Trust as a key factor to distributed work	2
1.3 The trust paradox of distributed work	4
1.4 Research questions and research focus	6
1.5 The structure of the dissertation	8
1.6 The main theme of the articles	9
1.7 Summary	10
2. Distributed work	12
2.1 Definitions	12
2.2 The development of distributed work	13
2.2.1 Planned and improvised changes	16
2.3 Types of distributed work	17
2.4 Research on distributed work groups	19
2.5 Summary	21
3. Trust in organizations and groups	22
3.1 Definition	22
3.2 Levels, dimensions and types	23
3.3 Central theoretical approaches	25
3.3.1 Rational understandings of trust	26
3.3.2 Ritual understandings of trust	28
3.3.3 Institutional understandings of trust	30
3.3.4 Norm-based understandings of trust	32
3.3.5 Reflexive understandings of trust	33
3.4 Sources of trust in distributed work groups	37
3.5 Trust in new organizations	38
3.6 Measuring trust in organizations and groups	41
3.6.1 Experiments	41

3.6.2 Surveys	42
3.6.3 Other methods	43
3.7 Summary	45
4. Distance, communication and trust	46
4.1 Communication and trust	46
4.1.1 Interpersonal communication in organizations and groups	47
4.2 Distance and communication	49
4.3 ICT and electronic proximity	50
4.4 ICT and options for indirect communication	53
4.5 Technical and social aspects	54
4.6 Duration and media multiplexity	56
4.7 Summary	56
5. Trust in distributed work groups; a review of selected works	58
5.1 Experimental designs	58
5.1.1 Jarvenpaa and Leidner (1999)	59
5.1.2 Kanawattanachi and Yoo (2002)	60
5.1.3 Zolin, Hinds, Fruchter and Levitt (2004)	60
5.1.4 Wilson, Straus and McEvily (2006)	61
5.1.5 Piccoli and Ives (2003)	62
5.2 Qualitative case studies	63
5.2.1 Panteli and Duncan (2004)	63
5.2.2 Pauleen and Yoong (2001)	64
5.3 Evaluation and critique of the contributions	65
5.4 Summary	69
6. Distributed work groups as structural networks	71
6.1 A social network approach to studies of groups	71
6.1.1 Relational dimensions and qualities	72
6.1.2 Structural patterns	74
6.2 Social network analyses of distributed work groups	77
6.3 Trust in relations and networks	79
6.4 Trust on different levels	80
6.5 Summary	83
7. Network theories	84
7.1 About network theory	84
7.2 Structural role theory	85
7.2.1 Brokers and structural holes	86

7.2.2 Structural role theory and development of trust	89
7.3 Cohesion theory	89
7.3.1 Simmelian ties	90
7.3.2 Cohesion theory and maintenance of trust	92
7.4 Cognitive network theory	92
7.4.1 Modalities	93
7.4.2 Cognitive network theory and distribution of trust	94
7.5 Integrating the main theoretical ideas: trust from below	94
7.6 Summary	96
8. Research design and methodology	97
8.1 Research design –case studies	97
8.1.1 Case studies as the basis for developing theory	97
8.1.2 Case study design	98
8.2 The data	100
8.3 Methodological tools	102
8.4 The process of collecting data	103
8.5 Reliability and validity	103
8.6 Summary	107
9. Main findings and implications	108
9.1 The development of trust	107
9.2 Distribution of trust	108
9.3 Maintenance of trust	109
9.4 Contributions to research	111
9.5 Implications for organizations	113
9.6 Summary	115
References	117
10. Appendices	
<i>Paper A: The development, distribution and maintenance of ...</i>	131
<i>Paper B: Building Trust in Networked Environments...</i>	153
<i>Paper C: Flow, bridges and brokers...</i>	183
<i>Paper D: Trust, friendship and expertise...</i>	209
<i>Paper E: Interpersonal trust and mobile communication...</i>	239
<i>Paper F: Core/periphery structures and trust in distributed work groups...</i>	259
Interview template	293
Questionnaires	294

Tables

Table i	Overview of included articles	VI
Table 1	Chapter overview	8
Table 2	Percentage of persons employed working part of their time away from enterprise premises and accessing enterprise's IT systems from there	15
Table 3	Research on distributed cooperation	20
Table 4	Summary of different perspectives on trust and the challenges/possibilities they emphasize in connection with distributed cooperation	38
Table 5	An overview of key types of ICT used in distributed work groups	51
Table 6	Overview of reviewed works	68
Table 7	Description of social network concepts used in the text	76
Table 8	Five central broker positions	84
Table 9	Overview of the cases used in the papers	100

Figures

Figure 1	Overview of articles and their main themes	10
Figure 2	Key types of distributed cooperation	17
Figure 3	Affective and cognitive dimensions of interpersonal trust	24
Figure 4	Daily interaction at Delta	75
Figure 5	Levels of trust in distributed work groups at two points in time	82
Figure 6	The main elements in the research process	104

1. Introduction

1.1 The distributed aspect of work

The importance of small groups and communities within modern work life is difficult to doubt. Over the last decades organisations have increasingly organised work around small groups, in the form of either projects, teams or communities.¹ The move towards small workgroups has caused many researchers to believe that future organisations, to a large part, will be organised around constellations of projects and teams. A central assumption within description of new network-based organisations is that these will consist of project groups joined together through a web of relations and interactions (Castells 2001; Ekbia and Kling 2005; Miles and Snow 1992). Castells' description of the networked enterprise is illustrative: "... the network enterprise is neither a network of enterprises nor an intra-firm networked organization. It is a lean agency of economic activity, built around a specific business project which is enacted by networks of various composition and origin" (Castells 2001, p. 67). Thus, work in small groups is a theme at the centre of attention for researcher interested in exploring and explaining features of modern organizations.

As a research field, the study of small work groups has a long tradition across different social scientific disciplines.² A premise for the majority of this research has been, however, that those who are part of the group are *co-located*, in the sense that they work together in the same office or in the same department. Classic small-group studies, such as the "Hawthorn studies" conducted by Mayo and his colleagues at the Western Electric Company, or the "Workers' collective" at a Norwegian industrial company as described by Lysgaard, were based on situations where the members of the groups communicated and interacted face-to-face (Lysgaard 1967; Mayo 1945). The same applies for the lion's share of the newer small-group studies (Katz, Lazer, Arrow et al. 2005). Yet, this premise cannot be taken for granted in modern organizations: Within large areas of work life, traditional co-located cooperation is supplemented with groups that work together across time and place, with the support of different types of information and communication technology (ICT). Such groups are referred to, among other names, as *distributed work groups*.

There is much to suggest that the distributed work group phenomenon is growing in popularity, propelled forward by the possible advantages that it can have for organisations, as well as

¹ In this thesis I will stick to the term "groups". This and other terms will be further defined and discussed in chapter two and six.

² For overview and introduction to small group studies in organizations, see; Arrow, McGrath and Berdahl (2000) and Forsyth (2006).

for groups and individuals. These are on the one hand related to the possibilities of avoiding economically demanding relocation of persons and perhaps entire departments. Instead of moving workers or entire departments, one can establish distributed groups with the help of ICT. Reducing work-related travel is often desirable with regard to the personal burden that this creates for employees, but also with regard to the environmental consequences of travel activities. On the other hand, there are substantial benefits connected to being able to quickly bringing together groups with specialised competence within a particular field. The distributed work makes it possible to put together groups with (local) special competence, independent of geographical barriers. For this reason, these groups are often viewed as tools for knowledge development and innovation in new organisations (Cummings and Kiesler 2005).

As globalization pushes organizations to operate across greater distances distributed workgroups have become widespread, and it would probably be difficult for the majority of modern operations today to survive without such groups. At the same time, research material is gradually emerging which indicates that many such groups are often plagued with problems. It has been shown that these groups often fragment more easily than traditional groups, and that they tend to perform less well than co-located groups. Particularly demanding are situations in which these groups include workers from several organisations and/or different national cultures (Cummings and Kiesler 2005; Cummings and Kiesler 2007; Polzer, Crisp, Jarvenpaa et al. 2006). Therefore many have queried what can be done to develop more well-functioning work over distance, and over the past years some research contributions have suggested that trust could be one important key to achieving better cooperation (Handy 1995; Jones and Oyung 2005; Lipnack and Stamps 2000; Poole 1999). Distributed groups that possess a higher degree of trust are believed to have several advantages, related to individual well being, performance and flexibility, and lately some studies have provided empirical evidence in support of this argument (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002; Zolin and Hinds 2004). Gradually, then, trust has become one of the most sought after qualities for distributed work groups and networked organizations in general. Yet, as I will show in more detail later, there are several challenges related to analysing and measuring trust in distributed groups. And if trust indeed is a key quality, it is important to better understand the conditions and opportunities for the development of this in such groups.

1.2 Trust as a key factor for distributed work

What is it with trust that makes it a relevant theme in relation to distributed work? To answer this it can be clarifying to look closer at what lies in the concept of trust.³ In a much used definition

³ I will discuss the concept of trust in more detail later in this introduction (Chapter 3).

trust is described as a “psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of other” (Rousseau, Sitkin, Burt et al. 1998 p 395). Given that people seldom can control what others do at any given time, we are often required to accept that those with whom we collaborate will not betray or act in discordance with our interests. When we make (more or less) conscious choices about to which extent we will expect others to act in our best interest, this involves some sort of trust. According to a review of central social scientific contributions, there is wide agreement that two central conditions must exist for trust to arise: risk and interdependency (Rousseau, Sitkin et al. 1998 p.395). *Risk* can be understood as a situation in which there is a possibility for loss, damage or negative consequences (Currall and Inkpen 2006). Thus, the need for trust tends to occur in situations where there are certain risks involved, typically created by reduced opportunities for observation and control. The second condition believed to be necessary for trust to occur is *interdependency*, or situations where the interest of one party cannot be achieved without reliance upon the others. In situations where there are no interdependencies involved in a particular relation, there is usually little to win or lose, so trust becomes less relevant. On a general level then, we can expect trust to occur in situations where both risk and interdependency are present.

Based on this brief explanation of the concept, one can more easily point at how both risk and interconnectedness are propelling a stronger need for trust in situations related to distributed work.⁴ Firstly, reduced opportunities for insight and transparency in others’ daily work tend to increase the risk of coordination errors, misunderstandings or fraud by some of the parties. Even though most distributed work groups make use of various sets of technologies to counteract the geographical distance involved, these can seldom fully compensate for the lack of co-located interaction and communication (Nissenbaum 2004). Undermining behaviour, such as “free-riding” where individuals deliberately underinvest in their contributions to a group, may be more difficult to discover in distributed settings.⁵ But also unintentional errors and mistakes might be more difficult to detect due to the lack of daily interaction and informal communication. Second, interdependency is usually also significant among parties in distributed work groups. In most such groups all participants are held responsible for the outcome of the work, and at least their reputations are at stake if the outcome is below expectations. The interdisciplinary character common for distributed groups also usually implies that everyone is responsible for separate parts, without having the possibility or competence to check the contributions of others directly. The typical knowledge intensive aspect of distributed work seems in itself to involve an interdependency that triggers a need for trust (Adler and Heckscher 2006).

⁴ Almost every kind of collaboration in groups involves some levels of risk, divided amongst individuals or the groups. Beck (1993) has argued, however, that risk in modern societies is increasingly transferred from institutions to individuals and smaller groups. If this is correct, it suggests a growing need for trust in such groups.

⁵ Free-riding is situations where members are contributing less to a collective task based on the belief that other group members will compensate for their lack of effort (Forsyth 2006 p.302).

Considered in totality then, one can say that distributed work groups have certain qualities that make the collaboration situation less transparent but also based on multiple parties' interconnected efforts. It is a situation where collaboration is in a vulnerable state, and hence, so are the members of the group and the group itself. The collaborative environments typical for distributed work groups seem to be more challenged in their cooperation than traditional groups, creating an increased need for trust.

One should note, however, that this situation could be (and sometimes probably is) met with more rigid control mechanisms and supervision, rather than trust. Yet for several reasons, such a response often turns out to be difficult and counter-productive: First, because close control and supervision of work have proved to hamper much of the energy and initiative in work groups (Piccoli and Ives 2003). In line with the so-called "control paradox" frequent supervision and control tend to lead to lower effort and productivity (Kramer and Cook 2004). Secondly, controlling work is resource demanding and often troublesome. In particular, knowledge based work often has an abstract and specialized character that makes it difficult to measure individual work efforts (Adler 2001; Bradach and Eccles 1989). A third aspect is that close supervision and control tend to run against the norms dominating a European and Nordic work life, where participation and democratic values usually are desirable (Elden 1983; Lafferty 1984). Therefore, trust appears as a more attractive and potentially more fruitful way to deal with the complexity of collaboration in distributed work groups, rather than tighter control mechanisms.⁶

1.3 The paradox of distributed work

In general there is little disagreement that trust is a factor that has a positive influence on group collaboration and that it is desirable to develop it to be stronger. The challenge lies in that trust is a quality which for different reasons is extremely difficult to develop with groups that are dispersed. Trust represents a mental state characterised by confidence in the belief that others will behave in line with one's own wishes and expectations, in situations where it is difficult for the individual to observe or control the actual actions of others. Most existing research considers such a positive confidence to come from repeated interaction between individuals that are *physically proximate* (Homans 1950; Lewicki and Bunker 1996; Shapiro, Sheppard and Cheraskin 1992). In situations where special parties can observe each other over time, co-workers could eventually feel that they know the other, and

⁶ This is not to say that trust on a more general level is replacing control in distributed work groups or in modern organizations as such. The point I am making here is that trust is one important quality that is useful for strengthening collaboration in distributed work groups. Tighter control and supervision are an alternative that is more problematic, even though control is still an important element in most organizations and groups. The interconnectedness of trust and control in distributed work has been discussed by O'Leary, Orlikowski and Yates (2002).

“predict” what they would do in different situations. Even though the use of available communication tools, such as email, text messaging, video conferencing, and the like can provide somewhat different degrees of “electronic presence,” dispersed co-workers could experience long periods of little interaction between them. The very communication situation therefore makes the building of trust more demanding.

Other aspects relevant to the conditions in which distributed work occurs also complicate the development of trust. One is the *duration of the group work*: many organisations can carry out changes in their groups relatively often, in step with changes in the markets or in organisational strategies.⁷ When the distributed groups are of a short-term and flighty character, this complicates the possibilities for developing trust. Another factor is that collaboration in distributed groups often occurs within organisations that are in a *process of change*. Stable organisational frameworks usually award an important role to the development and maintenance of trust in organizations (Grey and Garsten 2001). Often temporarily dispersed workgroups are established in situations where organisations are going through changes and the organisational frameworks are less stable. A particularly demanding situation occurs when organisations establish groups in the wake of a take-over or merger, as was the situation in some of the cases studied in the subsequent papers.

Together, this creates a situation that can be described as paradoxical, as there is a need for trust for distributed groups to function, while such groups have particular difficulties developing exactly that quality. This can be referred to as *the trust paradox of distributed work*.⁸ Most basically the paradox raises the question of whether it is possible at all to develop trust among collaborators under such conditions, and if so; what kind of trust can be obtained? The answer that one gives to such questions depends to a great extent on how one understands trust, as well as which types of distributed work one chooses to study. As I will come back to in this introduction, these are not single or simple notions. This dissertation begins, however, with the point of departure that it *is* possible to conceive trust within dispersed groups, but that this is not in any way given in advance. Distributed workgroups represent, on the contrary, risky situations where mistrust can just as well take root. What determines that trust in some such groups but not in others is an interesting question that has spurred the work presented here.

⁷ This “fluidity” and lack of stability provides an important point of departure for critical descriptions of modern work life as, among others, Sennett (1998) and Bauman (2000) has given.

⁸ This term has earlier been coined by Handy (1995).

1.4 Research question and research focus

The development of trust can therefore be regarded as an important condition for achieving well-functioning, distributed work groups. Still, this is something that is difficult to develop because of geographical distance, rapid changes, and unstable organizational environments. This creates a constant tension and challenge for the distributed groups that this dissertation seeks to shed light on. The overarching research question can thus be described: *How is trust established within work groups who work together across geographical distances, with extensive use of information and communication technology (ICT)?*

This dissertation seeks to investigate this question using a methodological and theoretical approach that is relatively new to this area: studies of distributed groups as relational networks. Based on this analytical perspective, three aspects are elaborated:

1. Challenges linked to the *development of trust* within distributed work groups.
2. The significance of communication technology with regard to the *distribution of trust* in distributed groups.
3. Mechanisms and processes linked to the *maintenance of trust* within distributed work groups.

The relevance of the research question is primarily based on the fact that distributed work is a phenomenon that is already considerably widespread within Norwegian and international business. As I shall further elaborate in the next chapter, there are several indications that such forms of working have become prevalent in many Norwegian companies during the last few years. Beyond this, there is an assumption that the distributed cooperation may be a precursor to how work will increasingly be carried out in the future. In many instances, distributed work is considered to be an important part of new (post-bureaucratic) organizations (Heckscher 1994). Research on how trust is established in such groups will therefore become increasingly relevant to the question of trust in the future working life in general. Moreover, the research question is made topical by the fact that there are empirical studies which indicate that distributed work groups often run into significant cooperation problems in comparison with more co-located groups (Cummings and Kiesler 2007; Kiesler and Cummings 2002). A closer understanding of trust within such groups can help shed light on how such problems can be understood, prevented or handled.

The research question above has been addressed in different ways within existing research. The contributions have on the one hand emphasized the significance of a simpler and more functional form of trust within distributed cooperation. A main argument has been that trust within new post-bureaucratic organizations will increasingly be of a more task-based sort; so-called “swift trust”

(Jarvenpaa and Leidner 1999). Another and partly competing assumption has been that trust is developed and established more rapidly in these kinds of groups, based on immediate impressions early in the cooperation phase (Zolin and Hinds 2004). The work in this dissertation supplements the approaches mentioned above, as the focus is directed toward the *structural aspects* of trust relations. Based on a series of empirical studies of trust within distributed groups, the significance of developing trust-bearing relations and constellations is emphasized. This involves a greater emphasis on the relational and structural aspects of developing trust than what has previously been common in studies of distributed groups. It also provides a more detailed understanding of how trust is built up through active nodes in a distributed network, and how mediating channels receive a special role in maintaining relations of trust. In this manner the dissertation provides a renewed, and presumably improved understanding of how trust can be connected to network building and relationship management.

The work that is presented does not seek to test out existing theory or models that are available in the field. The goal is to present and employ a new approach to trust in distributed groups, based on empirical studies of cooperation in Norwegian companies. I consider this to be possible elements of a theoretical understanding, which involves building and sustaining trust in distributed groups through social relations. On the one hand, this approach builds upon an understanding of groups as being dynamic, structural networks; on the other, it is based upon the idea that trust can be generated through individuals' "reflexive" actions. Using these two main perspectives as the point of departure, empirical findings are set forth which emphasize mechanisms for developing and establishing trust within distributed work groups.

This dissertation addresses various disciplinary areas. First and foremost, it addresses research on *distributed work*, and the issuant academic discussion focusing on the development of trust within this type of collaboration. This field (distributed work) has developed during the last 20 years at the intersection between different academic disciplines, including sociology, psychology, IT-studies, and media studies. My perspective for studying distributed work groups is supported on the one hand by research on *trust in organizations*, a field with its main roots in organizational sociology and social psychology. On the other hand, it draws upon concepts and methodology from studies of *social networks*. This is a field that is dominated by social scientists who study social phenomena starting out from structural networks. Beyond this, the work also addresses research focused on studying the introduction and the *use of ICT* within groups and organizations. Connections to these disciplinary fields will vary within the six articles that are presented in the dissertation.

1.5 The structure of the dissertation

In the following sections of this theoretical introduction, I want to clarify what the concept *distributed work* means (Chapter 2) and why it constitutes an important topic for research. This section will provide an account of the research that is performed within this field, and how this dissertation positions itself in relation to these works. In light of this examination, I will more closely explicate the concept of *trust*, in the way it has been understood within a social science tradition (Chapter 3). I want to elucidate some main theoretical perspectives, and describe how these can be viewed as different “sources” of trust in distributed groups. Five main approaches to trust are examined: rational, ritual, institutional, normative and reflexive. In the following chapter (Chapter 4) I will examine more closely how geographical distance affects the building of trust in distributed work groups, and what significance ICT can have for overcoming or moderating barriers of distance. Chapters 2 through 4 sum up fairly large fields of research, and therefore they will necessarily have a somewhat summarizing character. In the following chapter, however, I will more attentively consider relevant research from the field *trust in distributed groups* (Chapter 5). I will examine some of the most seminal works and discuss the main findings and some of the shortcomings of this research. In Chapter 6 I will further describe this dissertation’s main perspective, namely *a network-based understanding* of distributed work groups.

Table 1. Chapter overview

Core themes	Chapt.	Includes
Introduction	1	Brief introduction to the topic and description of research questions
Presentation of central theoretical positions and concepts	2	Distributed work
	3	Trust
	4	Communication, distance and ICT
Review of existing work	5	Overview of central empirical contributions
Applied perspectives, theories and methods	6	Outline of a network perspective on distributed work groups
	7	Theories used
	8	Description of cases and methodologies used
Main findings	9	Main findings and potential implications for research and organizations

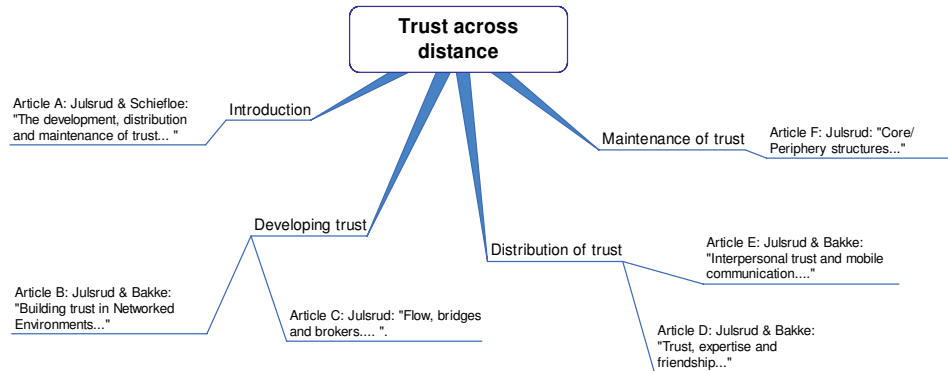
In Chapter 7 I will explicate the network-based theories that the different parts of this dissertation relate to: structural role theory, cohesion theory and cognitive network theory. Thereafter, I will explain the dissertation's *research strategy and empirical foundation* (Chapter 8), before I present the *main findings and implications* of these (Chapter 9). In the last chapter of the dissertation, attention is directed at how the articles in this dissertation contribute to the research that is carried out, and how the findings can benefit organizations that establish, or have already established distributed work. Table 1 sums up the main themes and objectives of each chapter.

1.6 The main theme of the articles

The dissertation contains six articles that together illuminate the main research question mentioned above, and the three areas of interest (see figure 1). *Article A* is an introductory article that explains how a network perspective can be used methodically for studying trust in organizations. Three central areas are pointed out in the article as being particularly relevant: the establishment of trust in distributed networks; the distribution of trust within groups; and the significance of denser, boundary-crossing constellations for the preservation of trust. In the five following articles, these three areas are elucidated through empirical studies of distributed work groups, constituting three different parts.

The first part contains two articles that based on empirical data analyze the development of trust across geographical units. The articles emphasize the significance of active trust builders (trust brokers) for developing trust within distributed groups. *Article B* points out the difference between two types of trust (affective and cognitive), and shows how these dimensions can be studied as different trust networks. Qualitative and quantitative studies of a central case – Omega – show that these two trust networks had different structural patterns and different “middlemen.” Those who were important builders of trust across geographical distances are described here as being trust brokers. A key objective of this article is to describe more closely the concept of brokering trust and the importance this had for developing trust at Omega. *Article C* replicates these findings through analyses of trust networks in another case, Delta, while the meaning of “active trust” is elaborated to a greater degree. Here we also find that there are variations in the constellation of affective and cognitive trust, and that there are some nodes in the network that have more border-crossing relations than others. Different variants of trust brokers are described here, supported by existing literature about network “brokerage.”

Figure 1. Overview of articles and their main themes



The second part contains two articles which examine how trust relations correlate with other types of relations within “distributed networks.” Here, attention is focused on disparities in the distribution of trust in relation to communication patterns, and factors that can explain such variation. Using cognitive network theory, I describe how the use of communication technology can be related to social relations that are based on trust. *Article D* demonstrates how mobile communications, such as SMS and mobile dialogues follow rather distinct patterns within a distributed group (Omega). In the context of trust relations, interaction via SMS is more comparable to cognitive trust than affective trust, and relations of friendship. In the following *Article E*, many of the same conditions are examined, but within other work groups. In these two articles, uniform patterns of media use and trust networks within two different cases are documented.

The third and last part contains Article E, which attempts to analyze the significance of network structures of general trust within different distributed groups. A central theme here is the establishment of constellations of “strong, professional ties” that cross geographical borders. Based on a comparative study of four cases (Omega, Delta, Beta, and Gaia) that have varying degrees of group-based trust, it is argued that groups with strong core/peripheral structures have better chances of building and maintaining trust. These types of “integrating cores” seem to play an important role in distributed groups, and are possible indicators of more trust-bearing networks.

1.7 Summary

This dissertation is directed at understanding how trust is developed, distributed and maintained within distributed work groups. The objective is primarily to provide an increased understanding of the mechanisms that are involved in occasions when trust is developed within distributed work groups. This is done using a network-based understanding of distributed work groups.

The basis for this dissertation is an enduring assumption within growing sectors of the research community that trust is a key factor for achieving successful distributed work. The representation of trust as a solution can certainly be turned in a more negative direction, such that the absence of trust is described as being a problem for distributed work. In presenting this as a paradox, however, I seek to emphasize that there really are two sides to the same story: trust presents a special challenge to such groups, but also a chance to develop distributed groups in a positive direction.

2. Distributed work

This chapter will further expound upon the concept and the phenomenon of distributed work.⁹ I will begin with a clarification of the concept, before I describe some of the motivating forces that constitute the basis for this new form of work. A typology of some of the most important forms of distributed work will be laid out. Thereafter, I will go through some of the main approaches that have been utilized within research on distributed work groups.

2.1 Definitions

Today, studies of distributed work are performed within different disciplines, using different types of terminology. This includes, for example, designations such as virtual teams, virtual communities, and computer supported work groups. *Distributed work* is increasingly used, however, as an overarching description of ways of working, where communication technology is used in order to connect units or individual co-workers in different locations. This approach will also be used here. In general, distributed work can be defined as *cooperation that is carried out with co-workers located in different geographical locations, supported by the use of ICT*.¹⁰ When this type of work is a central part of the work in permanent or temporary groups, the term distributed work groups can be used.

In connection with this definition, I will highlight a few key points. The first is that this understanding of distributed work focuses on groups that perform *cooperative* tasks together over a certain period of time. This has to do with carrying out certain shared tasks among a group of people who thereby also necessarily have certain forms of social relations with each other. The other point to which I want to draw attention is that even though the use of ICT in most contexts is a central part of distributed cooperation, there are no established requirements included in this definition regarding how much this technology should be used. Distributed work can be done with very simple technologies, like text messages or telephone conversations, or with advanced data systems for collaboration and cooperation in electronic fora. A third point is that the definition does not clearly distinguish between the distributed and co-localized work, but opens for a *fluid transition* between

⁹ The term "concept" here refers to the theoretical discussion of distributed work, while the term "phenomenon" is used to refer to the way this is manifested through empirical studies.

¹⁰ There is no single way to define distributed work. The definition I propose here is, however, much in line with the work of authors, such as: Townsend, DeMarie et al; DeSanctis and Monge; O'Leary and Cummings; and Hinds and Kiesler (DeSanctis and Monge 1999; Hinds and Kiesler 2002; O'Leary and Cummings 2007; Townsend, DeMarie and Hendrickson 1998).

them. Most work groups will be distributed to some degree, depending on shifting individual and/or organizational circumstances. Cooperation where all co-workers are localized at a distance from each other at all times makes up an extreme in this context. The distinction between co-localized and distributed groups will be based on an approximate stipulation of the limits of “closeness” and “distance”. Later in the dissertation, I will delve deeper into the significance of different constellations of co-localized and distributed co-workers (see Chapter 6.1)

2.2 The development of distributed work

It is difficult to give exact measurements on the extent of distributed forms of cooperation in working life, because the boundaries of local work are fluid. A complete account of the development within this field exceeds the scope of this introduction. Here, I will remain content to point out some of the general conditions within the labour market that point in the direction of a greater degree of distributed work, with reference to selected Norwegian and international studies.

A fundamental condition is linked to the development of a *more knowledge-driven and globalized economy*, where added values occur through the cultivation of information and knowledge, and not raw goods. These types of transformations of industry structures have been discussed and documented for a long time, and often make up the starting point for discussions of the labour market of the future (Bell 1976; Drucker 1994; Malone 2004). The development of the industries that are based on processing information is in this context especially interesting, since such an activity is less bound by physical localization than traditional (raw goods based) production. In companies where the cultivation of information is important, it is most often the case that a person will have greater chances to choose where to work. However, this does not mean that location is irrelevant: Knowledge-intensive work is on the contrary often oriented toward selecting a location based on where there is the greatest access to knowledge and competence. Within Research & Development, for example, it is increasingly common to establish departments in different countries in order to link together expertise wherever it exists (Brockhoff 1998). Also, within software development, it has also become common to assemble development teams with employees linked to professional groups in different parts of the world (Carmel 1999). A large part of the activity within distributed work groups is therefore probably related to knowledge-based work within product development, research-based projects and consulting work. Recent studies indicate that nearly half of all Norwegian employees work frequently with people from other companies, and, among managers and persons with higher levels of education, the proportion is even higher (Nesheim and Olsen 2006).

Another condition that helps make distributed work more widespread has to do with an increase in *communication and cooperation across companies*. In line with the emergence of a more

globalized labor market, there are many indications that communication and cooperation across boundaries of companies have increased during recent decades. One area where this has been especially noticeable is within research and academic cooperation. A study of publications within four different disciplines (physics, mathematics, biology, and chemistry) during the period from 1981 to 1997 found that the number of articles based on international cooperation had doubled during this period. At the same time, nine times the number of publications based on sizeable international cooperation projects emerged (Walsh and Maloney 2002). It can be assumed that a large part of the cooperation linked to this kind of activity is based on the use of information and communication technology, and that the work is carried out in distributed work groups. Within certain branches, we also see that cooperation develops into more permanent networks and clusters, which work with production, market development, and innovation. When organizations come together in greater alliances, they can be described as *meta-organizations*, which operate at higher level in order to coordinate and automatize exchanges between companies (Groth 1999).

A third motivating force toward more distributed work is linked to new ways of organizing work within modern companies. An important “organizational trend” within Norwegian and western labor markets has long been a greater investing in organizational forms where *working in groups and on projects* is an important component (Bleskestad 1992; Lundin and Midler 1998). In the Norwegian context, matrix organizations have especially become quite widespread, where projects are established across functional departments. A comparative Norwegian study concludes that there has been a significant increase in the use of team and project work during the period from 1997 to 2006, and that this is a common mode of working in approximately one out of every four Norwegian companies (Nesheim 2006; Nesheim and Olsen 2006). The same study found that more than half of Norwegian employees usually worked on projects or in a team, and nearly the same number (46 percent) often worked with the persons from other organizations. A greater focus on project work in many ways explains the reason for cooperation in more distributed groups, as these in many contexts operate with co-workers who are located in more than one place. A broad study of 12 Norwegian industries, performed by Telenor’s Research Department, found that one-fourth of the companies’ internal projects were distributed projects, in the sense that they involved parties from several geographic locations (Julsrud and Akselsen 2001). In extension of the project-oriented organizations, we see the contours of other types of organization that are focused on looser and interest-based networks. An example here is the expansion of so-called “communities of practice” within and across organizations (Hildreth and Kimble 2004; Wenger 2000).

A fourth condition that takes part in actualizing distributed cooperation is the increased access to, and use of, *information and communication technologies (ICT)* in the labor market. Distributed work is supported and realized through a broad spectrum of communication technologies like telephony, mobile telephony, and email. Access to these types of communication media has grown

during recent years, especially with regard to mobile communication: In 2007, at the end of the 1st quarter, there were 5.219.000 mobile telephone subscribers in Norway, which may indicate that most Norwegians now have access to mobile communication (PTT 2007). Twelve percent of mobile telephone subscribers had their bills entirely paid by their employers.¹¹ On average, in 2007 each user spoke for 148 minutes every month, and sent 92 text messages. Access to Internet and email in the business world has also greatly increased: During the period from 2000 until today (2007), access to the internet in Norwegian companies increased from 74 to 94 percent for business ventures with more than ten employees (SSB 2007). Over 60 percent of Norwegian companies had access to broadband (with a transfer capacity of at least 2 MB per second) in 2006. Equipment for video conferences can be important for supporting cooperation in distributed groups, and we seen a growing trend even here. Studies indicate that access to equipment for these types of conferences were doubled during the period from 1998 to 2003, and that approximately one out of every three Norwegian companies have their own room set up for such conferences (Denstadli and Julsrud 2003).

Beyond the features outlined here, it is also possible to observe that companies are increasingly *experimenting with alternative locations to carry out work* (Duffy 1997; Leaman and Borden 1993). Increased access to ICT and technical infrastructure has made it possible for many employees to carry out work at places other than the regular workplace. This includes work in one's own home, but also work from temporary places like hotel rooms, vacation spots, and public places. A study carried out by Telenor R&I in cooperation with Statistics Norway (Statistisk Sentralbyrå), found that the proportion of employees who worked other places than their permanent workplace, or at home, had increased from 22.3 to 27.4 percent during the period from 1998-2002 (Julsrud 2002). The group who combined work in their own home with work at their workplaces had nearly doubled during the same period, from 7.1 to 13.2 percent.

Table 2 Percentage of persons employed working part of their time away from enterprise premises and accessing enterprise's IT systems from there. Source: Eurostat

	2003	2004	2005	2006
Norway	62	67	66	77
Denmark	69	75	77	80
Finland		66	67	70
Sweden	68	71	71	72
EU (27 countries)		35	44	47

¹¹ Unpublished data from Telenor R&I, based on a country-wide representative study of 1000 informants from age 15-70. October 2006.

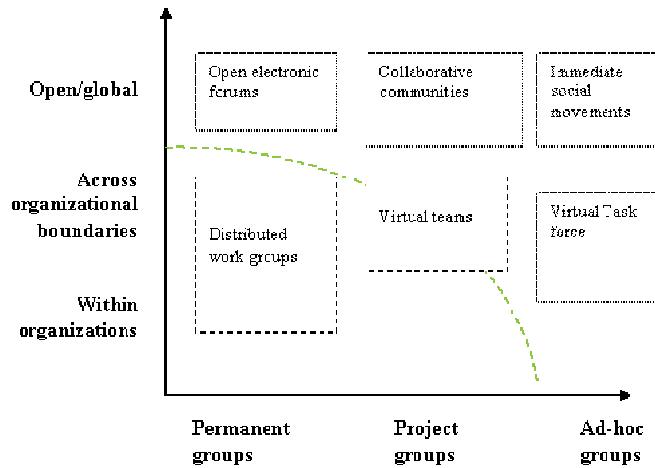
These numbers resonate with European studies that show that the proportion of employees who do part of their working hours outside of the company's territory, and who connect to the company's network during this period, is increasing (Eurostat 2007) (See table 2). These studies indicate that work is increasingly carried out in several more locations than the main workplace.

2.2.1 Planned and improvised changes

The named development features are tightly integrated and work together in many areas. Altogether, they highlight some of the central driving forces that affect the motivation and interest for establishing distributed work groups. In the cases that constitute the foundation for this dissertation, it is easy to see how several of these general trends were the basis for establishing distributed work groups. One example is Nomo: this company established several distributed groups as a result of purchasing a foreign competitor. It chose to use a matrix structure with permanent work groups that crossed country borders and former organizational borders. Cross-national groups were established, and cooperation was conducted with the support of different types of ICT. However, cooperation within these distributed groups was continually challenged by the need for cooperation with external partners as well as with groups and teams within the company. As I will come back to later in this dissertation, this eventually became very demanding for several of the groups in Nomo. The point in this context is that choice of organizational structure, internationalization, and the use of ICT all prompted a choice to try out distributed work groups.

Distributed cooperation represents a way of working that distinctively takes advantage of the possibilities that technology provides in order to collaborate over distance and across organizational boundaries. However, this is a development that is both planned and improvised. On the one hand, new organizations are increasingly designed according to the possibilities that are offered through the use of information and communication technologies (Groth 1999). The concept "virtual organizations" refers in most instances to new and ICT-based types of organizations where most of the interaction, coordination, and communication are based on mediated communication (Nohria and Berkley 1994). On the other hand, it is also the case that these technologies are adopted as a natural part of the work in the organization. New ways of using these technologies are improvised through daily use, especially with regard to technological tools for personal communication (Orlikowski 2001; Orlikowski 2002). In other words, distributed ways of working emerge through both planned changes and daily "tests" of the possibilities of the technology.

Figure 2. Key types of distributed work (the types that are thematized here fall within the dotted line.)



2.3 Types of distributed work

The relatively broad understanding of distributed work that this dissertation is based on allows for subgroups to be made visible; some of these subgroups are shown in Figure 2. The figure arranges some of the typically distributed forms of work in relation to degree of openness and permanence. While entirely open groups will include certain types of electronic communities, the most closed forms of cooperation will only contain groups within organizations. In open distributed forms of work, it will often be difficult to set precise boundaries for who can work together or not. Distributed work can also have different life spans. The most temporary forms include ad-hoc groups that are spontaneously established in connection with certain activities or events. *Open electronic forums* are forms of cooperation that are open for everyone and which are of a permanent character. An example is electronic email lists that deal with certain subjects, without having particular goals or intentions. These are open communities that cooperate via electronic media, with a basis in common interests. The tasks that involve cooperation constantly vary in such forums, according to the questions and topics that arise. *Collaborative communities* are also open to everyone, but they have a more limited life, and usually also a more clearly defined objective. An example here is the so-called Open-source software movement that is centered on the development of new types of programs over the Internet.¹²

¹² Within certain Internet based games such as World of Warcraft, EverQuest and Half-Life, participants need to establish collaborative communities to advance and (hopefully) win the game. Such groups are often labelled as “guilds” or “clans”,

Immediate social movements is a form for spontaneous coordination of activities linked to special events. An example here is how mobile phones and other electronic media were used in connection with “The Orange Revolution” in the Ukraine in 2004 (Castells, Fernández-Ardévol, Qiu et al. 2007 p 207). Text messages played an important role in the coordination of activities and actions in order to achieve a new and more just political election. When such spontaneous forms of cooperation arise within or across organizations, they can be called *Virtual task forces*. These are groups who begin working together because of acute situations, or other unexpected conditions. *Virtual team* is a term that designates a group that works within a limited time period in order to solve certain pre-defined tasks. An example of such a group is a research project that contains participants from different universities. *Distributed work groups* contain people from different geographical units within the same organization, or across different organizations. Such teams usually have a more permanent character than virtual teams.

Most of the cases that are studied in this dissertation fall under what is labelled in the figure as distributed work groups; that is, distributed units that are relatively permanent. This means that the groups have more or less clear boundaries for who gets to participate, and fairly well-defined projects and goals. In most cases, the groups operate across both geographical and organizational dividing lines. In this way, distributed work groups are distinguished from collaborative communities where the members themselves can decide at any moment whether they want to participate, and what they will contribute with.¹³ The boundaries of the more short-lived virtual teams were clearer, since in practice they had a rather limited existence within the organization, despite the fact that they officially could be regarded as being permanent groups.

The taxonomy indicates how distributed work takes on different forms depending on the situation in which it arises. Different types of distributed work provide different frameworks for cooperation. However, the figure should not be viewed as being anything but a heuristic overview; in practice the boundaries between the different forms will be often be rather diffuse. First, the degree of distributed cooperation will vary over time and be dependent on given situations. Periods of cooperation will run into periods with more distance between the parties. Second, the duration could sometimes be difficult to report. Permanent groups can easily become short-lived in organizations that are characterized by fast changes. Third, the boundaries between units and organization are often difficult to establish. The figure is therefore only intended to be a map over some of the more typical forms of cooperation with somewhat different characteristics, not a complete overview of the many forms of distributed work.

and they sometimes operate very similarly to professional collaborative communities. Such groups are often seen as important forerunners and sources for inspiration for new ways of working in business organizations (Herz 2002).

¹³ So-called “networks of practice”, or volunteer communities based on shared disciplinary interests, can be said to belong to this category (Brown and Duguid 2001).

2.4 Research on distributed work groups

Research on distributed cooperation has become more common during the last few decades. However, the research effort has been spread among different disciplines, often connected to conferences and journals. In recent years, some of the research has been collected into anthologies (Hinds and Kiesler 2002; Jackson and derWilen 1998) and summarizing academic articles (DeSanctis and Monge 1999; Townsend, DeMarie and Hendrickson 1998). Some of the more practically oriented books have also attempted to summarize the research in the field (Duarte and Snyder 2006; Jones and Oyung 2005; Lipnack and Stamps 2000; Marquardt and Horvath 2001). The breadth and variation in scientific approaches, theoretical anchoring, methodology and terminology can still make it difficult to secure a good overview of the research.

There are many different ways of studying work groups, and different perspectives are usually also the basis for studies of distributed groups. For the sake of providing an overview, I will here set out a general categorization of the articles, beginning with the central *methodical* approach that is used.¹⁴ The typology includes the following five main categories: 1) synthesizing studies; 2) descriptive in-depth studies; 3) studies of group attributes and performance; 4) studies of group processes and performance; and 5) studies of structural relations.

Synthesizing studies base themselves first and foremost on existing documents and literature. In this category, adaptation and presentation of secondhand data from previously conducted studies of distributed work are also included. Typical for these studies is that the authors seek to summarize and synthesize these results into more general hypotheses and theories. An example here is O'Leary and his colleagues' study of Hudson Bay Company through the use of archive material (O'Leary, Orlikowski and Yates 2002). But even Kiesler and Cummings' study of the importance of proximity for cooperation, which examines many different studies, would fall into this category (Kiesler and Cummings 2002). These authors examine and summarize a varied selection of studies that deal with the significance of distance for cooperation and interaction.

Descriptive in-depth studies are mainly qualitatively-oriented case studies of interaction, communication, and cooperation in groups. In many cases, these have an explicit goal of developing hypotheses. One example is Moon & Sproull's account of the development of the operating system for Linux within an extremely distributed group of developers, or Sarker and Sayah's study of system developers within eight distributed work groups (Sarker and Sahay 2004). These types of studies aim

¹⁴ Other taxonomies concerning the cooperation of small groups can be found. See for example Bell and Kozlowski (2002) and Chidabaram and Boström (1996). However, in my opinion, none of these are suitable for clarifying the differences in this field.

to give a broad and systematic account of the challenges and possibilities that exist within specific situations which involve distributed work.

A third main type of studies focuses on certain *group-based attributes* and their significance for the distributed group's ability to succeed (attribute oriented). Usually, these studies build on theoretical movements within psychology, sociology, or anthropology. Such group-based attributes can be feelings of identity, attitudes, or other attributes that characterize a group. An example here is Jarvenpaa and Leidner's study of how group-based trust affected results within distributed groups (Jarvenpaa and Leidner 1999). A typical characteristic of such studies is that they assume that characteristics of the group affect certain dependent variables, which in turn affect performance. Typical dependent variables are effectiveness, subjective contentment, external evaluation, or measurable indicators (number of publications). Such studies often make use of comparative and experimental designs

A fourth type of study focuses on the significance of *group processes* for the general productive performance of groups (also referred to as the process-oriented type of research). This can be interaction patterns, conditions for communication, or other behavioral variables. An example here is Maznevski and Chudoba's study of how the regularity and frequency of physical meetings affects productive performance within a selection of distributed groups (Maznevski and Chudoba 2000).

Table 3 Research on distributed cooperation

Type	Characteristics	Examples
Synthesizing	Summarizes existing research or uses secondary sources.	(Kiesler and Cummings 2002; King and Frost 2002)
Descriptive	Descriptive and interpretive studies directed toward individuals' understanding of distributed work	(Moon and Sproull 2002; Sadowski-Rasters, Duysters and Sadowski 2006; Sarker and Sahay 2004)
Attribute-oriented	Studies of the characteristics of the individuals in a selection of distributed groups. Usually comparative studies.	(Jarvenpaa and Leidner 1999; Wiesenfeld, Raghuram and Garud 1989)
Process-oriented	Studies group members' interactions and/or communication patterns over a period of time. Usually comparative studies.	(Maznevski and Chudoba 2000; Weisband 2002)
Structural	Studies distributed groups' relational structure.	(Ahuja and Carley 1999; Bélanger 1999; Koku and Wellman 2002)

Like the case mentioned above, in most instances this type of studies tests hypotheses, and generally uses a comparative design for comparing cases that have different processes and/or with different productive performance. The difference is that certain dynamic characteristics of the group are studied over time. Here, it is worth noting that media-use and interaction often represent central group processes that are examined.

The last main category includes studies of distributed groups as *social relations and structures*. In contrast to the other studies, these specifically focus on the social relations that exist within a group, or between the group and its surrounding environment. Networks are used as an explanatory variable for a given outcome, but periodically such studies also seek to explain the formation of networks. An example here is Koku and Wellman's study of cooperation in a distributed group of researchers at an American university (Koku and Wellman 2002). In contrast to most existing studies, focus is directed at interaction-based relations in addition to affective relations between group participants.

Much of the research that is concerned with trust in distributed groups view it as an attribute connected to individual persons. In summing up the degree to which different members trust others (or each other), the group's general degree of trust is evaluated. In contrast to such an attribute-oriented understanding, this dissertation employs a structural approach, where the attention is directed at social relations and the structural patterns that these represent within a group of distributed co-workers. In Chapter 6, I will more closely describe this perspective, and what possibilities this perspective provides within empirical studies.

2.5 Summary

In this chapter, I have defined distributed work as cooperation that is accomplished by colleagues localized in different places, supported by the use of ICT. Within this extensive field, I have highlighted six main types of distributed work, with distributed work groups being the main focus of this dissertation. Studies of trust in distributed work groups are conducted today using different analytical perspectives. In this dissertation, a structural approach will be primarily employed, where trust is described starting out from the social relations that connect a group of distributed co-workers. This perspective will be further elaborated in Chapters 6 and 7 of this dissertation.

3. Trust in organizations

The main research question in this dissertation is directed at how trust is developed in distributed workgroups. So far, I have described what is implied in the concept distributed workgroups, and presented some of the research that has been conducted. This chapter will more thoroughly discuss the concept of trust, and some of the central movements within social science theory in the field, with an emphasis on organizational studies. Five main perspectives on building trust are discussed, and I will look more closely at how these suggests different “sources” of trust within distributed workgroups.

3.1 Definition

During recent decades, trust has received a central place within different social science disciplines, like economics, sociology, political science, and psychology. Researchers within these different areas have to a large extent established different perspectives on this concept. Still, it is possible to emphasize trust as a phenomenon having characteristics that most people can agree on. A general description that covers the term the way it usually has been understood in the social sciences has been proposed by Rousseau and her colleagues (Rousseau, Sitkin et al. 1998 p 395). They define it as: “... a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another.”

The definition demonstrates that trust has to do with individuals’ positive expectations of other people’s intentions or behavior in situations where there is a risk of loss, injury, or the infliction of other inconveniences. Firstly, implicit in this definition rests the presumption that trust is a characteristic of a social relation. When a person chooses to believe that another person acts (mostly) as expected in a future risk situation, this can be described as a trust situation. In order to speak of trust, it is important to be able to define some individuals as trusters and others as trustees. Another central point that follows from the definition is that trust takes place in situations where the possibility of a negative outcome exists. Trust is not merely about having positive expectations, but having positive expectations that are developed in a situation that contains risk and uncertainty, and where the possibilities for having control are reduced or non-existent. Therefore, it can be said that trust exists in situations where a person chooses to cooperate with others despite the possibility of a negative outcome or a risk (Currall and Inkpen 2006). Such situations usually emerges in situations where there are a certain level of interdependency between parties, i.e. a situation where the interest of one party cannot be achieved without reliance upon the others.

In connection with understanding trust as being an important characteristic of social relations and systems, the concept of *mistrust* can be found. This not only indicates the absence of trust, but also the presence of negative expectations of other people's behavior. Mistrust has been described as a "functional equivalent" of trust because actors can choose to have trust in others or not, and both choices will reduce the social complexity of a relation¹⁵ (Barber 1983; Luhmann 1988). But whereas trust deals with uncertainty by choosing to enter into a risk relationship, mistrust involves a conscious avoidance of risk. Like most theoretical and empirical contributions to this field, the articles in this dissertation will focus on trust rather than mistrust. However, the empirical studies revealed that the distance between trust and mistrust was at times rather short in distributed groups. Studies of trust would probably be difficult to conduct without referring to risk or mistrust.

3.2 Levels, dimensions and types

Trust generally has to do with subjects' expectations of others within a given situation. Even though a relatively broad disciplinary consensus about the general content of the concept of trust exists, there are many different perceptions of where "the source of trust" can be found. Within psychological literature, it is often emphasized that individuals have different innate or acquired conditions for trusting others. An *individualistic* understanding stresses this as being an individual characteristic linked to the general attitudes of individuals toward other individuals and situations. The phrase "propensity to trust" is often used in order to indicate a stable internal factor that influences the probability of one party having trust in another (Mayer, Davis and Schoorman 1995). Such premises can be due to personality-type, personal experiences, or cultural background, and it is generally believed that such conditions can influence the building of trust in working life (Brown, Poole and Rogers 2004).

More in line with the definition provided above, several professionals meanwhile have advocated the idea that trust is primarily a characteristic of a social relation. The concept *interpersonal trust* is used in order to describe a relation between individual persons.¹⁶ Such relations of trust can be specific (trust in person Y concerning technical questions) or include many different circumstances (trust in person X in almost all contexts). The cognitive and affective trust dichotomy is often used to indicate two such divergent forms of trust (McAllister 1995), and these will also be used in several of the following articles in the dissertation. Cognitive and affective forms of trust can be seen as two dimensions that describe the trust between two parties, and most relationships will contain elements of

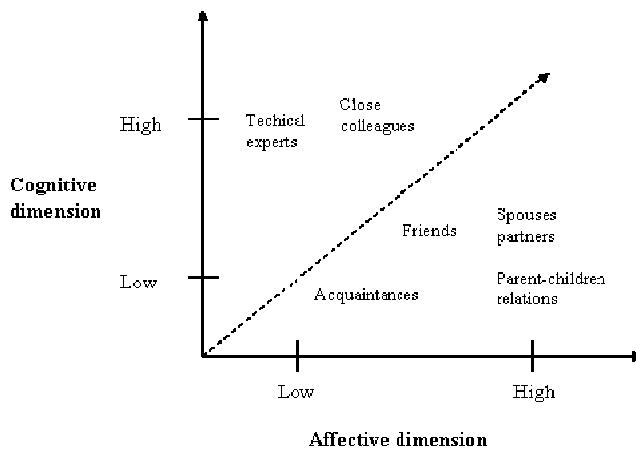
¹⁵ This idea has been most strongly promoted by Luhmann (2006). Grimen have, however, pointed out that this is in contrast with the classical functionalistic approach in sociology where mistrust is seen as an indicator of an dysfunctional social system (Grimen 2000).

¹⁶ Notice that interpersonal trust is periodically also referred to as "relational trust."

both types (Rousseau, Sitkin et al. 1998). A relationship between parents and children will for example usually have a strongly affective element, but with a lesser degree of cognitive trust. In the opposite instance, our trust in a technical expert (doctors, pilots, car mechanics) usually has a more cognitive form (see figure 3 below). Previous research has shown that cognitive and affective dimensions are often tightly connected with each other within job relations (McAllister 1995). Since an important part of the concept of trust deals with relations between persons, several trust relations that are coupled together can be described as *trust networks* (Tilly 2005).

An important point in several more recent examples of research, especially within sociology and political science, is that trust can be attributed to other actors than individual persons. Many have argued that organizations can for example serve as objects for the trust of others, and some even claim that organizations can appear as subjects of trust (i.e. units that have trust in others) (Sydow 2006). Trust in abstract systems such money, institutions, and advanced technology – so-called *system trust* – has been described as an important characteristic of modern social systems (Giddens 1991; Luhmann 1988; Zucker 1986). There is however some disagreement about whether this really falls under what can be regarded as trust, or if other concepts ought to be introduced to describe trust that spans from individuals to systems.¹⁷

Figure 3. Affective and cognitive dimensions of interpersonal trust (Notice that the relationships provided in the figure are only meant as/to be examples).



¹⁷ While Giddens (1991) prefers to the term “system trust”, Luhmann (1988) has suggested that this should be described as confidence.

Still, it is clear that this stretches the boundaries for that which naturally falls under the definition of trust which was proposed above. Beyond this, there is broad consensus that trust cannot be understood independent of the social context it is a part of. A leading idea within sociology has for a long time been that trust is not only about the expectations of individual persons, but also norms and values within certain institutions or cultures. Thus, it is periodically claimed that certain groups (McEvily, Weber, Bicchieri et al. 2006), organizations (Cohen and Prusak 2001) or nations (Fukuyama 1995) have higher or lower levels of trust than others. Within such a perspective, the term *generalized trust* is commonly utilized. Even within such a purely sociological perspective, the definition of trust as being “positive expectations” can be retained, but attention here is directed toward social conditions as sources for this expectation.

Viewed from this perspective, trust is a concept that has a foothold in psychology, but which is drawn upon and thematized on different social levels. This means that an examination of the concept of trust necessarily will be extensive, such that it can capture the fairly different understandings that exist within the social sciences. This also implies that the transition and transferring of trust between social levels are of particular interest. As I will later come back to, this is a factor that makes a network perspective especially interesting as a methodological and theoretical approach. I will in the later sections of this introduction retain the term *interpersonal trust* for trust that exists between persons, while general trust in groups will be referred to as *group-based trust*.

3.3 Central theoretical approaches

There is a broad literature on trust which stretches across several social science disciplines. It is beyond the scope and ambition of this introduction to elucidate this large field of study in its entirety. I will underline here five theoretical understandings that have been especially significant for the field in general, but also for subsequent studies of trust among distributed groups. These perspectives – rational, ritual, norm-based, institutional, and reflexive understandings – thematize trust using rather different approaches.¹⁸ While the four first perspectives are relatively well developed, the last one has only been emphasized in more recent works. This chapter will not provide exhaustive presentations of the underlying theories, but clarify some of the most important approaches to the concept within the disciplines that study organization.

¹⁸ The categorization that is put forth here is my own. The structure that is used here builds on Möllering (2006) and Lane (1998), among others, even though I group the theories somewhat differently than these authors do.

3.3.1 Rational understandings of trust

Rational understandings of trust have been crucial to studies of trust within most social sciences. According to these understandings, trust is something that is the object of actors' active and rational choices, based on different types of accessible information. The potential reward for trusting will be weighed up against the alternative of not trusting anyone or anything, and the research directs itself toward analyzing, understanding, and partially predicting the choices that actors are confronted with. These basic assumptions are fundamental to contributions on trust from Coleman (1988; 1990), Axelrod (1984) and Gambetta (1988), among others.

A key point of departure in this school of thought is the understanding that trust, in many areas, can be evaluated from rational understandings of *probability*. Since actors are generally understood as being rational, it is then possible to evaluate the probabilities of trust within a given situation, which then again opens for the possibility to predict or model future outcomes within similar situations. Coleman (1988, 1990) is perhaps the one scholar within "rational choice" theory who has discussed trust to a significant degree. His point of departure is how actors choose to trust others based on access to information about whether those others are worthy of trust. According to his understanding, choosing to trust becomes analogous with taking on a bet. He writes: "If the chances of winning, relative to the chances of losing, are greater than the amount that would be lost (if he loses) relative to the amount that would be won (if he wins), then placing the bet as an expected gain, and if he is rational he should place it" (Coleman 1990, p.99).

When faced with a choice of trusting, an actor will seek out information about the worth of another party's trust, together with the benefits of having a trusting relationship, the possible costs of betrayal, and the probability that betrayal will take place. A rational actor will seek out information about these factors, and decide to place their trust in someone as long as the costs of doing so do not exceed the benefits. A key aspect of Coleman's understanding of trust is also the role other actors have in passing on trust within "trust chains" (Coleman 1990). Third parties can enter into the picture as middlemen who take on some of the risk of trusting, something that makes building trust possible where it otherwise would have been difficult. A decision of "placing a bet" on other, then is not only a question of your own experiences, but also of the experiences of those that you already trust. In situations where there are repeated interactions and the number of participants is surveyable, individuals can build up a *reputation* that will strongly affect their trustworthiness.

Another central point of departure for rational understanding is how individuals handle different forms of *trust dilemmas*. The most general trust dilemma is whether an actor chooses to trust in someone (with the risks this implies in case of a possible betrayal) or not, and thereby take on the costs of standing alone (Gambetta 1988; Kramer and Cook 2004). Within these types of studies, trust is often understood as being one of several possible strategies when there is a trust dilemma. The

challenge becomes deciding which strategy over time can provide the best “profits”. A well-known dilemma that is often referred to in this literature is “the prisoner’s dilemma,” where two prisoners have to make the choice of confessing or denying a shared crime (Möllering 2006, p. 32-33). Both prisoners must decide to confess or keep silent, but the consequences of their choices are affected by what the other chooses to do: choosing to trust the other appears to be one of the strategic solutions, just as valid as the choice not to trust. However, the choice is complicated by the fact that it is impossible to know what the other party will do. Within rational understandings of trust many similar “trust-games” have been developed that start out with dilemmas where different types of information are accessible. Important factors here are on the one hand, whether a person is able to carry out repeated games and the possibilities that exist for choosing other partners, and on the other, whether there are other witnesses to the game such that a reputation mechanism is active.

Such games are relevant in that they often reflect general situations, and thereby can be said to produce general knowledge about how trust is established within social systems. However, most of these studies are pure theoretical explanations, or they tested out in statistical simulations (Buskens 1998). Still, there are empirical studies that investigate how actors act when they are confronted with trust dilemmas. A well-known example is Axelrod’s study of trust and cooperation with the help of an experiment-situation (Axelrod 1984). Based on a description of an imaginary situation, actors were asked to attempt developing a form of cooperation that they thought was the most beneficial. The game was repeated several times such that it was possible to follow which strategies were used and how beneficial they were over time. The best outcome was derived from a “friendly” cooperation strategy, where a person cooperates in the first round, and later does the same as the other in the previous round (a “tit-for tat strategy”). However, those who chose more aggressive and greedy strategies came out worse than the others. Axelrod thereby claims that this both demonstrates why cooperation generally pays off, and indicates why cooperation has evolutionarily developed.

A third main topic within rational understandings involves studies of what causes a person to *choose to trust* others. Mayer and his colleagues have in this field developed a model that attempts to summarize research concerning this topic (Mayer, Davis and Schoorman 1995). The model stresses that the development of trust is dependent upon the situation of both a person A, who considers trusting (truster), and a person B, who is a potential object for this trust (trustee). For the truster, it is primarily an inherent tendency to trust or not that is underscored (“propensity to trust”). This is assumed as constituting a relatively stable psychological fact. For the trustee, there are three central factors that are pointed out as being essential for an assessment of whether someone is trustworthy: “ability”, “benevolence” and “integrity”. While ability refers to perceived competency and the abilities that a person is expected have, benevolence refers to the institutional relationship that exists between trustee and truster. The authors compare this with the motivation that one can expect the trustee to have for cooperating or not. The third factor, integrity, has to do with the more general principles it

can be assumed a person has. Affiliation to certain groups or associations is mentioned as examples here. In the model proposed by Mayer et al., the choice to trust others is seen as a product of these three factors, together with the truster's general propensity to trust others. In situations where trust is developed, the result will be an increased willingness to take on risk-filled actions, something that will again strengthen the three trust-building factors. Within more empirically directed rational studies, Bacharach and Gambetta have studied what makes taxi-drivers in New York and Belfast trust their customers or not (Bacharach and Gambetta 2001). These researchers emphasize how different indicators (symbols, actions, etc.) are decisive for the degree to which drivers trust their customers or not. Similar to Mayer and his co-authors, Bacharach and Gambetta seek to locate important indicators of trust, and, like Coleman, they assume that trust is primarily a rational process.

Within rational theories, trust is first and foremost something that concerns individual actors, who, during regular and irregular intervals, are confronted with active decisions about whether to trust others or not. The theories have had significant breakthroughs within economic theory, political theory, and sections of organization theory. However, the premise itself that trust is based on the choices of rational actors, and that these actors are capable of having a overview of relevant factors so that they can make the right choices, is frequently criticized (Kramer and Tyler 1996; Lane 1998). A counterargument that is periodically directed at these types of understandings of trust is that these studies usually relate to situations where a person has a form of complete oversight over other people's choices. Such situations are seldom especially representative of the situations people are faced with in real life, and, moreover, this in many ways would make the need for trust superfluous. In situations where actors have full oversight, it has been claimed that trust is actually unnecessary. As we shall see below, other perspectives place great emphasis on the assumption that trust has to do with "giving oneself up to" something that is more uncertain, and outside of what can be considered to be rational.

3.3.2 Ritual understandings of trust

The rational approaches to trust view it as a question of choosing to cooperate with others or not. Within phenomenology, ethnomethodology, and symbolic interactionism, however, it is possible to locate a different perception of trust where it is not primarily considered to be a rational process, but rather an "in-built" quality of social systems (Garfinkel 1963; Garfinkel 1967; Goffman 1959; Goffman 1971; Schütz 1967). The source of trust is not the individual person's intellect, but rather the actions and the community the individual person enters into at birth. A leading idea here is that trust is developed and maintained by actors' daily participation in natural activities and rituals, and here I will refer to this as a *ritual understanding* of trust. Within phenomenology and ethnomethodology (Garfinkel 1967), trust is emphasized as an implicit condition for social interaction. Schutz' idea that

actors in society hold a natural attitude toward life around them, and that their “lifeworld” is largely taken for granted is either explicitly or implicitly the basis for numerous works within ethnomethodology.

In the works of Garfinkel, trust is understood to be a part of that which we “take for granted” to such a degree that we do not realize it before unexpected changes occur in our daily life (Garfinkel 1967, p. 38). Similar to the rational theories, Garfinkel often uses game-metaphors when he describes interactions and social processes. However, this has more to do with unconscious games within a culture than individual strategic games, and he describes the fundamental game rules for social life through three “constitutive expectations”. These can be described as a set of rules for the game which a) provides space for alternative actions and alternative outcomes, b) is binding for everyone involved, and c) pertains equally to all players. Through experiments, Garfinkel attempts to illustrate how people seem to work actively in order to maintain these expectations, or to get things to fall within the rules that pertain to social situations. His experiment involves setting up situations where these rules deliberately are breached by one of the parties, to explore how this creates confusion and attempts to re-establish the normal situation. For Garfinkel, trust is related to acting in accordance with the pre-established rules of the social game. He writes that: “to say that one person “trust” another means that the person seeks to act in such a fashion as to produce through his action or to respect as conditions of play actual events that accord with normative orders of events depicted in the basic rules of play” (Garfinkel 1963: 193).

Within ethnomethodology trust is an implicit condition for participating in social life, but it is also something that continuously is re-produced through participation in daily interactions. This perspective is also clearly expressed in Goffman’s work (Goffman 1963; Goffman 1967; Goffman 1971). Here, the function of daily rituals in daily life is described as being a way of showing that one accepts and recognizes the social status of others. The well-known “civil indifference” that, according to Goffman, is typical of modern societies, can be understood as a way of expressing and maintaining a form of generalized trust (Goffman 1971). The ritual perspective’s emphasis on trust as a natural attitude, and something that is reproduced through regular interaction and action is also reflected in more recent sociological theories, including Giddens’ work (Giddens 1984; Giddens 1991). Similar to Garfinkel and (especially) Goffman, Giddens stresses the routines of daily life as crucial for developing trust in our existence. Using theory from developmental psychology, he argues that trust is developed in connection with the child’s experiences with distance in time and place (1991, p. 38). For small children, the development of *basic trust*, and thereby one’s own identity, builds upon a gradual experience of caregivers returning after periods of being absent. The key to developing basic trust is the child’s understanding of repetition and daily routines. He writes: “From the early days of life, habit and routine play fundamental roles in the forging of relations in the potential space between infant and caretaker. Core connections are established between routine, the reproduction of coordination

conventions, and the feeling of ontological security in later activities of the individual” (Giddens 1991, p 39).

The routines of daily life are key elements for how people are able to build up a feeling of security and safety around themselves in circumstances characterized by insecurity. This understanding of trust is close to the “natural attitude” which is rooted in phenomenology and ethnomethodology, even though he to a greater degree emphasizes this as being a type of practice. Still, Giddens eventually develops his theories toward a more dynamic understanding of trust, especially through his description of “active trust”. I think this represents a somewhat different understanding of trust than what is typical for the ritual approach described so far. Therefore, I will come back to this when I describe the reflexive perspective on trust.

3.3.3 Institutional understandings of trust

The ritual approach to trust has been an important starting point for studies of trust within new-institutional organization theory. This school of thought can be considered to be an extension of phenomenology and ethnomethodology, but with greater emphasis on the active role of institutions in developing basic “rules of behavior”.¹⁹ It also usually operates on a more macro level than for example Garfinkel and Goffman. In line with Berger and Luckman’s understanding of socially constructed realities (Berger and Luckmann 1966), neo-institutional theory attempts to look at those processes that are the basis for the development of shared understandings within institutions. Here, trust becomes something that is largely taken for granted, but at the same time is something that is recreated through daily activities, rules, and routines. In this way, it can be imagined that trust is something that a person is “taught to do” through participation in the daily life of institutions. This is an idea that has been developed by Möllering (2006a), among others. Using DiMaggio and Powells description of “isomorphisms” as a point of departure, Möllering claims that a person can speak of trust as an institutional isomorphism. His point is that manifestations of trust behavior can largely be based on a natural attitude, or on the fact that “everyone else does it.” Personal relationships are here radically toned down for the sake of (viewing) trust as a process that is developed through imposed norms”, imitations of other people’s behavior, or through attempting to fulfill the norms that pertain to certain institutional roles. Möllering claims that: “DiMaggio and Powells three mechanisms of institutional isomorphism offer explanations for trust that represents a genuine alternative to rationalist accounts, since external pressure, modelling and socialization influence action independently of its conceivable utility to the actor (Möllering 2006, p 64).

¹⁹ For an introduction to new-institutionalism in organizational studies, see DiMaggio and Powell (DiMaggio and Powell 1991).

Within neo-institutional organization theory, ethnomethodological thought is thereby developed further in the direction of institutions and organizations. While Garfinkel and Goffman are preoccupied with social situations as frameworks in order for understanding social action, the social institutions (and most commonly the organizations) increasingly become objects of the research. The work of Zucker (1977; 1986) has created a precedent within this school of thought with regard to studies of change in trust from an institutional perspective. Her main concern is to explain and describe how the production of trust in society has gone through changes in line with the emergence of new societal institutions. Starting out from a review of economic structural changes in the United States during the period from 1840 to 1920, she claims that the institutions have played, and play, a constantly greater role with regard to the production of trust. Zucker describes first three principal ways that trust routinely is reproduced in modern society. First of all, there is a *process-based trust* linked to explicit interactions or exchanges between persons in the past or the future. This is a production of trust that is often linked to the exchange of gifts and services. For this type of trust production, reputation is very important in that it indicates good possibilities for further transactions or interactions. The other main form is *characteristic-based trust*, which is based on affiliation with or connection to certain social categories (e.g. family background, ethnic affiliation). The third main form is the *institutional trust* that has to do with great societal institutions. The basis of this type of trust is the presence of “objective” instances that operate independently of individual characteristics or distinguishing marks. In connection with this, Zucker emphasizes two types of trust: First of all, a form that is based on expectations of occupational roles (like lawyer, doctor, professor) or certain organizations (hospitals, bureaucratic institutions, etc). The other main type of institutional trust comes from intermediary mechanisms, where third parties serve as guarantors of exchanges or agreements. This can be, for example, insurance companies, banks, or brokers.

Zucker stresses that all of these modes of production are important and active in all modern societies. Still, she argues that there have been great fluctuations in the forms of trust through history. Her main argument is that the process-based form gradually eroded in the United States toward that end of the 1800s, due to internal and external immigration, together with unstable economic frameworks for activity. While attempts to reestablish process-based trust failed for the most part, a great escalation in institutional trust took place in society. Trust is constructed within institutions, but institutions increasingly also become the recipients of trust. In modern society, we need to trust in formal institutions, and according to Zucker, a gradual development in the direction of a more impersonally and institutionally anchored trust has taken place.

3.3.4 Norm-based understandings of trust

Within Zucker's neo-institutional framework, trust in the institutions becomes an alternative and a compensation for relational trust within more advanced societies. Here, she is largely in agreement with modernity theorists like Luhman and Giddens, who have claimed that modern societies increasingly are built on trusting abstract "systems". As an extension of this, studies have been conducted that direct focus on trust as something that exists more generally within the cultural norms of a society. The concept "generalized trust" refers to the existence of a form of general positive confidence in others, embedded in broad cultures and national regions. A central point of departure for several recent theories has been that it is possible to locate and measure such differences over time, and between different national cultures (Fukuyama 1995; Putnam 2000; Woolcock 2001). The concept *social capital*²⁰ is periodically used to describe the value of having well-developed relationships based on trust within a society. This is an approach that in many ways can be considered to be a continuation of institutional perspectives, in that trust is socially constructed within social systems. At the same time, there is more focus on the underlying *norms* that are found within cultures and communities, and this perspective is broadened to include greater units such as nations and cultures.

A key contributor to this field is Putnam (2000), who has argued that, in general, trust in American society has been reduced during the last fifty years. His understanding of trust is linked up to the broader concept social capital, which is understood as being "connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them" (Putnam 2000, p. 19). His main thesis is that these relations and norms have been – and are – in retreat in American society due to various factors, including the more individualized ways of life and a gradual erosion of the unions and associations that were previously important for connecting people. The degree to which such a dystopic development actually is taking places can definitively be discussed, and some researchers have claimed that Putnam ignores important characteristics of development that actually contribute toward building new forms of social capital (Lin 1999; Wellman 2002). In this context, it is however sufficient to emphasize that Putnam's understanding of trust is related to social norms within a community, linked to social relations and networks.

While Putnam has been preoccupied with reading changes in generalized trust within society over time, others have been more focused on expanding upon geographic distinctions: A central thesis of new contributions to the field is that it is precisely local process-based trust that is significant for the economic and political development of greater regions and nations. Fukuyama (1995) has argued that

²⁰ Social capital is a concept that can be defined in different ways and is often used on different social levels. The understanding that is mentioned here is in line with Putnam, who views this as a society's collective "social network, and the norms for reciprocity and trustworthiness are developed in the light of these" (See Putnam 2000, p. 19). Others have used the concept to describe the relational resources of individual actors (Burt 2005; Lin 1999).

there are great variations in generalized trust within different national cultures and over time. Similar to Putnam, he emphasizes that trust builds on certain shared values and norms within a community. According to Fukuyama, the basis for such norms is located first and foremost within family relations. However, he stresses the significance of mastering building trust on a level *between* the tight family groups and large public institutions. Characteristics of high-trust cultures are, according to Fukuyama, a tendency to develop trust within volunteer organizations, local interest groups, and religious communities. Based on such a general theory of trust, he attempts to sort nations according to high or low levels of trust.

The institutional and norm-based approaches to trust have been an important basis for several large studies of trust within nations and regions. Studies have been conducted under the direction of OECD and World Value Survey, among others. These studies have received a great deal of attention in the general public in Norway and other places (This will be more thoroughly described in Chapter 3.5). At the same time, these contributions seriously depart from the relational and actor-oriented understanding of trust that can for instance be found within the rational perspective. Viewed in this way, there is a certain justification for discussing whether the same phenomenon that is actually being discussed, or if other concepts should be employed.²¹

Interesting differences between the way neo-institutional theorists like Zucker view how the production of trust is changing in modern societies, and the norm-based approaches of Putnam and Fukuyama. For the latter two mentioned here, impersonal institutional trust in itself is not sufficient to develop trust within societies. They view the development of relational trust at a lower level as decisive for achieving a broader and more general trust. Zucker, on the other hand, views institutions as the bearers of trust in recent times, and to such a degree that the relational networks lose a great deal of their significance and power.

3.3.5 Reflexive understandings of trust

An essential point of the concept of trust is that it is actualized by uncertainty and risk, and that trust represents a step in the direction of accepting things that cannot be entirely controlled. A critique that is periodically directed at rational understandings is that they to a limited degree accept that trust can be based on factors *beyond* rational calculations. The ritual approach can simultaneously be criticized for the fact that it views trust as something rather passive, something individual actors are assumed to take for granted, as long as nothing unexpected occurs. Institutional and normative approaches can also be criticized for having an “over-socialized” viewpoint on the actors, where trust

²¹ For a critique along these lines, see Hardin (2006 p 58-74).

for the most part is dictated by external conditions. Much of the same critique can be directed toward the institutional understandings.

More recent contributions have pointed out that between these, an alternative understanding of trust on the level of the actor can be found, which still does not have a predominantly rational form. Support for such a perspective is found in the later work of Giddens, and others.²² Giddens describes the establishment of trust as the following: “a ‘leap into faith’ which brackets ignorance or lack of information” (Giddens 1991, p. 244). It is true that trust is an underlying attitude toward existence, but it is also often something that a person must actively relate to in daily life. Still, it is not the case that we always have the chance to evaluate this on a rational basis, in the way the rational theories seem to imagine, but rather it is a question of securing confidence in something or someone on an often fluid and emotionally contingent basis. Therefore, according to Giddens, to trust implies wandering out into the unknown, without guarantees for anything. Giddens emphasizes in later works the significance of trust as an active process that modern people increasingly have to actively work at to maintain. The concept *active trust* describes this as a process that demands action and engagement: “What can be called active trust becomes increasingly significant to the degree to which post-traditional social relations emerge. Active trust has to be energetically treated and sustained. It is at the origins of new forms of social solidarity today, in contexts ranging from intimate personal ties right through global systems of interaction.”(Giddens 1994 p 186).

Giddens’s anchoring in ethnomethodological thought can hardly be called into question, but the approach to trust that he describes here is different than that which is common within ethnomethodology or neo-institutional theory. Giddens stresses that trust in (late-modern) societies can no longer be taken for granted but needs to be actively “worked on” on a relational level. This can be considered to be a separate understanding of trust where the focus is on the active development of social relations. In a society where external institutions are changing, or no longer can be taken for granted, trust becomes more of a personal matter than it was before. His emphasis on trust as something active, yet based on a form of confidence, is important because it states a position that goes beyond both the rational and the norm-based understandings of trust.

Nevertheless, Giddens is not alone in having this position. The basis for another more active understanding of trust building can be found in *social exchange theory* as it has been described by Blau, Homans and others (Blau 1964; Homans 1950; Kollock 1994; Lawler and Yoon 1996). Within this school of thought the actor is usually seen as rational, but descriptions of trust emphasize it primarily as being a process characterized by gradual testing.²³ Blau (1964) believes that relationships

²² Giddens does not himself propose the concept “active trust” as a part of a new way of understanding trust. His main concern is however a theoretical discussion around the changing significance of trust in modern societies.

²³ Social exchange theory is often coupled with the tradition around “rational choice theory”. However, Blau himself seeks to distance himself from viewing social interactions as calculated actions. On the contrary, he emphasizes that social

gradually develop on the basis of exchange of material or immaterial rewards, and that imbalance gradually can generate dependence and relations of dominance. Trust is not something that can be taken for granted, but is something that is developed through repeated interactions. While the first steps within an interaction generally hold little risk, eventually more trust can be built into the relations, such that they can handle higher risk. The idea is that trust must be gradually built up through active measures, such that in the best case it can develop a self-reinforcing “spiral” where trust grows little by little. The *first initiatives* are especially critical and decisive for developing trust, claims Blau, since this is a type of contact that is entered into with minimal trust, and great risk for rejection.

As mentioned earlier, the idea that trust is strengthened through successfully repeated exchanges is a central theorem within social exchange theory. The exchange system is driven by the desires for reward, either in the form of material goods, but also perhaps primarily immaterial goods like acknowledgement, respect, admiration, and (especially) power. At the same time, threats of sanction exist in the form of lacking power, exclusion, or loss of prestige. However, Blau emphasizes that social exchanges, in stark contrast to economic transactions, are unspecific and impossible to precisely define. An interaction begins without written agreements or assurances, but with a justifiable hope of reciprocation. A certain degree of trust, or positive expectation, is therefore necessary in order to begin engaging in social exchanges at all (Blau 1964, p.94). If a favor is answered with an acceptable return favor, the recipient is left with increased credibility, and the relation of trust is strengthened. On the other hand, if a favor or gift is not reciprocated, or the reciprocations are insufficient, mistrust can develop. For Blau, the underlying factor that drives social interactions forward is *attraction* to others, or a desire to be seen or respected. Meanwhile, this individual motive gradually drives relational trust forth as social relations are developed in a positive direction. He writes that: “... processes of social exchange, which may originate in pure self-interest, generate trust in social relations through their recurrent and gradually expanding character” (Blau, 1964, p 94).

In this kind of context, trust appears to be abstract value that actors invest in over time with expectations of getting something in return at a later point in time. The development of relationships through repeated exchange eventually develops stable relationships and thereby social structures. The significance of good early contact is emphasized in later works on establishing trust in organizations. According to Zand (1997) successful early contact is the key for trust to develop into a *self-reinforcing spiral*. Such a development involves a gradual greater openness in a relationship where one party eventually gives the other party access to more information and reduces controlling measures. However, Zand also argues that a negative trust spiral can be imagined if initial negative impressions of others are formed.

exchanges are characterized by the fact that they fall between calculations of benefits on the one hand and expressions of love on the other (Blau 1964, p 112).

Luhman's approach to trust is first and foremost linked to a system-theoretical understanding, in which trust is understood to be a mechanism impelled by situations characterized by great complexity (Luhmann 1979; 1988; 2006). Nonetheless, tendencies toward a reflexive understanding can be found in his work. The significance of *making the first move* resonates with Luhman's understanding of trust, which uses the expression "the principle of gradualness" in order to describe how trust is built up over time. He also points out that trust must emerge on a free basis, not as norm-based actions. Acting in accordance with fixed norms constitutes a poor basis for developing relational trust, he claims. On the contrary, only exceptional or unique experiences are important when persons choose to develop trust relationships or not.

The principle of a gradual development of trust has also been emphasized in social psychological studies on work relationships. Lewicki and Bunker claim that work relationships, similar to private relationships, go through phases that involve three distinct forms of trust (Lewicki and Bunker 1996). In the first phase, trust is described as being based on calculation, linked to certain possible benefits that can be derived through cooperation, or the disadvantages that exist in not cooperating. Maintaining a good reputation can be this type of important motivation in organizations. Lewicki and Bunker describe the next level as *knowledge-based* trust. This form is based on duration and repeated interactions such that a more general expectation of others is developed. A third type of trust is described as identity-based, where each party can identify with the needs and motives of others. Within this particular form of trust, the parties can replace each other in several situations and no forms of surveillance or control are necessary. Key factors that strengthen identity-based trust are developing shared symbols of identity, co-localization, and adjustments to a shared set of values. The point Lewicki and Bunker are trying to make is that work relations start out on a calculation-based level, and in most cases develop into relations that are knowledge-based. Only in some instances, however, do these relationships develop further into identity-based trust.

A reflexive understanding also finds support in Tilly's historical studies of far-reaching trust networks within religious and political movements (Tilly 2005). Tilly argues that trust is one method of coordination that people use in order to organize their ventures, in addition to markets and hierarchies. Therefore, people invest significant energy into developing a network of trust in many areas, either within the frameworks of the public system, or completely separate from these. For Tilly, trust is not first and foremost something that can be linked to individual persons, but a characteristic of social relations and networks. An (transactional) understanding: "... treats trust as a contingent, negotiated property of social interaction" (Tilly, 2005 p 25).

The theorists who are described here as having a "reflexive understanding of trust" in no way represent a uniform school of thought. What they have in common is an assumption that actors can (and in certain instances should) have an active attitude toward trust, which manifests itself in

interaction-based initiatives directed toward other people. An element of “gradualness” linked to developing trust also exists. A person chooses to count on others, yet does not wager everything. Trust is built up over time from less risky interactions to more binding commitments and alliances. In most representations of trust, the idea that it springs out of a situation where risk and uncertainty exist is emphasized. A key point for Giddens is that modern societies have certain qualities that make trust between people more important than previously. His understanding of active trust resonates in schools of thought that emphasize the development of trust as a dynamic process linked to the establishment and development of social relations. The idea that active trust becomes more important in modernity, however, moves in a different direction than neo-institutionalists like Zucker, who sees limited space for process-based trust in modern society.

3.4 Sources of trust in distributed work groups

The examination of different perspectives indicates how trust has been discussed within different traditions within social science disciplines. These differences do not primarily have to do with what trust is, but rather what factors are important for it to develop within social groups and community. In sum, this can be described as calling attention to five somewhat different conditions: While the rational perspectives emphasize trust as being a product of individuals’ *rational calculations*, the ritual perspectives emphasize trust as being something that is maintained and reproduced through *participation in social rituals*. The institutional perspectives emphasize the significance of *social institutions* as guarantors and producers of trust, especially through the establishment of social roles, while the norm-based understandings emphasize the significance of shared *social and cultural norms*. Similar to the rational understandings, reflexive perspectives emphasize the significance of *individual actors* who have a general understanding that trust is necessary, and something persons have to actively work with.

As previously described, distributed groups have special challenges in connection with developing trust. Whatever perspective a person operates from affects how s/he assesses the possibilities for building up trust in distributed work groups (see Table 4). Taken to an extreme, it could be said that rational perspectives stress that cooperation will actually have to pay off for the involved parties in order for them to develop. More precisely, the involved parties must have sufficient insight into the other partners’ motivations and incentives in order to be able assess the degree to which a collaboration might be advantageous. In accordance with perspective of rational theories, cooperation will develop where it appear as rational for both parties. A ritual understanding stresses the significance of the fact that a person can carry out regularly focused and unfocused interactions in order to build trust.

Table 4. Summary of different perspectives on trust and some of the challenges/possibilities they emphasize in connection with distributed cooperation

	Rational	Ritual	Institutional	Norm-based	Reflexive
Level	Individual	Individual/ group	Society	Society	Individual/group
Central type of Trust	Interpersonal, calculating	Action based	Role based	Based on cultural values and norms	Interpersonal, affective and calculating
Central motivation	Self interest	Social participation/ security	Coordination of complex systems	Cultural stability	Self interest, insight and reflection
Potential challenges in distributed work	No incentives for developing cooperation. Lacking information about others	Lacking possibilities for daily, unfocused interaction. Different norms and rules.	Varied, or unclear institutional frameworks	Participants from different organizational and national cultures	Lacking interest, motivation and possibilities among individuals
Possibilities for distributed work	Increase or illustrate self interest for the participants	Establishment of time and space for interaction and contact	Build on roles within professional environments	Build on shared norms and values in communities and societies	Open for active relational development by individuals over time

The existence of shared arenas for situations of interaction becomes important here, together with certain shared understandings of what rules and codes apply. An institutional perspective on the other hand directs attention toward the significance of certain shared institutions. The importance of having uniform perceptions of roles can play a role here. Norm-based perspectives will emphasize that shared cultural norms and rules should exist for trust to build upon in such groups. The reflexive perspectives, however, focus on the individual actor's active measures for building trust, starting out with a broader understanding of the fact that this is actually important for the group as a whole, or for the organization. In a reflexive approach, building trust across distance becomes a question of whether people think it is necessary, and engage in an active building of trust-bearing relations.

3.5 Trust in new organizations

Within literature about trust in new forms of organization²⁴, a great deal of the discussion has been based on *institutional thought*. As previously mentioned, on a macro-level, Zucker and others have argued that new (institutional) forms of trust are making headway because of changes in the organizations. According to Zucker, this is firstly due to the need for exchanges between industries, occupations, social industries, and unions. The second factor – which is of particular interest here – is the increase in transactions across geographical distance. Others have followed up on this way-of-thinking and argued that a simpler institutional trust will make headway in new organizations (Heckscher 1994).

The argument that trust in new organizations will increasingly base itself on shared projects and uniform perception of roles has been expressed through the concept *swift trust* which several empirical studies of distributed work groups have emphasized (see Chapter 5). Meyerson and her colleagues introduced this concept in order to describe how a simpler and more task-focused form of trust dominated within temporary groups (Meyerson, Weick and Kramer 1996). The basis for this was a series of second-hand studies of cooperation within different exclusive professional environments (film crews, ambulance personnel, firemen, the cockpit-crew in airplanes, etc.). Studies of these groups showed that cooperation could rapidly be established if it was based on a shared understanding of roles and projects prevailing within different professional environments. Hence, key to the swift trust was the existence of institutional frameworks within which the temporary groups worked. Theoretically, this understanding is then linked to an institutional understanding of trust.

However, from another standpoint it has been argued that an institutional-based swift trust is not sufficient in newly distributed organizations and groups. More closely related to a ritual and norm-based understandings of trust, it has been claimed that the growth of a stronger form of trust is taking place – or needs to be taking place – in new organizations. This perspective has been promoted by Handy, among others, who argue that these types of distributed organizations and virtual teams primarily have a need for stronger relational trust (Handy 1995). He writes that: “If we are to enjoy the efficiencies and other benefits of the virtual organization, we will have to rediscover how to run organizations based more on trust than on control. Virtuality requires trust to make it work: technology on its own is not enough” (Handy 1995:5).

²⁴ Different labels are used to denote “new organizational forms”, including: post- bureaucratic organizations (Heckscher 1994), virtual organizations (Nohria and Berkley 1994) and network organizations (Miles and Snow 1992). These concepts are not isomorphous but the still have high degree of similarity, and I will simply use the term new organizational forms to refer to these broad stream of theories. For a closer review and comparison of these theories, see Poole (1999).

For Handy, the solution is not for organizations to base themselves on a simpler and more task-oriented trust form. Rather, his recommendation is to try developing stronger communities within and across organizations, where trust can be developed despite reduced physical interaction. His emphasis on strengthening trust within tight work communities resonates in several camps - to begin with, among researchers who think trust can be considered to be a new and essential quality of modern organizations (Adler 2001; McEvily, Perrone and Zaheer 2003). Adler and Heckscher have argued that the more complex environments and less opportunity to control that exist, the stronger the need for trust and professional communities (Adler and Heckscher 2006). Secondly, it is supported by theorists who stress the significance of a “community of practice” for developing knowledge and learning within organizations (Wenger 1998; Wenger 2000). Here, tight professional communities are considered to be important for developing and preserving knowledge in organizations as a shared understanding and resource.

The challenges for distributed work is that many of the organizational frameworks within which regular groups work, periodically are not active, or are less effective. When distributed groups are established, people from different organizations and with different professional backgrounds are often involved. Cooperation often takes place across different organizations and occasionally also different national cultures. This means that the basis for a shared understanding of projects and roles, in the way it is depicted within institutional understandings, is limited. Therefore, it is not a given that the possibilities for “swift trust” are present in such groups. At the same time, it is also not certain that the prospects for developing a practice-based form of trust, at least in the way that it is emphasized in the ritual perspectives are good. The organizational framework for cooperation is often changing, such that it can be difficult to establish good arenas for developing trust, at least at the beginning of such cooperation. This means that there are scarce opportunities to develop denser communities – at least in the way they are emphasized within norm-based and ritual understandings. It takes time to develop shared arenas for the development of trust within distributed groups. This can also not be expected to take place “by itself”, through participation in the daily cooperation. The transition to more mediated forms of interaction usually demands a greater degree of reflection about the choice of forms of communication.

These factors indicate, I will argue, that there is a need for a more active and reflexive form of trust within distributed groups. This perspective has rarely been applied in theories and discussions of new forms of cooperation and trust. Support for this kind of viewpoint can be indirectly found within theories that emphasize the significance of “facilitators” in distributed cooperation (McEvily and Zaheer 2004; Pauleen and Yoong 2001; Thomas and Bostrom 2005), or the significance of “boundary spanners” in order to accomplish inter-organizational cooperation (Friedman and Podolny 1982; Tushman and Scanlan 1981). In several of the cases that are analyzed in this study, it is evident that the distributed groups had difficulties with developing trust at the commencement of their cooperation.

Most of these groups operated across geographical and organizational boundaries, where trust in the organizations was declining. Trust was therefore not something that happened automatically, through participation in shared activities, or through shared perceptions of the tasks at hand. Instead, we found that individuals' active and relational building of trust was decisive for it to happen. In later sections of this dissertation, I expand on how I proceeded to study this, and in what way active trust actions contributed to strengthening trust in the distributed groups.

3.6 Measuring trust in organizations and groups

In many empirical studies of trust, measuring levels of trust is an important point. Several of the abovementioned studies of trust on the societal level have made quantitative studies of trust their point of departure. With regard to measuring trust in groups and in organizations, experiments and survey-studies have especially been employed, and here I will briefly describe these techniques. Finally, I will also comment on other techniques that have been used.

3.6.1 Experiments

One of the most common ways of measuring trust is through experiments, where cooperative situations are measured through certain types of *games*. The forms of trust games vary considerably, but many are variations on "the prisoner's dilemma" where two or more persons are confronted by a situation where they can choose to cooperate or not (described in Chapter 3.3.1). In most of these types of situations, the test subjects are asked to carry out certain shared activities that lead to reward, and in some cases, also lead to sanctions (in case they fail to succeed). In addition, the participants are given information about what the others know or do not know, and how long the game will last. In any case, cooperation within the groups is registered and measured within a given time period, such that the researchers can gain an understanding for what kinds of strategies the actors use, and how effective these strategies are. An example of such an experiment is Axelrod's previously mentioned study in which different people were asked to participate in cooperative games that involved different types of rewards (Axelrod 1984). On the basis of many different rounds of games, Axelrod could eventually deduce what cooperative strategies were most profitable.

Some of these experiments in the organizational context are field experiments, where a given set of tasks which have to be solved by parties within a given social context are used. An example is Ferrin and Dirks (2003), who in a study tried out the same set of cooperative tasks among groups who were given different types of rewards. The method provided the researchers with the opportunity to see how the choice to cooperate was affected by different individual factors, including pre-existing

assumptions about the trustworthiness of the partners within whom they had to cooperate. As I will demonstrate in a later chapter, this is a way of measuring trust that is also used in studies of distributed groups (Wilson, Straus and McEvily 2006).

The advantage of experiment-based studies is that they provide researchers with the opportunity to have control over important conditions that are involved in cooperation situations, such that they can systematically determine what significance this has for actors' patterns of action. These are methods that are testable and well-suited for testing out theoretically-based hypotheses. The disadvantage is that they generally have a weak external validity, since the degree to which the results are relevant to cooperation situations outside the experiment situation is uncertain. It is also the case that these studies focus more on cooperation than on trust as it is generally understood. Further, it can be more difficult to say what it is that motivates people to cooperate or not; that which the researcher interprets as trust (a choice to cooperate) can be attributed to entirely other motives – for example, the desire to earn money or express certain altruistic values. When viewed in this way, these studies can also be criticized for having little internal validity.

3.6.2 Surveys

The other main way of measuring trust is through survey studies. Within studies on the societal level, certain questions have been used as the basis for determining general trust. For example, in the international WVS (World Value Survey) trust has been measured through a simple question: "Generally speaking, would you say that most people can be trusted, or do you need to be very careful in dealing with people?" (Field 2003 p 125)

Within psychologically oriented research on trust, survey instruments have been greatly utilized. Usually, a large series of questions have been used to cover the different dimensions of the concept. At the end of the 1960s, Rotter (1967) developed a scale for interpersonal trust (ITS) that was later further developed and moderated. Rotter's original scale includes 25 statements that informants are supposed to evaluate along a *Likert scale*. An example of a statement in Rotter's scale is the following: "Parents usually can be relied upon to keep their promises".

Rotter's ITS scale measures then the degree to which a person trusts others *in general*, and the dimensions that lie within such a general confidence. Within another type of survey, the questions are directed at the degree to which a person trusts *certain other* people. This is the strategy that McAllister (1995) utilizes when studying trust relations between work colleagues in a large organization. One of the many questions he uses is, for example: "I can talk freely to NN about difficulties I am having at work and I know that (s)he will listen". The collective set of questions seeks to locate relationships that indicate affection and cognition-based trust, respectively. A similar form is used by Cummings and Bromiley (1995), who have developed their own framework for measuring trust within

organizations, the so-called Organizational Trust Inventory (OTI). This contains in its entirety over 62 statements that fall within somewhat different dimensions. What is special about this scale is that the object of all the questions is an organization or a department within an organization. Survey studies of trust in smaller groups are less common, but in such studies, OTI or other scales have mostly been used and adapted so that they work for groups. An example here is Jarvanpaa and Leidner (1999) who in their study of trust in virtual groups used a set of five questions that captured general trust within different groups of students. The group-based trust was measured here as being the average values of the participants within this set of statements.

Thus, there are today several different ways of measuring trust through the use of survey instruments. These spans from simple indicator questions to comprehensive scales that attempt to map all aspects of trust. In most cases, they are directed toward measuring a general interpersonal trust, or a general trust in institutions in society. An advantage of these studies is that they make possible the evaluation and comparison of trust over time and between different groups, organizations, and cultures. Such studies often provide fascinating insight into the variations of trust, and they have influenced public discussions in Norway and abroad.²⁵ At the same time, there are significant flaws attached to these studies that are seldom thematized or discussed. First of all, these assume that the informants are conscious of their level of trust, and can express this openly. This departs from, for example, the way ritual perspectives understand trust as being an “underlying attitude”. In large surveys (like WVS) direct questions are generally posed about whether the informants trust others or not, but this presumes that the informants themselves are familiar with the concept and have a similar understanding of it to as the other informants. This can be a dubious assumption and can thereby undermine the internal validity of the study. Secondly, it is not certain that checked answers on a form say anything about how a person *actually behaves* in real situations. While most theoretical understandings of trust emphasize that this involves an assessment of a situation characterized by risk, there is often little risk connected to checking off answers on (hypothetical) questions on a form. Such studies can thereby also be criticized for having a weak external validity.

3.6.3 Other methods

Most surveys seek to measure the general trust others might have. While this is in line with the normative perspective’s emphasis on trust as a general attitude within a culture, this diverges from several of the other perspectives. What is typical for rational or reflexive understandings is that they

²⁵ An example of this is how rankings of trust and social capital are often presented as news. During the fall of 2007, Aftenposten presented an article where attention was focused on Norway’s high score on the WVS study. It said here that “Norway was number two, beaten only by Denmark” (Meisingset 2007).

regard trust as a relational and interpersonal phenomenon. Within *network studies*, systematically mapping these kinds of relationships has been attempted, by developing questions that can capture the quality of trust-bearing relations. This can be regarded as a special form of quantitative studies that are based on informants indicating trust relations within a more specific network.²⁶ Network studies of trust have studied this through direct and indirect questions. Krackhardt and Hanson (1993) suggest using a direct form of questioning, where they openly ask if a person trusts others in the same company in certain general situations. Cross and Parker (2004 p 14) do the same. On the other hand, Burt and Knez (1996) use an indirect form in a study of trust relations in a large American firm. They ask the informants to indicate who they would confide in if they had plans to switch jobs to a competing company. The thought behind this and similar questions is to describe a hypothetical situation that involves a certain risk (In this case, the fact that a person has behaved “disloyally” toward the company can be used against her/him later).

Like for survey methods in general, this can be criticized for the fact that the questions often describe situations that are hypothetical. It is difficult to say if such questions actually say anything about how the participants will behave in actual situations. A third strategy within network studies is to use observations of behavior as indicators of trust relations, for example by looking at the frequency of interaction, reciprocity, and similar factors. This solves the problem concerning the informants’ own indication of trustworthiness, but at the same time it can be difficult to interpret the content of such observations in an effective manner.

A primary weakness of experiments and quantitative measurements of trust is that it separates the actors from the social context within which trust is always developed. While the experiment situations often appear as being restricted and irrelevant in relation to actual situations, the survey method easily becomes a little bit too general and unspecific. Therefore, many researchers have been critical the way trust has been operationalized. Hardin argues, with reference to experiments and survey studies, “In sum there is relatively little to learn about trust from these two massive research programmes” (Hardin, 2001 p. 74). Critics of quantitative techniques often stress the significance of *qualitative studies* that can increase understandings of how trust actually is practiced and understood within given situations. Möllering argues accordingly that interpretive methods have an important place within studies of trust in organizations: “The general orientation should be to get away from measuring predefined variables and get closer to the respondents idiosyncratic experiences and interpretation” (Möllering 2006, p.152).

This dissertation is built on the perspective that qualitative and quantitative studies of trust fulfill each other in important ways. While quantitative studies can provide important indications of

²⁶ Notice that for network studies that are conducted within the ego-network tradition, the informant will herself choose what relations are included in the study. For 1-mode network studies, this will appear as pre-defined units on a form that the informants examine (see also Chapter 6).

trust within groups and organizations, qualitative studies can contribute with insight into the conditions for this, and with the ways in which this is expressed. Through different types of *triangulation*, quantitative surveys, network analyses, and qualitative techniques are combined in order to strengthen validity and reliability in empirical studies of trust (Bernard 2000).

3.7 Summary

Trust is about having positive expectations of other actors' future behavior in situations where risk and interdependency exist. These type of positive expectations can be believed to build upon different conditions, and existing theories emphasize different conditions in this field: Rational understandings stress a calculated insight into the motives of others; ritual understandings emphasize participation in shared rituals and routines; institutional theories emphasize the significance of regulating external institutions; and norm-based understandings stress the significance of shared cultural norms. In addition, a reflexive perspective exists, where trust is attached to a conscious development of social relations between people over time.

These different approaches should be viewed as the main points within different theoretical schools of thought, not as different types of trust, or different methodological approaches. Several new contributions also seek to integrate the different types of trust into comprehensive models (Mayer, Davis and Schoorman 1995; McKnight, Cummings and Chervany 1995; Möllering 2006b). Dichotomies such as cognitive and rational trust seek to capture and combine some of the range of distribution within the concept (McAllister 1995). The theories point toward different sources of trust within distributed work, and possible theoretical positions in order to carry out theoretical and empirical analyses.

The majority of the empirical research about trust utilizes experiment-based studies and/or quantitative surveys for measuring trust. Still, there is considerable doubt about the validity of these types of measurements. Instead of viewing quantitative designs as complete measurements of trust, they should probably be regarded as indicators, and they should be used in combination with qualitative data to the greatest extent possible.

4. Distance, communication and trust

A key characteristic of distributed work is that it includes people who work together across geographical distances. The possibilities of – at least partly – overcoming distance can provide advantages to the companies involved in terms of reducing travel and the chance to put groups with local competencies together. At the same time, geographical distance makes cooperation more challenging, and especially with regard to the development of trust. In this chapter, I will describe why and how distance makes building trust difficult, and the possibilities that electronic media can offer for helping overcome distance. In particular, I will attempt to explain the possibilities that these types of media offer for producing that which is often referred to as “electronic proximity”. The question that will be elucidated is how social relations are affected by distance, and what opportunities communication media provides for overcoming barriers distance. I will also, briefly, discuss some of the possibilities for indirect communication embedded in the technologies; an aspect that may have significant impact on trust-building.

As previously mentioned, trust within distributed work is studied at different levels and from different theoretical approaches. In this chapter, the emphasis will primarily be on trust at an interpersonal and group level, inline with a reflexive understanding of trust. The descriptions of communication processes will naturally follow this level, and this approach.

4.1 Communication and trust

Interpersonal communication can be described as a process that involves exchanges of information between two or more parties, and on the basis of this, the formation of shared viewpoints and understandings (Hartley 1993). Rogers and Kincaid define communication as “ a process in which the participants create and share information with one another in order to reach a mutual understanding” (Rogers and Kincaid 1981 p 63).

Communication is an element that implicitly or explicitly will enter into most understandings of an interpersonal development of trust. However, the way in which trust and communication are related to each other varies, and trust is sometimes viewed as a *consequence* of communication, and sometimes as a *condition* for communication. In organization-directed empirical studies, trust has been traditionally viewed as an underlying factor that contributes to a climate of cooperation in a positive way, and thereby productive performance. Trust is considered to positively affect the intensity of the exchange of information, as well as the general climate of communication in groups and organizations (Dirks and Ferrin 2001). This is considered to be the leading understanding of trust and

communication within organization studies (McEvily, Perrone and Zaheer 2003). However, based on an examination of studies of trust within organizations, Dirks and Ferrin (2001) found relatively modest support for these types of direct connections. Instead, they believe that trust should be viewed as a *moderating variable*, which can strengthen the importance of other variables. They write: “By impacting the assessment of the other party’s future or past actions, trust reduces some of the concomitant uncertainty and ambiguity” (Dirks and Ferrin 2001, p 456). The authors conclude that trust should receive status as a “special variable” in organizational analyses, in the sense that it primarily works together with other variables.

From another perspective, however, it has been argued that viewing trust merely as a motivating or moderating factor in relation to communication is too limited. An alternative position is to view trust as a *product* of repeated acts of communication. Tilly argues that the trust-bearing attitudes are developed as a consequence of repeated interactions over time (Tilly 2005, p 25). This does not undermine the fact that trust strengthens communication, but that communication and trust are linked together in several ways: trust relations are dependent on frequent communication in order to be established, maintained, and (if necessary) reactivated. When viewed in this way, trust becomes not only a condition for communication, but also a part of the “mutual understanding” that comes out of repetitive exchanges of information.

4.1.1 Interpersonal communication in organizations and groups

The definition of communication above emphasizes this as an exchange of information with the intention of establishing a shared understanding. In continuation of this, questions arise about how such an exchange of information can be related to the development of trust. In this context, I will point to several key forms of interpersonal communication that can be considered to be significant for trust in different ways. Firstly, with regard to interpersonal communication within organizations, a divide between *formal* and *informal communication* can be established. The divide refers to the degree to which communication follows a pre-defined route with regard to with the execution of a task and decision-making structure (superior-inferior), or if it goes across these. Formalized communication will usually be embedded in task descriptions or organizational maps. An important characteristic of the more recent understandings of organizations, however, is that informal communication is of great significance, especially within organizations that operate in changeable environments (Krackhardt and Brass 1994; Tichy and Fombrun 1979). Among other things, it is generally believed that informal communication can have significance for important exchanges of information and immediate problem

solving.²⁷ In particular the affective type of trust, is related to more frequent informal communication (McAllister 1995).

Secondly, an important distinction can be drawn between communication that is *planned* and *unplanned*. This distinction overlaps with the formal/informal dichotomy, since most of the informal communication will be unplanned. Still, a great deal of the formal interaction can also be unplanned during cooperation processes. Within a network understanding, planned and purposeful communication processes could drive different types of network forward over time (Kilduff and Tsai 2003).

A third distinction can be drawn between *focused and unfocused communication*. Focused communication refers to direct conversations and participation in shared activities between two or more parties (Goffman 1963). Conversations are especially important for developing shared understandings and shared viewpoints. Unfocused interaction refers to all types of gestures and signals that are communicated between people, simply because they are at the same place at the same time. This involves body language, mimicry, in addition to speech, movements etc. Unfocused communication also includes observations of other people's interactions, conduct, and reactions.²⁸

A special form of communication that is often emphasized in connection with trust is indirect communication, or *communication with third parties*. Third party situations play an important role in rational approaches to trust (Burt and Knez 1996; Coleman 1988). In communicating to third parties, people can investigate the trustworthiness of others in a more credible way than by directly asking the persons concerned. Such a mechanism is important, not just because it makes it possible to draw on the experiences of others, but also because it has a preventative effect. In order for the reputation mechanism to be effective, there must be a certain degree of density and supervision in the surrounding networks of relations.

As mentioned previously (Chapter 3), an important distinction is often emphasized between the task-oriented form of trust relations (cognitive trust), and the more inclusive and emotional type (affective trust). The composition of trust relationships with regard to this distinction will generally coincide with the communication that is used: affective trust relationships can be linked to an informal form of communication, while cognitive trust within organizations will generally be connected to formal communication. However, these forms are often combined in different ways, and also often change over time. There are indications that affective relations in the labor market are more sustaining, but also more infrequent, than cognitive trust relationships (Gabarro 1990; Lewicki and Bunker 1996).

²⁷ This particularly relates to theories that describe social capital in organizations. Social capital is primarily built on informal social relations within organizations.

²⁸ The distinction between focused and unfocused interaction, initially described by Goffman (1963), has later been taken up by Giddens (1984). He describes "reflective monitoring" as an essential element in the development and preservation of trust on a fundamentally ontological plane.

Different understandings of trust also emphasize somewhat different forms of communication. While a direct and task-oriented form of communication dominates rational understandings, formal and unfocused communication is accorded more significance within ritual perspectives. Shared ritual actions and use of symbols have an important function of upholding trust as a natural behavior, and unfocused communication plays an important part here. Within reflexive perspectives, the significance of both informal and formal communication for the development of trust is emphasized, together with the linking of trust relations within greater networks that involve third persons. At the same time, theories that emphasize informal, unfocused and unplanned communication usually also stress that *physical presence* is essential for the development of trust. This is especially true for ritual theories that view interactions as being important. This makes it vital to examine the significance of distance and proximity more closely.

4.2 Distance and communication

On an individual level, several studies of communication and location have found that the greater the distance between parties, the less frequent the interaction (Allen 1977; Corman and Scott 1994; Kraut, Fussel, Brennan et al. 2002). A study of cooperation in a group of research laboratories found that the probability for conversations on technical or professional questions decreased proportional to the distance between the offices of the co-workers. The greatest reduction was between 10 and 30 meters (Allen 1977). In a later study of researchers, it was documented that researchers who had offices door-to-door had approximately twice as much interaction than those who had offices on the same floor (Kraut et al 2002).

Geographical distances also coincide with other types of distance. Figuratively, *cultural distances* that are connected with distributed cooperation are often mentioned. In distributed groups in which co-workers work together in global work groups and teams, the geographical distance barriers often coincide with cultural barriers. Different types of cultural barriers will be significant, but presumably the national, organizational, and professional factors are especially important (Cummings and Kiesler 2005; Zaheer and Zaheer 2006). Cooperation in groups that have a foothold in cultures where social trust varies could be confronted with other communication problems than in situations where social trust is on the same level.

It should be emphasized that cultural boundaries are not merely an unambiguous disadvantage for groups; the possibilities for putting culturally heterogeneous groups together can also represent an advantage in having distributed work. Perhaps it is precisely the possibility of putting groups with heterogeneous knowledge and competencies together that is one of the most important priorities for distributed groups, since this opens up the possibility for communication, the flow of information, and

the exchange of ideas across boundaries. The disadvantages of cultural variation must therefore be viewed in relation to the potential gains it can represent.

However, since communication is often more intensive between co-localized employees, the barriers of distance can themselves *generate* disparities and division. There is quite a bit of research that supports this, especially within social psychological studies of distributed groups. Supported by so-called *faultline theory*, Polzer and his colleagues have claimed that location can be used as an element in group-based identification processes, on the same level as gender, age, professional background, among others (2006). Faultline theory originates in social identification theory, and within this theory the focus has been especially directed at how disparity within the groups can create imbalance and “faultlines” (Lau and Murnighan 1998). According to this theory, the dangers for imbalance are especially great when two different “sub-units” develop within the groups. Polzer and his colleagues claimed that the distance boundaries can represent “faultlines” within distributed groups that thereby can be a part of hindering successful cooperation over time. Experiment-based studies of groups with distributed students have to some degree supported this hypothesis.²⁹

4.3 ICT and electronic proximity

Information and communication technology (ICT) plays a key role in distributed work, even though the composition of media and the intensity of its use will vary (see Chapter 2). The use of ICT functions as an important tool for handling distance, and the concept *electronic proximity* has been used to indicate these possibilities (Monge and Contractor 2003 p 227). In order to discuss these possibilities, an overview of the technologies that are usually utilized within distributed work might be useful. These can be roughly sorted into three main groups: personal media, group-based media, and open media. These can be divided again into subgroups of synchronous and asynchronous forms (see Table 5). This is not a complete list of technologies that are accessible for distributed workgroups, but an overview that indicates some major types.³⁰

²⁹ Within game theory experiments, similar results have emerged: Based on a study of students organized in different groups, Krackhardt and Stern found that in situations with great uncertainty, the antagonisms between the groups increased. However, groups with relations of friendship across the units managed better than the groups in which this was not the case (Krackhardt and Stern 1988).

³⁰ For other classifications of technology relevant for distributed cooperation see; Duarte and Snyder (2006) and Munkvold (2003).

Interpersonal communication media are communication forms where two persons exchange sound, pictures, text, figures, etc. with each other. Important forms of synchronous personal communications media is voice telephony via cordless or permanently connected terminals. An important trend during recent years is that several of these interpersonal forms of communication have become more portable and “mobile”, such that several communication services can be used in an integrated manner via mobile handsets (email, speech, messages, etc.). Of the asynchronous forms, email has been particularly important for distributed workgroups (Thomas and Bostrom 2005; Yoo and Alavi 2005). Messaging services on mobile or stationary terminals have also increased during recent years, and this includes mobile text and picture messages (SMS, MMS), together with instant messaging on the PC (IM, etc). In a number of contexts, the use of these could almost be synchronous, but more often this usage is of an asynchronous nature. An important trend is the coupling of mobile telephony and other types of information, like information about geographical positioning on one’s own or a receiver’s telephone.

The *group-based communication media* includes systems that make it possible for three or more people to communicate with each other within small and large meetings. Examples of synchronous technologies are telephone meetings and video conferences, while the uses of shared databases or electronic calendars are examples of asynchronous technologies.

Table 5. An overview of key types of ICT used in distributed work groups

	Synchronous	Asynchronous
Interpersonal	<ul style="list-style-type: none"> - Voice telephony - Video conversation - IM/Chat 	<ul style="list-style-type: none"> - Text messages (i.e.SMS) - Multimedia messages (MMS) - Instant messaging (i.e. IM) - Email - Telefax
Group based	<ul style="list-style-type: none"> - Telephone meeting - Video conference (studio) - Desktop conferences (i.e. Livemeeting) - Electronic meeting systems (EMS) 	<ul style="list-style-type: none"> - Shared databases and or bulletin boards - Calendar and planning systems - Project pages (i.e. Sharepoint) - Email lists
Open	<ul style="list-style-type: none"> - Conversation room on the Internet (IRC) - Webcast systems 	<ul style="list-style-type: none"> - Websites - Blogs - Open databases - Email lists - Social software (e.g. Facebook) - System for user-generated content (e.g. Flickr)

Internet-based software that supports distributed work groups often pair different types of synchronous and asynchronous media together, such that it is possible to send personal messages during meetings, for example.

A third main group consists of the *open media technologies* that can also be used by people other than the group's formal participants. The majority of these are text-based and asynchronous in form. Examples here are the use of open homepages, blogs, or social software that report information about the user's daily tasks, network of relations, etc (for example Facebook, MySpace). Such systems often require some form of registration and approval by the users, but they are still more or less open, and can be utilized by everyone who is interested.³¹

Communication within all of these technologies is based on different types of *technical infrastructure*. This has to do with networks for telephony and data-traffic, together with different types (often more local) wireless networks. Much of the communication between distributed organizations takes place via the *Internet*.³² The dominant application on the internet is the *World Wide Web (WWW)*, a service that makes different types of information accessible in the form of homepages that are linked together, along with the distribution of email and instant messaging (Hannemyr 2005). The internet has grown enormously since the middle of the 1990s, and is today a dominating carrier of communication for organizations and private persons. The growth of the internet has resulted in the increasing convergence of previously rather separate services within data technology, telephone technology, and broadcasting. The networks' transfer capacity is important for whichever types of communications are available. So-called "broadband connections" (speed from 1-2Mbit/s and up) are becoming more widespread, and this makes new services available, for example voice telephony and video-conferences.

Even though much of the communication between and within organizations happens via internet, most organizations have also their own *internal data network*. Due to security-related considerations, most organizations have systems and firewalls that ensure that it is only the company's own employees who have access to internal networks, whether they find themselves in the organization's area or not. Groups that work across organizational boundaries have to find solutions where a sufficient amount of security is ensured, while not restraining the opportunities for effective cooperation.

³¹ Note that these sets technologies is related to different types of distributed work groups, discussed earlier in this introduction (chapter 2.3). For instance, the more open media technologies like web sites, blogs and open databases are an important premise for development larger collaborative communities. Thus different types of distributed work tend to evolves around different types of communication media.

³² The term internet is used today in two different ways: First of all, it is used as a description of the worldwide infrastructure of joined data networks, which are based on certain standards. Secondly, it is also used as a name of the standard that makes communication possible via this network, described within a set of protocols (TCP/IP) (Hannemyr 2005, p 48).

These different types of technologies have different possibilities for creating “electronic proximity”. In general are synchronous media and media that can emulate face-to-face situation often considered as stronger in generating “closeness” than asynchronous and simpler media. As I will discuss further below, however, this is not only a question of technical qualities but also the way the media are interpreted among the users. First, however I will discuss another dimension of the communication technologies that is of importance for trust: their possibilities for indirect communication.

4.4 ICT and options for indirect communication

Development of trust is not only a question of communicating directly with others, but also observing *others* communicating and interacting. This is important firstly because it exposes what kinds of norms that exist within a group, and (for instance) what kind of communication actions that are sanctioned. Secondly, it is important because it opens for the development of the reputation effects, often considered as an important element in the development of trust. In short; it gets possible for participants in group to see and decide whether other act in a trustworthy way.

Available ICT gives distributed groups different opportunities for indirect communication: While interpersonal media usually do not have these opportunities, group-based and open media usually include this. Some of these systems, like e-mail lists, social software or blogs also record most of the ongoing communication for a certain time. Obviously this gives better opportunities for individuals to decide on whether others are trustworthy or not, but also for individual to use ICT to present themselves to others as trustworthy individuals. Within the domain of commercial activities on the Internet, technical systems has broadly extended the reach and impact of reputation mechanisms (Clark and Montgomery 1998; Wong 2008). Technical systems implemented on commercial sites like eBay and QXL have proved to be efficient in gathering and summarize others reputation and trustworthiness.³³ And, social software like Facebook can easily be used by individuals to present individuals as trustworthy, by being connected to other (trustworthy) individuals.

Within organizations and groups, however, the most important aspect is the extent that others have the ability to observe other participants in their daily interaction, as well as to present themselves as trustworthy individuals. In general a broader range of group based and open systems open for more possibilities for developing trust, but probably also to amplify negative trust through intensification of reputation mechanisms (Burt and Knez 1996).

³³ An example can be found on QXL, a Norwegian web-site for actions, were buyers rate the sellers' general trustworthiness after every retail. After a while “honest” sellers may builds up a reputation that can help them in their subsequent trades. See: www.qxl.no and www.ebuy.com

4.5 Technical and social aspects

As mentioned previously in this chapter, physical presence is important for the establishment of communication and affective trust. What significance do the different types of ICT have for developing a sense of closeness within distributed groups? In general, it can be pointed out that ICT can affect “experienced presence” because of their inherent technical qualities, along with the symbolic significance attributed to them within a certain cultural context. With regard to *technical qualities*, it has long been believed that the “richness” of communication technologies is important for how well they mediate proximity (Daft and Lengel 1984; Daft, Lengel and Trevino 1987; Short, Williams and Christie 1976). What is meant by richness is the degree of similarity between communication technology with face-to-face communication.³⁴ In this type of understanding, media that communicates in real-time, with live pictures and sound, are considered to be richer than exchanging emails, for example. *Media richness theory* postulates that rich media are more suited for handling conversations with high degrees of equivocality and uncertainty, while simpler media are more suited for conversations with less complexity. Daft and his co-authors claim that situations with high equivocality emerge where there is disagreement, uncertainty or different frameworks for understanding. Such situations are common when participants from different cultures communicate with each other (Daft, Lengel and Trevino 1987 p. 357). A similar theory that also focuses on the media’s technical qualities is *information processing theory* (Walther 2002). This theory emphasizes the ability of media to handle information, and how long it takes. According to this theory, people will continuously exchange information with the intentions of developing relationships, but the time this takes depends on the media’s capacity to transfer information. The technical qualities lay out obvious premises for the interaction that is possible to carry out in a situation. An email mediates other forms of information than a conversation. One weakness of media richness and information processing theory, however, is that they often appear as deterministic, in that they imagine that one type of technology will have similar effects irrespective of social context or how and where it is used. The qualities of the technology are prioritized over the users’ active interpretation of the technology.

Another stream of research has to a greater degree emphasized the significance of social context to explain the effects of technology, including the experience of proximity. Partly as a reaction to technologically deterministic thought, it has been stressed within social-constructivist theories that technologies and artefacts have an *interpretive flexibility*, which means that they often receive different meanings in different social contexts (Bijker and Law 1992). Within social constructivist technology theory (SCOT), technologies are considered to be under continuous interpretation and re-

³⁴ In more technical terminology, four criteria are set out that altogether rank a medium’s richness: degree of feedback, multiple cues, variety, and personal focus. Altogether, this suggests that face-to-face communication is the richest form of communication along these criteria.

interpretation within groups of users. More important than the actual qualities of the technologies are the symbolic meanings attributed to them within groups of users. The concept “domestication” has been used to describe the process by which technology is given meaning and significance within a social community (Silverstone and Haddon 1996). Studies of domestication processes indicate that technologies can often be given rather different meanings within different social contexts. For example, sending an SMS in a Scandinavian context is generally understood as “personal”, while in other cultures it can be understood as an expression of a “business connection” (Ling 2004). This social-constructivist tradition represents an important counterbalance to technology focused understandings, and has guided many recent studies of ICT in organizations and groups. A weakness of these types of theories – and especially the SCOT tradition – is that they can appear to be socially deterministic, in that they put disproportionately great emphasis on the significance of social processes and too little emphasis on the characteristics of the technologies (Winner 1993).

Another less social-deterministic understanding of the significance of technology for communication has been developed in relation to the idea of *technological affordances* (Gaver 1991; Norman 1998). The concept describes how technologies has certain physical qualities that help regulate what it can be used for, in relation to people’s physical and psychological abilities. Gaver writes that “most fundamentally, affordances are properties of the world that make possible some action to an organism, equipped to act in certain ways.” (Gaver 1991, p.2). In the same way that a door handle indicates a certain type of use, other technological tools have a certain potential for what they are and are not suited for, based on human physiology and psychology. This perspective is used in recent empirical studies of telephony (Hutchby 2001) and document handling in the labor market (Sellen and Harper 2002). Within studies of social networks, researchers have started using the term *social affordance* in order to describe the possibilities that data-mediated communication (CMC) provides for developing and maintaining social relations (Licoppe and Smoreda 2004; Wellman 2001b; Wellman, Quan-Haase, Boase et al. 2003).

For this thesis one important issue has been to explore the way ICT has been used within distributed groups related to the distribution of interpersonal trust. Much in line with a reflexive approach to trust I have focussed on the ongoing and active use of ICT in forging and maintaining affective and cognitive trust relations. Such an understanding links studies of interpersonal media-use to the analyses of individuals’ personal and job-related social networks, and I have grounded this on the ideas that technologies have different social affordances. This does not conceal that technologies are affected by social factors, but it recognizes that they also have distinct qualities that makes them more or less suitable for different objectives.

4.6 Duration and media multiplexity

Thus, with regard to trust, it is essential to emphasize the fact that communication technology affects communication, not only by virtue of its technological characteristics (i.e. affordances), but also through the value ascribed to it within social contexts. A video conference can be a part of strengthening trust within a group, but the effect also depends on the symbolic value of this technology within that same group. If there are organizations with quite different understandings of what a videoconference conveys, then the effect can be uncertain.

Nevertheless, it is not enough to focus on the individual medium: in most distributed workgroups, communication is characterized by the combination of *multiple* media (and face-to-face communication) over time. In most distributed groups, people are confronted with situations where social relationships are supported by both synchronous and asynchronous technologies. When relationships are linked together through the use of different types of ICT, the term *media-multiplexity* is often employed.³⁵ Another factor has to do with seriality and *duration*: In accordance with reflexive approaches to trust, these are developed through gradual interactions over time. Studies of communication patterns in groups reveal that these often change over time (Ghosh, Yates and Orlikowski 2004; Maznevski and Chudoba 2000). Trust relationships that have an affective bias will often be long-lasting, so simple “one-shot studies” of communication patterns may be misleading indicators. For studies of trust and communication media, it is necessary to try to look at the interaction between different media over time, rather than individual studies of single media. In the same way, it will be important to establish a time perspective of studies about mediated communication within these types of groups.

4.7 Summary

Trust and communication develops mostly in a dynamic interaction where trust is a condition for communication, but also an outcome. Interpersonal trust – and especially the more affective type of trust – is considered to be easier to build up in situations with a high degree of proximity and with a long duration. However, distance is not only a barrier for trust; there are studies that indicate that distance barriers in themselves can contribute to *strengthening* antagonisms within distributed groups, especially in situations that involve great uncertainty.

³⁵ Relational multiplexity is a term within network studies that indicates analyses where two or more relationships are dealt with at the same time. This is different from uniplex analyses (Monge and Contractor 2003 p 35-36).

In distributed groups, different types of electronic media are used, and sometimes in combination with physical meeting in order to deal with distance barriers. Three main types are described here: interpersonal, group-based, and open. These media have different capacity to mediate proximity, but also for indirect communication that is decisive for the development of norms and reputation in distributed work.

The effect of technologies on trust building cannot be related to technological qualities only, but also their value their gets in a social context must be considered. The term “social affordances” capture some of the various qualities embedded in technologies, applied by users within a certain context, and this term is applied in several of the subsequent papers.

5. Developing trust in distributed groups: An examination of existing research

Thus far, I have described how distributed work challenges the building of trust through geographical barriers, as well as through cultural hindrances. In this chapter, I want to direct closer attention to seven studies of trust within distributed groups, which were published during the period from 1999 through 2006. These contributions to the field were selected on the basis of their impact on later works, and with the intention of covering studies with the greatest possible variation in how trust is studied. The contributions naturally fall into two main groups according to the type of designs they utilize: experiment-based and qualitative studies respectively.³⁶ Common topics, approaches to research, and central findings will be discussed.³⁷

5.1 Experimental designs

A number of studies of trust in distributed groups are utilizing an experimental design, comparing sample of groups that are working under different conditions but given similar task to solve. Typically, one group of cases is given tasks to be completed within distributed environments, while another category of cases are solving the same (or similar) tasks face-to-face. Trust is then measured by the use of surveys in all groups during one or more time. The effect of working in distributed settings on the general level of trust is then estimated. Usually these findings are supplemented with qualitative data based on archives of communication that has taken place within the groups during the collaborative. The level of control over the independent variables is different in these studies. Nevertheless, the focus is on comparing groups that are given different “treatment” (i.e. different working environments), or that have different levels of trust-scores.

³⁶ The experiment-based studies emphasize trust as a characteristic of different groups, in the most cases based on individual attitudes. An alternative classification – in line with the categorizations made in chapter 2.3 – is to describe these as “attribute-oriented” studies, and the qualitative studies as “descriptive”. However, I assume that the labels that are used here – experiment-based and qualitative studies – are more intuitively comprehensible.

³⁷ Not all of the contributions here use the term “distributed work groups”, and partially divergent definitions are used. Nonetheless, I will proceed in using the distributed workgroups as a general term/description.

5.1.1 Jarvenpaa and Leidner (1999)

Jarvenpaa and Leidner (1999) emphasize the idea that globally distributed teams increasingly will have to base themselves on forms of trust that are similar to what is described by Meyerson and his colleagues as so-called *swift-trust* (Meyerson, Weick and Kramer 1996). Their argument is based on comprehensive data that included 29 student-groups consisting of four to six persons, localized in universities over the entire world. The groups involved members located in different countries, and all teams were given the same task: developing a WWW site with a new service of interest to IS practitioners around the world, related to the overarching IS World Net³⁸. An email survey was used to measure trust in the groups during two stages as well other relevant information about the collaboration. The groups were subsequently sorted into four groups according to how trust develops during the period (high-high, high-low, low-low, low-high). Twelve of the groups were selected for further analysis, involving studies of the e-mail interaction in the group.

The authors concluded that “swift trust” was especially important to the groups that had high levels of trust during the entire period, or ended up with high trust in the end. For Jarvenpaa and Leidner, however, it was not clearness in roles or norms that were most important for the development of “swift trust”. On this issue they deviate from Meyerson et al, who claimed that this type of trust was based precisely on clear understandings of roles and norms within well-defined professional communities. Neither was the issue of reputation important for the students. Instead, Jarvenpaa and Leidner found that trust was spontaneously developed, based on early communication and certain stereotypical interpretations of others: “Given that members in our global virtual teams were not identifiable by their roles nor necessarily by their national origin (...) it is unclear what stereotypes were created swiftly based on the members imported propensity to initiate or respond to the first electronic communication stimuli rather than based on any other particular stereotype” (p. 810).

The analysis of the e-mail content and the questionnaires found key differences in the internal communication patterns of the groups. For the groups with high levels of trust, these studies point out that communication early in the project was important and particularly different types of social communication. Social communication was important, the authors claim, as long as it did not happen at the expense of project-oriented communication. Examples of this type of communication are information about things that were not directly project-related (family, hobbies), and positive encouragement along the way. These groups were also characterized by the fact that the members provided rapid feedback to the requests of others, and individual initiative was apparent. A rapid and steady handling of problems was also described as being important in groups that managed to develop a high level of trust.

³⁸ IS WorldNet is an electronic community involving researchers in the field of Information Systems (IS).

5.1.2 Kanawattanachi and Yoo (2002)

Like Jarvenpaa and Leidner, Kanawattanachi and Yoo (2002) used the idea of swift trust as their point of departure. They argue that in distributed groups it can be assumed that trust is developed in ways other than how it is developed in co-localized groups. They argue however that it is more precise to use the dichotomy of affective and cognitive trust, in the way it is described by McAllister (1995). Swift trust is according to their understanding synonymous with a more task-based trust (cognitive trust). Based on an experiment with 40 small student teams located at different universities, they compared groups with high and low performance capacities (performance) during a period of eight weeks. The groups were asked to carry out a strategic business game that simulates cooperation in a company. Each side received different roles and the game was created in such a way that collective cooperation became necessary in order to achieve effective performance in the company. In order to communicate, they used data-supported cooperation tools that include a discussion-forum, exchanging emails, work on shared documents, and the possibility of observing the development of their shared “activity”. For all of the groups, trust was measured in different stages, along with general performance. Beyond group-based trust, interpersonal trust and dispositional trust were measured.³⁹ The study found that groups with high level of performance had a rapid development of cognitive trust and in addition managed to keep it at a higher level than groups with low group-based trust. The same differences were not found for affective trust, and with that the importance of cognitive trust for distributed groups is emphasized. In other words, a task-oriented trust is more important for the performance of the group than the broad emotional type of trust.

5.1.3 Zolin, Hinds, Fruchter and Levitt (2004)

Zolin, Hinds, Fruchter and Levitt (2004) use the aforementioned theory of Mayer et al (1995) as the basis for a study on the development of trust in distributed groups (see Chapter 3.2.1). In accordance with this model, trustworthiness is based on the receiver’s perceived benevolence, integrity and ability. The authors believe, however, that this model must be further developed in order to be able to describe the development of trust also in distributed environments. They developed the model such that it also considered the risk and reward linked to trusting others in virtual environments, along with cultural variation. The model was then tested out on twelve smaller groups consisting of engineering and architecture students located in six different countries. In total, 108 dyads were included in the analysis. Key elements in their model are “trust”, “risk”, “reward”, “perceived trustworthiness”, and “propensity to trust”, “perceived completion” and “cultural variation”. It is

³⁹ Dispositional trust refers to the degree to which people reveal a consistent tendency to rely on others within a broad spectrum of situations and persons (McKnight, Cummings and Chervany 1995).

interesting to notice that trust here was measured in a dyadic way, through questions that revealed an inclination to control, and observation of a given partner.

In testing the model, they found that the *early perceived* trustworthiness was important for later assessment of trust within the relationships. The authors conclude with the following: "... among cross-functional, geographically distributed partners, if a worker is perceived as trustworthy, he or she will be perceived as delivering work commitments (...) Thus, initial perceptions of one's co-workers may determine the extent to which one *believes* these co-workers have followed through on work expectations. This points to the importance of first impression ..." (p.19)

The results indicate some of the problems that arose when the group participants must assess others who cannot be observed, and that they don't know on advance. When the employees could not assess others based on a actual facts, they relied on a first impression which later reinforced the building of trust. They found that groups with greater cultural variation had greater problems developing a high level of trust, but also that trust in groups kept itself relatively stable throughout the period of study.

5.1.4 Wilson, Straus, and McEvily (2006)

The abovementioned studies all point toward the first impression, or the immediate impression that emerges within a relationship, as being important for the establishment of trust in distributed groups. Interestingly, a more recent study has come out with a rather different result. *Wilson, Straus and McEvily* (2006) began with the social information-processing theory (SIP) when they researched the significance of reduced social information of trust levels in distributed groups. Social information processing theory assumes, as mentioned above, that social relations are developed within all available media over time. This basically takes place in face-to-face situations in the same way it does via communication technology. The difference between face-to-face communication and mediated communication is first and foremost that the latter takes more time because the information capacity of electronic media is limited (Walther 1992).

Wilson et al reports from a large experiment where 156 students were organized into 52- three person groups. The teams were divided into two groups that had to solve concrete tasks where the sequence of face-to-face meetings and purely data-mediated encounters varied. Some groups met exclusively in mediated and face-to-face sessions. The projects were so-called "mixed-motive tasks" that include elements of trust, uncertainty and risk that are linked to a hypothetical scenario. Throughout different periods, the various groups were assessed according to different dimensions of trust, including affective trust, cognitive trust, and satisfaction with cooperation within the group. The internal communication of the groups was documented via video-tapes and copies of exchanged messages that were later analyzed. Relational trust was measured between the participants once a week

for three weeks. A key result from the study is that in the groups that were started with data-mediated communication, and continued with face-to-face communication, trust developed slower than in groups where the order was the opposite. This is in line with what information processing theory predicts. Interestingly, the completely mediated group in the end achieved the same level of trust as those who only met face-to-face. The authors concludes that: "... the communication mediums alters the rate at which trust develops, but does not produce fundamentally different levels of trust in computer mediated versus face-to-face teams" (p 29).

On the whole, they found support for the SIP-theory. But they also found variation in the communication content of the different groups: In the groups that began with mediated meetings, there were more critical and negative comments than in the others. It was especially the reduction in such negative comments that was most important in explaining the faster development of trust in the groups that began with face-to-face communication, the authors claimed.

5.1.5 Piccoli and Ives (2003)

While the abovementioned studies are directed toward explaining what it is that causes trust to develop within distributed groups, and especially when trust is established, there are other studies that have sought to bring to light factors that causes trust *not* to develop, or to be reduced. In an experiment that included 51 virtual teams of students, the Piccoli and Ives (2003) found that leadership forms that have a high degree of surveillance and control had a negative effect on the trust in the groups. The study was designed as a field experiment where students from the United States, Europe and New Zealand were asked to solve a shared project that required a lot of communication. They had at their disposal a data-supported cooperation tool that made sending emails, exchanging messages, bulletin boards, "chat rooms", and sharing documents possible. Half of the groups were asked to work according to traditional control mechanisms, with regular reports, detailed division of responsibility etc, while the other half worked without such guidelines. Trust was measured before and after the cooperation within all of the groups, and all communication within the groups was documented and analyzed.

The authors find that groups with traditional control developed mistrust to a greater degree than groups without it. In cases with especially low levels of trust, there was an excess of cases of disloyalty combined with active surveillance and control of other members of the group. Active surveillance made it such that offences would quickly be discovered and emphasized, something that quickly led the others to reassess their trust in the group. It seemed like disloyalties that took place toward the end of the period in particular, when it became closer to delivering the work, had great significance for the group.

5.2 Qualitative case studies

The studies that are described thus far have in common that they compare a great number of distributed groups that are motivated to solve tasks which require a certain degree of cooperation. Most of the studies combine quantitative data with studies of recorded e-mail interaction, or interaction through other electronic media. Still, these are mainly used as add-on to provide further explanations to the findings generated from the experiments. Below, I will more closely examine two studies that use qualitative designs in order to study the development of trust within distributed groups.

5.2.1 Panteli and Duncan (2004)

As mentioned previously in Chapter 3.5, the term “swift trust” has been greatly discussed in relation to distributed organizations and groups. Based on a ritual understanding of trust, Panteli and Duncan (2004) suggest using the term *situational trust* to describe the development of trust in distributed groups. The concept is anchored in Goffman’s theories of self-presentation and social dramaturgy (Goffman 1959). The establishment of trust in distributed work groups or virtual teams is conceived as a successful form of self presentation, which helps to strengthen the trustworthiness of one or several actors in front of an audience. The audience in this context is the project leader, other participants in the group, or people who are interested in the group’s finished result.

Based on a qualitative study of a distributed group of leaders, Panteli and Duncan describe how situational trust was established through a series of “performances”. Their source material is email archives from interaction internal to the group, along with individual interviews with the participants. The authors claim that different types of *scripts*⁴⁰ were active for the development of trust, including the following: formal scripts for interactions; scripts that existed before the project began; scripts that developed in the process; scripts that were transformed along the way; and purely unscripted interactions. For example, certain types of behavior were embedded in formal scripts (i.e. contracts), like regularly reading emails during the cooperation. The act of showing that one actually did this helped maintain the impression of being a trustworthy co-worker. At the same time, scripts were developed to inform other members of the group when a particular co-worker was unavailable, which was something that was not laid out in any of the agreement documents. Informing others of one’s absence is something the authors interpret as being an unscripted interaction that helped to strengthen trust within the group. The authors write “in sum during both scripting and performing

⁴⁰ Scripts are usually described as “cognitive maps” that describe a sequence of expected behaviour among a set of characters or roles (Mangham and Overington 1987 p 172). From an organizational culture perspective, scripts can be described as a cognitive framework that underlies an organization story (Martin 2002 p 74).

phases of the project, the players take on the roles of actors and audience interchangeably and they all need to employ impressionistic behaviour to secure a trustworthy image” (p. 435)

Situational trust is something that is developed and reinforced through interactions, and even contractual relationships become here a part of the “game” of establishing trust and expressing trusting behaviors. Trust relations are eventually strengthened where successful behaviors exist between actors, co-actors, and an audience. The authors underline further that the existence of “key-actors” was important for establishing trust, and for securing the group’s success. At Delta, these were project-leaders and directors who especially focused on presenting the group as trustworthy to the world. Panteli and Duncan emphasize that situational trust is something other than “swift trust”, since the latter is something that is developed within situations and not “ex-ante” cooperation situations. Nonetheless, they believe that “swift trust” can be a precursor to the formation of situational trust in distributed groups, even though this is not applicable to the case they describe in their article.

5.2.2 Pauleen and Yoong (2001)

Several of the studies above have indicated that active relationship development has been significant for the development of trust in the distributed groups that have been studied. However, such processes have been hardly explicitly analyzed. Pauleen and Yoong (2001), make this the main topic in their study of “*facilitators*” in global teams. This study is not explicitly directed toward trust, but at how individual active persons have significant influence over how well a distributed group functions. The study is relevant in this context because it is linked to studies of distributed groups, and because it draws on a relational understanding of groups and (implicitly) also of trust.

Pauleen and Yoong use an inductive and interpretive method in their study of relationship-building within different distributed groups. Within different groups, the actions of seven facilitators are emphasized (i.e. persons who have a dedicated responsibility to integrate and develop work within distributed groups). The main focus of the article is a thorough description of how facilitators handle groups where relationships cross different organizational and cultural boundaries. The main results from the study indicate that planning and the use of different types of communication technology are decisive for how these groups manage to develop and preserve relationships in environments that operate over many different boundaries. The authors underline how the active usage of different types of electronic media, including face-to-face, letters, telephony, email, and data-supported conferences were significant for establishing relationships that cross boundaries. They stress that richer media are especially important for work across cultural boundaries. Still, they find that simple messaging media (here ICQ) were significant for developing informal relations. With regard to handling the organizational, cultural, and temporal and spatial boundaries, they stress that more boundaries generally require more active relationship work: “... more boundaries between facilitators and team

members at the start of a virtual team will probably mean that facilitators need to build a higher level of relationship with team members and create more intensive, culturally appropriate relationship-building strategies using richer communication channels” (p. 217)

Trust is described in this study primarily as a central objective for the facilitator who engages in the work of establishing relationships across cultural and linguistic barriers. In this context, increased communication is suggested, as well as several early face-to-face meetings, and the use of richer media. According to the authors, the most difficult challenge is developing a group-based culture – and common trust – across borders. Based on the interviews, a form of “cultural melting” within individual groups is described, concurrent with intense relationship development. This article thereby focuses on the importance of personal relationships for establishing cooperation across distances, and views facilitators as being active builders of such relationships. Media-use is linked to the facilitator as a dynamic actor with clear motives, and trust is related first and foremost to well-developed personal relationships within the group.

5.3 Evaluation and critique of the contributions

I will here point out some of the general findings that have emerged, along with some limitations of these studies. With regard to the experiments, these studies seek to explain how trust is established in distributed groups as opposed to co-localized groups. A key finding in several of these works has been that trust appears to be established early in distributed groups, primarily based on immediate impressions, or also preceding attitudes toward others. These findings are partially contested by the results of Wilson et al, which emphasize the duration of cooperation as a key factor for developing trust in these types of groups. Nevertheless, everyone agrees that internal communication processes are important for developing and maintaining trust.

The experiment-based studies suffer first and foremost from the fact that they generally are not very well suited to generalize to distributed groups in other sectors of the labor market (i.e. they have low external validity). All of the studies are based on the execution of tasks in groups consisting of students, motivated by possibilities for monetary reward and also good grades. The groups were usually composed by students from different universities during a short period of time, as part of the experiment. It is not unproblematic to compare the students’ cooperative situation to the cooperative situations that are found in organizations in the labor market. Cooperation within a game-situation or student projects will usually hold less risk than cooperation in companies, where careers and incomes will be directly affected by the groups’ ability to handle challenges. Also, the projects in knowledge-based companies will often have another type of complexity than short-lived student projects, and different types of formal relationships and power dynamics will play a role. Several of the trust

mechanisms described earlier, which are linked to organizations and institutions, are therefore not as active within these experiments as they are in actual organizations. Moreover, most groups that are studied are relatively small (from three to six persons) compared to the distributed groups that can be found in organizations. It could be assumed that the dynamic of these is different than what is found in larger groups and teams. In contrast to many distributed groups found in the labor market, these groups also have a disproportionately minimal degree of face-to-face communication (Sadowski-Rasters, Duysters and Sadowski 2006). Therefore, the findings in these studies are generally difficult to transfer onto the conditions of actual organizations.

Another weakness of the experimental studies is that there are significant differences in how trust is operationalized: All of the studies emphasize measuring trust while the experiment is taking place, but there is immense variation in how this is done. This raises questions about whether it is the same type of trust that is being measured, and if it is possible to compare the results. Jarvenpaa and Leidner believe that trust can be measured as a characteristic of the group, and they adjust previously standardized sequences of questions in order to map out trust and trustworthiness (Mayer, Davis and Schoorman 1995; Pearce, Sommers, Morris et al. 1992). This scale was later also used by Piccoli and Ives. Meanwhile, Kanawattanachai and Yoo use a formula set out by McAllister (1995) and Cook and Wall (1980) for measuring affective and cognitive trust, but convert this to indicate group-based trust rather than dyadic trust. The content of the key term “swift trust” remains unclear and the way it is used by Jarvenpaa and Leidner is quite different from the way Meyerson et al initially described this; as trust embedded in a clearly defined network of professionals. Kanawattanachai and Yoo choose to understand “swift trust” as being identical to “cognitive trust” although this seems to be a mix up of two rather different ideas. In the experiments, trust is in most cases measured as a general group attribute (i.e. a quality of the group based on the participants’ general feeling of trust) but sometimes through the dyadic relations inside the group (trust in certain others). However, group-based trust has hardly been theoretically developed, and it is unclear how this correlates with dyadic trust. Other forms of trust, like organizational or institutional trust, have on the whole not been thematized in the experiments. Several of the experiments focus on the development of trust in groups over time. Still, most of these studies are relatively brief - in most cases, limited to between three weeks and a couple of months. Studies over a longer period would have provided more trustworthy results in this field. We can thus also say that the experiments contain a number of serious flaws attached to the construct validity and its internal validity.

Qualitative studies of trust in distributed work group have so far been less common. An exception here is the ethnomethodologically oriented study conducted by Panteli and Duncan, and Pauleen and Yoong’s study of facilitators in global workgroups. Panteli and Duncan use another theoretical framework in order to study trust building in distributed groups than that which is used within the experiments. This helps direct focus toward the symbolic actions that are used to build trust

in distributed groups. In light of this perspective, trust becomes a strategic concern for the actors, but it is rather unclear how this can contribute to any group-based trust. There is a significant flaw in this work concerning the fact that emails are mainly used as the source for the analyses of social interaction in the group, and not a broader set of communicative actions. In the more actor-oriented study conducted by Pauleen and Yoong, active relationship building is clearer, even though trust is secondary to the development of the relationship itself. This is the only study that addresses the different types of distance boundaries and cultural boundaries within which distributed work usually operates. The strong emphasis on facilitators however makes it such that the other kinds of relationships are hardly elucidated or described. The study also does not question how trust can be developed over time on different levels.

With regard to *the use of mediated communication* in most of the studies, the use of email was the main focus. Within the experiments, the researchers have had access to email exchanges and other mediated interactions of the group throughout the period. This data is used in all of the experiment-based studies to provide a better understanding of the quantitative findings. However, a broader spectrum of communication technologies are captured in the study conducted by Zolin et al, where the participants had access to different types of data-supported technology over the internet. This made simple videoconferencing possible, along with the sending of documents, working on shared electronic documents, and the exchange of electronic messages. Still, the study did not further analyze the use of these technologies. The study conducted by Wilson and her colleagues is the study that most explicitly addresses media-use over time. The results indicate that the media's qualities are significant for the development of trust over time, in line with the theory that is employed (the simpler the media, the longer time it took for trust to develop). The qualitative studies conducted by Panteli and Duncan focus exclusively on analyses of email, which are sorted according to categories of content (i.e. "scripts"). In Pauleen and Yoong's article, a broad spectrum of technology is examined, and the users employ these more actively than in the other studies, where the users are dependent on the technologies' potential for transferring information. They also describe the use of simple message-based media for establishing and developing the feeling of personal contact and proximity. To a certain degree, this study then supports media richness theory, with the understanding that "rich media" is better suited for handling more complex forms of communication.

Table 6. Overview of reviewed works

No	Work	Research design	Sample	Type of trust measured	Central conclusions
1	Jarvenpaa and Leidner (1999)	Field experiment comparing groups with high and low levels of group trust. Quantitative and qualitative	29 student groups in student project	Swift trust in groups (Scales adapted from Mayer et al and Pierce et al)	Successful teams use swift trust. Importance of supporting behavior, predictable leadership and good communication
2	Kanawattanachai and Yoo (2002)	Field experiment comparing high and low trust groups. Quantitative and qualitative	Sample of 36 teams of students performing assigned tasks. Four members in each groups	Cognitive and affective trust in groups as well as group trust (adapted from Mayer et al and Pierce et al)	In temporary work teams, the cognitive element of trust is more important than the affective one
3	Zolin, Hinds et al (2004)	Field experiment comparing trust over time. Testing of a revised model of organizational trust in cross functional global teams.	12 teams of students, 3-4 members in each	Studies of dyadic trust as well as related variables (risk, reward, etc)	Initial impressions are important for deciding the trustworthiness in distributed relations. Distributed dyads hold a stable level of trust over time
4	Wilson, Strauss and McEvily (2006)	Field experiments comparing trust levels in groups with different interaction patterns.	52 teams of students. Three persons in each	Group based and inter-personal trust	Trust develops slower in computer mediated teams, but reaches the same level as face-to face teams over time
5	Piccoli and Ives (2003)	Field experiment comparing groups using different control mechanisms. Quantitative and qualitative	51 teams of students, 3 and 4 members in each	Swift trust in groups (Scales adapted from Mayer et al and Pierce et al)	Traditional control mechanisms have a negative effect on trust in virtual teams.
6	Panteli and Duncan (2004)	Qualitative study of single case. Content analysis of e-mails and interviews	One case study	Situational trust is described. (No measure of trust used)	Trust develops through performance of different types of script based interactions
7	Pauleen and Yoong (2001)	Qualitative study of seven groups /facilitators.	Comparative study of seven facilitators	Study of the actions of group facilitators (No measure of trust used)	Facilitating complex distributed work groups is based on developing strong relations, and active use of media

5.4 Summary

This chapter has examined several central empirical studies of trust in distributed workgroups. The majority of the studies that have been carried out in this area have used an experiment-based method based on groups of students localized at different universities, while two of the contributions have used qualitative case studies. Even though there are a number of conflicting results within the experiments, several of the studies have indicated that trust is established early in such groups, and that more task-based forms of trust (swift trust) are easier to establish. It is also evident in several of the studies that communication processes within the groups are important in order to develop trust, and that active communication early in the cooperative effort has a positive effect. Traditional forms of control on the other hand are shown to have a negative effect on the development of trust in distributed groups. Still, a significant weakness of the experiment-based studies is that its capacity to generalize to distributed groups in other parts of the labor market is uncertain.

There are great differences in how trust is measured, which makes it difficult to compare or generalize across the studies. These factors, together with the somewhat different methodological approaches, probably explain a good fraction of the inconsistencies in the results. Despite the fact that most of the contributions focus on group-based trust, this form of trust is surprisingly seldom discussed. How group-based trust is connected to other types of trust, like relational trust or organizational trust, is also seldom dealt with. In most of the theories, trust development is considered to be a passive process, contingent upon situational factors like time, forms of control, and access to communication technology. Variations in distance are not studied to any significant degree, since most of the study focus is directed at groups that work in a distributed fashion at all times.

Most of these studies draw on a rational explanation of trust. This especially pertains to the articles by Zolin, Hinds et al (2004) and Wilson, Strauss, and McEvily (2006) who view trust building primarily as a result of having access to information about the other cooperative partners. An institutional understanding is found in the works of Jarvenpaa and Leidner and Kanawattanachai and Yoo (2002), since these studies attempt to employ the concept “swift trust”, a term developed within an institutional tradition. Still, the institutional anchoring is greatly moderated, in relation to how the concept originally was set out by Meyer and his colleagues. The study conducted by Panteli and Duncan (2004) explicitly seeks to construct a ritual understanding of trust in their study, anchored in symbolic interactionism. An active and relationally oriented trust building process, in the way it is emphasized within reflexive understandings of trust, is mostly absent.⁴¹ Still, in the qualitative study

⁴¹ Still, there are indications in the qualitative empirical studies of Jarvenpaa & Leidner and Kanawattanachai & Yoo that indicate that active group leaders are important for the development of trust in some of the groups. However, this relationship is not further expanded upon.

conducted by Pauleen and Yoong (2001), the inclination toward having such an understanding of trust exists, where they stress the significance of facilitators within distributed groups, can be found.

6. Distributed workgroups as social networks

In this chapter, I will more closely describe the analytical perspective that is used in this dissertation. The point of departure is a structural understanding of distributed groups, in the way it was outlined in Chapter 2. The structural understanding that is used here builds primarily on concepts and understandings within the field of social network analysis, and I will begin this chapter by providing a closer account of this. Next, I will describe how trust can be understood within a network perspective, and how trust in relational networks can be related to other types of trust.

6.1 A social network approach to studies of groups

Distributed workgroups can be studied starting out from different theoretical or analytical perspectives. A perspective that thus far has been hardly used in this field is *social network analysis*.⁴² This is a methodological and theoretical school of thought within the social sciences that is characterized by focusing on actors' social relations in order to explain and understand different social phenomena (Breiger 2004; Bø and Schiefloe 2007; Scott 2000; Wellman 1988). Social network analysis can thus be defined as "... the disciplined inquiry into the patterning of relations among social actors, as well as the patterning of relations among actors at different levels of analysis" (Breiger 2004 p. 505).

This perspective is derived from social anthropology and social psychology, but has during the last decades been taken up within studies of organizations, political institutions, epidemiology, communication studies, computer-supported learning and cooperation, and more.⁴³ There are different methodological traditions for analyzing social networks: First, networks can be studied with the individual person as the point of departure, or the *networks of individuals* within a greater selection. The process of analysis then consists of mapping out what major relationships the focal individual (ego) has and how the different contact persons (alter) are related to each other. Another tradition focuses on certain shared *incidents* or activities that link two individuals together (two-mode). A third approach is to view all of the relationships within a given number of nodes in a pre-defined group or organization (1-mode). It is the latter-mentioned form that has been the most commonly used in

⁴² There is however a small collection of literature in this field, published during the last 15 years. These are mentioned in chapter 2.5.

⁴³ A great deal of the international research in this field is centered around the International Network for Social Network Analysis (INSNA). The network is behind the journals *Social Networks* and *Connections*; it coordinates annual conferences, and has an electronic discussion forum. For more information, see www.isna.org

studies of small groups within work and private life, and it is also this method that will be employed in this dissertation.⁴⁴

Within this perspective, *groups* are primarily defined through their total set of relationships, either between actors in a group, between groups, or between individuals and groups (Katz, Lazer et al. 2005). This is a definition that correspond well to a general understanding of groups as “two or more individuals who are connected to another by social relationships” (Forsyth 2006 p 3). From a social network perspective the boundaries for the groups can either be defined through *structural qualities* within a broader network, or on the basis of pre-defined criteria. In the first instance, groups will appear as a concentration within a broader network, based on the frequency of interaction, for example. Within such an approach, the groups have an undefined boundary with the surrounding network, and it becomes crucial to define a limit that defines the group’s boundary toward the remainder of the divisions of the network.⁴⁵ Another way to understand groups is to start out from a pre-determined gathering of individuals, which is established through formal and informal affiliation with a division or group. The boundaries of the group here are then pre-defined by the members themselves, or by others.⁴⁶ It is the last type of group-based network that this dissertation is focused on.

6.1.1 Relational dimensions and qualities

Within social network analyses, different types of relations are usually studied, or else different dimensions or qualities of certain relations. Some of the most commonly studied relations within organizational analysis are *communication networks* (who is communicating with who), *formal relationships* (who is expected to report to who), *affective relationships* (who has positive and/or negative feelings for each other), *workflow relationships* (who sends work to whom), or *cognitive relationships* (who knows who). A particular variant of communication networks is linked to studying variation according to the form of communication that is used. Here, emails, telephone conversations, and face-to-face communication have been studied and compared (Haythornthwaite 2002; 2005; Rice 1990; Wellman 2001a).

A commonly used dimension within network studies goes between *weak and strong ties* (Granovetter 1973). Granovetter defines relational strength as being “... a combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services which

⁴⁴ For more information on traditions and schools of thought within social network analysis, refer to Wasserman and Faust (1994), Breiger (2004) and Scott (2000).

⁴⁵ The limits for such border values are established within algorithms that define core/periphery structures in social networks. See Borgatti and Everett (1999)

⁴⁶ Within studies of groups with fixed boundaries, there is also an important distinction between internal and external relationships. Internal relationships often have a strong bond, while external relationships are weaker. Thus, within studies of groups’ social capital, an understanding of groups as constellations of internal and external relational network has been developed (Burt 2005; Katz and Lazer 2005; Sparrowe, Liden, Wayne et al. 2001).

characterize the tie” (1973, p. 1361). This distinction suggests a rough classification of relationships (i.e. ties) based on four somewhat distinct qualities. Empirical studies have used different systems of classification for grouping relationships as strong or weak (Krackhardt 1992). The distinction is utilized in most contexts as a label for differentiating between friends, partners and family on the one hand, and more random acquaintances on the other.

Relationships within distributed workgroups are seldom weak relationships, since the co-workers in these situations will usually know each other rather well. Therefore, such groups will usually include persons who have more or less strong relationships with each other.⁴⁷ Within network analysis, it is common to study several different relationships or aspects of these relationships in order to develop indicators. An indicator of a friendship can be construed by combining frequency of interaction, perceived intimacy, and reciprocity (two-way communication). Nodes in a network that are connected through several types of relationships are said to have high *relational multiplexity* (Tichy and Fombrun 1979).

Despite the fact that different “types” of relationships are sometimes mentioned, in many cases, it is more precise to describe them as dimensions or *qualities* of a particular relationship. For example, a relationship between two colleagues will to a greater or lesser degree contain aspects of friendship and trust, even though the transitions between these and other qualities are often undefined. Such qualities will also change over time, in accordance with different occurrences and circumstances. Still, the perceived quality of the relationship guides what they can be used for, or the transactional content that is mediated through them. Most relationships will convey many different types of content. Tichy and Formbrun (1979, p. 927), point out four central types of “flow” within social networks: 1) exchange of goods; 2) affect and liking; 3) information and ideas; and 4) influence and power. Occasionally, the networks are categorized according to what they are mostly used to communicate (for example “knowledge network”, “information network”, etc.). It is more precise, however, to say that relationships can be used for different objectives, and that the qualities of the relationships largely guide what they can be used for. In general, stronger relationships can be used for more purposes than weaker relationships (Bø and Schiefloe 2007p. 158).

In a network perspective, then, *trust* can be considered to be a particular quality of a social relation. Relationships with this characteristic will often be closely linked to friendship, even though these are not necessarily isomorphic qualities. A relationship where trust exists can convey different types of resources, like for example sympathy, support, material goods, etc. A special characteristic of trust relations is that they can be used to discuss issues that involve an element of risk and uncertainty

⁴⁷ Studies of networks in modern organizations have pointed out that relations between work colleagues are seldom strong or weak, but generally somewhere in between. Therefore, empirical studies of social networks in organizations have often reformulated this set of concepts. See for instance; Krackhardt (1992), Nardi et al (2000) and Wenger (1991).

for those involved. As emphasized in Chapter 3, trust involves wagering on the fact that others will not exploit the vulnerability that is shown. This means that trust relations can have a special value with regard to conversations and discussions of ideas that are unclear, or in the early stages (which can put a person in a bad light), relationships where critical decisions are discussed, as well as personal/confidential concerns. In other words, trust relations open up for a special degree of reflexivity and openness that often can have great value for those involved, and the groups they belong to (Lencioni 2002).

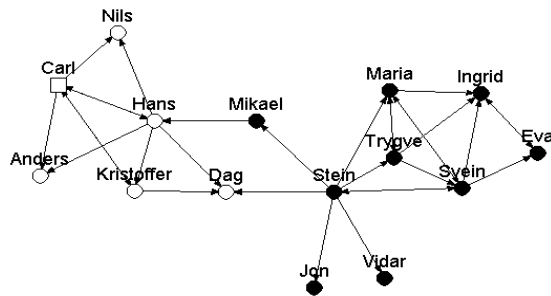
6.1.2. Structural patterns

A central focus of social network analysis is to make use of the information that exists in relational patterns within groups of actors in order to explain or understand social phenomena. A collection of social relations within a set of nodes (actors) is described in social network analysis as *social structure*. Relational data is organized in most cases in one or more *network matrices* that quantitatively indicate the relationships between actors.⁴⁸ The arrangement of relational data in a matrix form is the basis for most mathematical methods that are utilized for analyzing or describing structural networks.

Graph theory is the most common method that is used to analyze structural formations, constellations and positions within networks (Scott 2000; Wasserman and Faust 1994). The principles of graph theory make it possible to graphically express the social structures in the form of diagrams or charts. Within social network analysis, a graph is understood to be a model that indicates a social network, where the nodes represent actors and the lines indicate the relations between them. Figure 4 points out the interaction patterns within one of the cases that is analyzed in this dissertation (Delta), based on principles of graph theory. Here, the relationships are based on daily interactions. The kind of relational data that is available affects what kinds of analyses are suitable and how they can be utilized. An important distinction exists between relationships that are *directional* and *non-directional* (i.e. if they indicate a certain direction of a relationship or merely that a connection exists).

⁴⁸ Such matrices are usually described as “sociomatrix” or an “adjacent matrix”. For I-mode data, there is usually a column and a row for every node in a network. The data in the matrix indicate which pair of nodes have relationships or not, and possibly the strength of these.

Figure 4 Daily interaction at Delta (Color indicates organizational belonging/country)



Another important distinction exists between relationships that indicate different values, and those that merely indicate that there *is* a relationship between two nodes, or not (binary). The graph in Figure 4 illustrates a network that is based on directional, binary relationships. Structural formations are described and analyzed within network analysis using standardized concepts and methods. For example, a graph can be described as relatively centralized using a “centralization index”, which indicates the degree to which a network assumes the form of a “star”, where a person is centrally placed (Freeman 1979). However, it is not necessarily just a simple graph that is analyzed, it is also common to study whether different networks overlaps, or have a similar structure.

General descriptions of network structures can further be used to analyze network constellations *within* various networks. Within a social network of relations, a concentration of nodes that has several connections, or where relations are especially strong, will often emerge. Such concentrations within a structural network can be described with the help of fixed definitions such as “cliques” or “cores” (For a more detailed description of these and other network terms, see Table 7). On an even “lower” level, the positions individual nodes have within one or more networks can be studied within structural analysis. The positionings of actors within several different networks can be used to describe the “roles” individual actors have within a group. However, a common course of action is to study nodes that hold similar or unique positions within a network. For example, in the graph in Figure 4, Stein has a special position since his absence would divide the network into isolated components. Such a position is often described as a “cut-point”.

Table 7. Description of social network concepts used in the text

Term	Description
Centralization	The extent to which a network is centralized around a few central actors (Freeman 1979).
Density	The number of ties in the network divided by the maximum number of ties that are possible (Scott 2000).
Clique	A group in which (a) all actors have direct ties with all other actors in the group, and b)there is no actor outside-the-group to whom all members have a tie (Wasserman and Faust 1994).
Core/periphery structure	A network that cannot be subdivided into exclusive cohesive subgroups or factions, although some actors may be much better connected than others. Alternatively put, the network consists of just one group to which all actors belong to a greater or lesser extent (Everett and Borgatti 1998).
Multiplexity	The extent to which two actors are connected by more than one type of tie (Kilduff and Tsai 2003).
Reciprocity	A balance theory principal concerning the expectation that if A has a tie with B, that tie will be reciprocated by B. The extent of reciprocity in a network can be assessed as the number of reciprocated ties divided by the number of dyads (Kilduff and Tsai 2003).
Centrality	The extent to which an actor occupies a central position in the network (This can be measured in different ways) (Freeman 1979)
Balance	Incorporates the notions of reciprocity and transitivity. A network with a high degree of balance is one with a) a tie between two people that tends to be reciprocated, and if b) two people have a common tie to a third person, then the two people tend to have ad direct tie to each other (Kilduff and Tsai 2003).
Transitivity	A balance theory principle that concerns/has to do with/relates to the expectations that relations among three people will be complete. The proportion of transitive triples in a network can be assessed as the number of completed transitive triples divided by the number of triples for which the addition of one missing link would make them complete (Holland and Leinhardt 1977).
Tie strength	A combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services that characterize the tie (Granovetter 1973).
Brokerage	A process in which intermediary actors facilitate transactions between other actors lacking access to or trust in one another (Marsden 1982).

Since the beginning of the 1970s, there has been a rapid development in formal methods for describing, measuring, and analyzing social networks. The development of methods for analyzing positional roles has been particularly important, through the development of techniques for measuring structural equivalence, and grouping of nodes in networks with the help of so-called “block models” (Lorraine and White 1971; White, Boorman and Breiger 1976). In recent studies, methods that examine the connection between different kinds of relationships and networks, supported by different types of graph-modeling, have been increasingly utilized, including “Random graphs”, “Dependence graphs” and “p*-methodology”(Wasserman and Robins 2005).⁴⁹ In connection with the growth of formal methods, a rich material of specialized data-programs for the analysis of social networks has also emerged.⁵⁰

The work that is a part of this dissertation relies on a number of relatively simple techniques in the field for analyzing structural qualities of “distributed networks”. This includes analyses of positional as well as structural aspects. For a closer examination of the network-based methods that are used, refer to the introduction of Chapter 8 and the methods section in the individual articles.

6.2 Social network analyses of distributed groups

Altogether, social network analysis represents a way of studying distributed work in a way that makes it possible to gain an increased understanding of the relational mechanisms and structures that at any time will enter into a distributed workgroup. Network analyses of small groups are in themselves not anything new within this field.⁵¹ On the contrary, some of the earliest social-psychological studies in this area were conducted about precisely the communication patterns within small work groups (Bavelas 1950; Shaw 1964). Still, during the last 30 years, little research has been conducted in this field, even though individual new contributions have been published during the last few years (Katz and Lazer 2005). There are, however, several factors that mean that the network perspective has a great deal to contribute to studies of distributed groups. An important factor is that within such groups, relationships become something that must be more actively worked with to establish and maintain. A co-worker has significant influence over who s/he will choose to send an email to, contact via telephone, or meet face-to-face during a workday. The development of a

⁴⁹ For an examination of available methods and techniques of social network analysis, refer to Wasserman and Faust (1994), Carrington, Scott and Wasserman (2005) and Monge and Contractor (2003).

⁵⁰ The most commonly utilized program is probably Ucinet, which was developed by researchers at Harvard University (Borgatti, Everett and Freeman 2002). This program is free for research purposes and is continually updated in accordance with new methods and techniques. Other popular programs for social network analysis include Netminer, Pajek, Socnet, Jung, Gradaph, and Structure. An examination of these and other programs is performed by Huisman and Duijn (2005)

⁵¹ Network analyses of small groups have been done by Mokken (1979), Breiger (1974), Alba (1976) and Alba & Kadushin (1976).

relationship does not necessarily happen “automatically” in that people conduct work tasks together. In this way, the development of a relationship can easily become an issue to which individuals and leaders usually develop a more strategic connection. This connection is also strengthened by the fact that informal relationships, generally often receive a more important meaning in new (and less bureaucratic) organizations (Tichy and Fombrun 1979).

Another important element is that distributed groups almost always consist of a combination of co-localized and distributed workers. The *geographical location* of co-workers therefore enters into the group studies in a new way, and network analysis contains special possibilities for visualizing and analyzing this. In relation to distributed groups, this perspective has the special advantage of being able to study constellations of distributed nodes and co-localized nodes located in the same place, since the connection between relationships and place can easily be elucidated. For example, Figure 4 provides an immediate impression of how the co-workers’ location had significance for daily frequency of interaction at Delta. Until now, information about the co-workers’ geographical constellation has hardly been utilized within studies of distributed groups.⁵²

A third factor is that within distributed groups, tight networks, where everyone has decent contact with everyone else, will almost always be difficult. Therefore, distributed groups often take on the form of different constellations of tight and loose relationships, linked to certain central places, projects or persons. These conditions have hardly been discussed within traditional studies of distributed groups. Network analysis can contribute to strengthening the insight into how these alternative constellations look, where the central relationships are found, and how they affect group cooperation.

In spite of these possibilities, there are very few network analyses that have been done on distributed groups. Exceptions are a few studies of coordination and communication. These studies have on the one hand attempted to locate the coordination-based structures that distributed workgroups assume in relation to co-localized groups (Ahuja and Carley 1999; Hinds and McGrath 2006). On the other hand, there are a number of studies that have analyzed the technology-use of distributed groups with regard to relational strength and geographical distance (Haythornthwaite 2002; Koku and Wellman 2002; Quan-Haase and Wellman 2006).⁵³ Therefore, the main emphasis of these studies so far has been centered on relationships based on frequency of interaction, and to a lesser degree on affective relationships like friendship and trust.

⁵² However, an exception is theories who view geographic places in light of so-called faultline theory (Polzer, Crisp et al. 2006).

⁵³ These studies are thoroughly presented in attached articles, and especially article F.

6.3 Trust in relationships and networks

Within network studies, trust is understood first and foremost as being a *quality of a social relation*, and often as a characteristic of *strong ties*. “The strength of strong ties” is according to Krackhardt exactly that they “constitute a base of trust that can reduce resistance and provide comfort in the face of uncertainty” (Krackhardt 1992 p.84). Still, strong ties are measured in different ways, and not all ways of operationalizing this concept involves trust, in the way it has been previously defined. Strong ties have been measured through frequency of interaction, reciprocity in the networks of interaction, and through the use of other terms of relationship (“friend”, “important person” etc) (Krackhardt 1992). Thus, there is not a complete overlap between relations of trust and strong ties within network analyses. More explicit mappings of interpersonal trust in organizations have also been carried out within network studies (Burt and Knez 1996; Cross and Parker 2004; Krackhardt and Hanson 1993). As described in chapter 3.5, trust has in network studies either been directly measured (by asking informants in a given network about who they trust), or indirectly (through the use of indicator questions). As mentioned previously, a distinction can be made between affective and cognitive forms of interpersonal trust. While affective trust usually also involves a strong bond, this is certainly not a necessity for the cognitive form.

Another main line of thought within network studies is to view trust as a *quality of a network structure*. A leading idea within structural sociology and psychology has been that triads have other characteristics and distinguishing marks than dyads. An important precursor to this is Simmel’s descriptions of triadic relationships (Wolff 1950). According to Simmel, people embedded in three-part structures experience very different constraints and opportunities than those in dyadic relationships. First, dyads preserve individuality more than triads. In triads, single individuals can be outvoted and pushed out by the two other members. This means that triads tend to be more focused on the interest of the group rather than on individuals. Second, the bargaining power for each individual in triads is much lower, as a threat of withdrawal from one party is made hollow by the fact that two other parties remain. And third, conflicts are more readily handled in triads, since one person can act as a moderator. The moderating effect is present, according to Simmel, even if the third party is passive; the mere fact that there is a third party can be sufficient enough to moderate/sufficient for moderating a conflict between two parties.⁵⁴

The centrality of triadic structures and “third parties” has been recognized in several later contributions in network theory and trust: In particular, Heider’s balance theory has been influential

⁵⁴ Simmel’s point of departure is the third party as a “non-partisan”, i.e. a neutral part. However, he also stresses in the same work that the third party can take advantage of the situation as a “Tertius Gaudens”, or by “Divide et Impera”. The latter roles have been important for later studies in social network analysis, focusing on the concepts “structural holes” and “information brokerage” (Burt 1992; Fernandez and Gould 1994).

within social psychology and studies of transitivity (Heider 1958). In recent studies of social capital, the work of James Coleman has reflected similar ideas (Coleman 1988). Coleman argues that a *closure structure* (i.e. triads and cliques) is essential for the development of social capital and trustworthiness. Focusing on the cognitive rather than the affective sides of trust, he argues that a closer network of stronger relations creates trustworthiness due to the increased ability to monitor and control. Reputation is one central element in this: “Reputation cannot arise in an open structure without closure, and collective sanctions that would ensure trustworthiness cannot be applied. Thus, we may say that closure creates trustworthiness in a social structure” (Coleman 1988, p. 107-108).

Thus, the general idea that interactions with persons outside a dyad are positive for the development and maintenance of trust is widely held in studies of social networks. Even though Coleman clearly extends the idea of triads on a higher societal level, the central argument remains intact.

Within network studies, trust is thereby described as a possible quality of a dyadic relationship, and as a possible product of a network of relationships. However, the approaches have led to somewhat different roles being attributed to trust within network analysis: on the one hand, as a motivator of change and development of social networks, and on the other hand, as a possible result of certain types of networks. The first perspective has most clearly been expressed within organization studies, which emphasize trust as being a special form of management that can contribute to building networks (Johansen and Selart 2006; McEvily, Perrone and Zaheer 2003). McEvily et al. argues that trust affects organizing through the mobilizing of resources. This involves motivating players to contribute their own resources to combine, coordinate and use them in joint activities, in order to influence performance and outcomes. Moreover, trust is seen as central for the development of more stable and enduring interaction patterns in organizations. According to these authors, trust should be seen as an organizing principle that: “... molds the social structure of an organizational system” in different ways (McEvily, Perrone et al 2003, p.93-94). The other main perspective has been dominant within branches of network research, and is expressed in the works of Burt (2005) and Coleman (1988) and others. As mentioned previously, Coleman for example believes that certain types of networks are better suited for developing trustworthiness than others. There is not necessarily any conflict between these perspectives, but this indicate that the concept of trust can be linked to social networks in different ways.

6.4 Trust on different levels

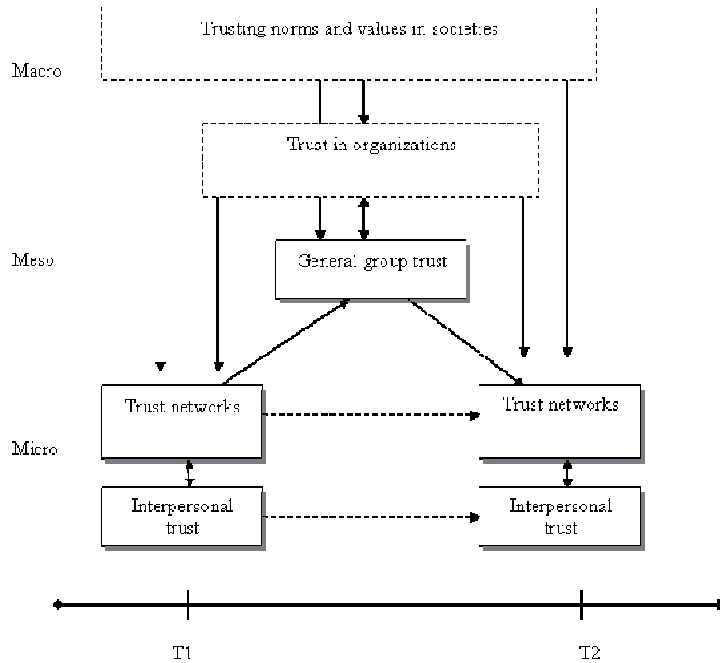
A network-based understanding of trust views this as a relational quality within dyads, and as the products of denser relational structures. With regard to social relationships, these, as previously

mentioned, can have a primarily cognitive or affective inclination. When several affective or cognitive relationships of trust are joined, a *trust network* is created. Such networks can have a reinforcing effect on the trust in relationships, as previously described. In a group where a trust network exists, two persons who do not know each other can for example quickly establish trust, given that both know (and trust) a third person. Betrayal is more difficult in a trust network, since this can have dramatically negative effects on important and strong relationships, which often take time to build up.

Trust on a structural level will therefore be able to strengthen trust at an interpersonal level, but over time will also contribute to developing general positive expectations of other people's behaviour, or *generalized trust*. We can therefore analytically distinguish between three somewhat different levels of trust within a group: interpersonal trust; network trust; and generalized trust. In a greater perspective, generalized trust in organizations and societal trust (including institutional trust) will affect the relationships in a group and the general group-based trust. The connections between these levels are shown in Figure 5.

The connections can be clarified using an example from *Omega*, one of the groups that will further be examined later in the dissertation. Omega was established as a distributed group in the wake of a company acquisition. In the situation that arose, many of the workers in the acquired company had little faith in the new owners. The waning organizational trust made it more difficult for the group to develop good cooperation, and cooperative problems were significant during the first period. Since the groups consisted of co-workers localized in two countries, national differences became an issue, and when cooperative problems eventually arose, questions arose about whether or not differences in national cultures were the reason. Even though this included two Nordic countries, where it could be anticipated that societal trust was fairly similar, there were occasionally different norms and expectations of how a leader should act. Still, trust was gradually developed between individual persons at Omega, and some of them were especially focused on building such relations across geographic and national divides. These relationships contributed to strengthening trust, and this eventually also strengthened the general feeling of trust in others. In this way, relational and group-based trust was developed within a framework where other types of trust and mistrust were continually present.

Figure 5. Levels of trust in distributed work groups at two points in time



This dissertation thematizes mainly the connections between trust understood as being relational and structural networks within distributed groups. These relationships and networks are described on an interpersonal level. The articles are aimed at understanding how relationships of affective and cognitive trust are established in distributed groups, what structures they follow in different types of distributed groups, and how they are supported by available communications media. In this way, a bottom-up perspective of building trust is constructed in four different cases, where cognitive and affective dimensions are investigated.⁵⁵ This does not mean that social or organization-based forms of trust are ignored, but that the main focus of the work is directed toward the relations of trust and the structures they create.

⁵⁵ In one of the articles (Article F), I incorporate a broader scope in also mapping out generalized trust. In this work, the focus is on the connection between generalized trust and the trust-bearing structures within the group.

6.5 Summary

In this chapter, I have more closely described how distributed workgroups can be analyzed as a network of multiple social relations. This analytical perspective emphasizes distributed groups as being constellations of actors linked together through a network of social relations and connections. In this context, trust appears as a particular quality of social relationships, especially well-suited and necessary for dealing with relationships that are characterized by risk. When such trust-bearing relationships are linked together in a trust network, this can reinforce trust within a group, and generalized trust can eventually be developed within such trust networks. The main focus of this dissertation is on trust developed on a relational and network level, and in the next chapter, I will more closely examine theories that are used to study changes, variations and developments within such networks.

7. Network theories

There are no theories within the field of network theory that explicitly address trust. Still, there are several theories that implicitly touch upon it, and that can provide insight into the field. In the articles that are presented in this dissertation, somewhat different types of network theory are used, all of which have to do with the underlying issues of the establishment, maintenance, and distribution of trust in distributed workgroups. In this chapter, I will provide a close account of these theories and how they are employed in the articles. First of all, this involves *role theory*, which is used for explaining the development of trust within the groups. The focus here is on the active building of interpersonal trust by individual nodes over geographical distance and organizational boundaries. Next, this deals with *cognitive network theory*, based on principles taken from structuration theory. This theory will be used in order to describe the connection between the use of communication technology and trust within distributed groups. Third, *cohesion theory* is used in order to explain variation in trust between different groups.⁵⁶

These theories describe somewhat different processes involving how the network affects actor's scope of action, connections between different types of network, and the significance the network has for establishing shared understandings and attitudes. However, there are no fundamental contradictions between these approaches. In the last part of the chapter, I will more closely discuss how these theoretical perspectives can be viewed in context, and how they can be combined through a reflexive perspective on trust in distributed groups.

7.1 About network theory

Social network analysis is a perspective that intersects several social science disciplines. The exchange of theories and concepts between different disciplines is extensive, and has been especially intense between social psychology, sociology, and organization theory. A good portion of what is described as social network theory has originally been borrowed from other disciplines, especially anthropology and social psychology. Still, certain theories can be pointed out as being "internally - homegrown" network theories, in the sense that they have been developed as a part of network-related research (Kilduff and Tsai 2003). These theories typically operate at a meso-level, with emphasis on the dynamic between the individual and the structural networks of which they are part. They often have qualities that make it possible to describe them as "middle-range theories" (Merton 1968), in that

⁵⁶ Note that there are different ways of grouping and classifying this type of theory. I have mostly based my own groupings on labels and categories proposed by Kilduff and Tsai (2003).

they seek to explain connections within bounded areas, which can be empirically tested using case studies, individually or in series.

7.2 Structural role theory

Structural networks consist of a series of nodes linked together through different types of relationships. A key assumption within parts of network theory has been that positioning within such networks affects the behavior and scope of action of individual persons. Within sociology, the concept of “role” is used to refer to situations where groups have established norms that are only valid for certain categories or people (Scott 2006 p 144). In network analysis, roles are usually described as being linked to patterns of multiple relationships that surround people, while positions refer to nodes that have similar patterns of relationships within a single network (Wasserman and Faust 1994, p 348-9). In practice, however, position and role are often used interchangeably within this field.

A basic thought within structural role analysis has been that persons who are positioned in the same way within social networks will also be similar in other ways. Roles emerge on the basis of uniform positions within structures, and such positions are assumed to guide behavior and attitudes. With a basis in positional role theory, techniques for sorting and grouping nodes in networks have been developed, primarily within the so-called block models. Block models can be described as a mathematical technique for organizing nodes into groups (i.e. blocks) based on their position within a network. Positional studies have focused on the significance of having the same relational structure within the same network, or the same position within different networks. In the first instance, this usually refers to *structurally equivalent* nodes; in the second instance, *role-equivalent* positions (Kilduff and Tsai 2003, p. 59).⁵⁷ Two mothers in a nuclear family can for example be said to have role-equivalent positions, since they have the same positions within a family structure, but (usually) to different fathers and children.

The development of positional analyses has made it easier to analyze roles within networks, and helped emphasize the similarity in/of roles across social networks. Some of the key roles analyzed within social networks are the following: “hub”; “isolated”; “hangers on”; and “brokers” (Cross and Parker 2004).

⁵⁷ Notice that role equivalence is often also described as “regular equivalence”.

7.2.1 Brokers and structural holes

Within network studies, a great deal of interest has been dedicated to the role that actively connects different network constellations. This role is often referred to as a *network broker* or simply *broker*. More specifically, network brokering can be described as “a process in which intermediary actors facilitate transactions between other actors lacking access to or trust in one another” (Marsden 1982 p.202).

The role can be understood with a basis in the concept of cut-points mentioned above, and the term “bridge” which specifically refers to the relationship that divides a group in two if it removed. The role of the broker therefore specifically addresses a particular nodal position and (at least) two groups or networks that are geographically or socially separate.

Table 8 Five central broker positions, based on Gould and Fernandez (1989) (Dark node = broker)

Type	Description	Illustration
“Itinerant broker”	The broker belongs to a group that is different than/from the two other parties	
“Coordinator”	The broker is a member of the same groups as the two other parties	
“Gatekeeper”	The broker connects from a part belonging to an external group to an internal part/to a part belonging to an internal one	
“Representative”	The broker connects between an internal part to a part belonging to an external one.	
“Liaison”	The broker and the parties all belong to different groups	

A broker can enter into one of these, or he/she can stand outside these. The role a broker has in such situations often has great significance for the latitude a broker has. With a basis in somewhat different constellations, Gould and Fernandez (1989) have set out a five-part typology of brokers that include “coordinators”, “itinerant broker”, “gatekeeper”, “representative”, and “liaison”.⁵⁸ Table 8 indicates these five central broker positions. A central point of departure for broker theories has been that there are certain advantages for those who hold broker positions. Burt has developed his theory of *structural holes* around precisely such opportunities (Burt 1992; Burt 2001; Burt 2005). Persons who are good at connecting previously separated network constellations are what Burt refers to as network brokers, and the active connection of such network constellations is described as brokering. Similar to Granovetter, he believes that weak ties are more useful for gaining new information than strong ties, but at the same time he places greater emphasis on the structural aspects of such relationships. He claims that in the empty space between unrelated constellations of networks, structural holes arise that can be strategically exploited by entrepreneurs. Serving as a network broker therefore has a lot to do with “seeing possibilities” within structural networks, and strategically building relationships in accordance with this. The coupling of networks provides several advantages, according to Burt, including increased access to information, increased opportunities for control, and increased opportunities for influence. Structural holes emerge across such groups as “a relationship of non-redundancy between two contacts” (Burt 2001 p. 22). Persons who have the same relationships within the same network (i.e. structurally equivalent nodes) are in this context redundant since they will not give the broker access to new information. In order to maximize their advantages, a broker should avoid linking relationships to structurally equivalent nodes, but instead develop their network into constantly new constellations. A good fraction of research has supported the idea that relationships that cross isolated units are important to the individual broker. For example, empirical studies of organizations show that people who have personal networks that cross various dense constellations, are more rapidly promoted, and are more positively evaluated by leaders and colleagues (Gabbay and Leenders 2001; Hansen, Podolny and Pfeffer 2001; Mehra, Kilduff and Bass 2001).

Burt’s theory of brokering in networks constitutes a further development and a reformulation of Granovetter’s theory of “the strength of weak ties”, but with a greater focus on network building as an individual strategic activity. This has been often used in later network studies, but has also been critiqued from different perspectives. Firstly, according to many researchers, it exaggerates the significance of brokering as a result of self-interest. Brokering can be imagined without being linked to the idea of a utilitarian broker, and ethnographic studies have found that such coupling activities can often go beyond such motivations (Boissevain 1974; Fernandez and Gould 1994). The other is that the theory apparently neglects the significance of stronger relationships. However, it can be argued that a

⁵⁸ In principle, brokering can be performed by more people than one middle-man, but within network theory, one does not usually operate with more than two “path lengths”. The typology of Gould and Fernandez (1989) also does not consider more lengths than this.

network role is not only a question of position, but also about the *contents* of a relationship. Certain recent studies have indicated that Burt's theory of information brokering is not valid for other types of structures than those that affect access to information resources and advising (Hansen, Podolny and Pfeffer 2001; Podolny and Baron 1997). In a study of 658 employees in an international engineering firm, Podolny and Baron (1997) found support for Burt's theory with regard to relationships linked to advising and the exchanging of information. However, with regard to so-called "buy in networks" (i.e. relationships that were important for accepting social support) structural holes had a negative effect for the engineers. People with many structural holes within networks consisting of strong ties experienced negative effectiveness, mobility, and well-being. The explanation given by the authors is that this has to do with role conflicts and stress linked to belonging to different groups with different expectations. They claim then that it is too restricting to only examine the strategic opportunities linked to social networks: "...individuals seek not only resources and information through social networks, but also a sense of belonging and understanding of what is expected from them, and sometimes the very same tie (e.g. to a mentor or supervisor) can be a source of both resource based and identity-based flows. Consequently, individuals are highly constrained in their ability to form a network that is maximally efficient with respect to some property such as structural holes." (p. 690).

Thus, Burt's understanding of the broker can be said to be primarily valid for strategic relationships where access to information is important. However, the theory diminishes the significance of stronger relationships and the significance of trust for individual persons and groups. An alternative understanding of the activity of brokering is found in connection with the concept *boundary spanning*; a concept that is developed in close connection with network theory.⁵⁹ This concept refers to persons and organizations that have many internal and external relationships in an organization, which are used to communicate information across departments and organizations (Friedman and Podolny 1982; Marchington, Grimshaw, Rubery et al. 2005; Tushman 1977; Tushman and Scanlan 1981). Boundary spanning has primarily been studied in connection with inter-organizational cooperation, and with a focus on handling formal relationships and contacts. However, these studies indicate, similar to the theory on structural holes, that "boundary spanning roles" are important for increasing the flow of information and the effectiveness of cooperative constellations. Still, there are also findings that indicate that such a role is often subject to compound pressure in connection with having strong relationships within two different groupings. The role can be a demanding position, especially if these are stronger and more binding relationships.

⁵⁹ This pertains to Rogers (1971), Granovetter (1973) and Freeman (1979)

7.2.2. Structural role theory and the development of trust in distributed groups

The point of departure for two of the articles in this dissertation is understanding and explaining how trust has been developed within distributed groups. In light of structural role theory, attention is directed at the different roles that can be found within a structural network. It turns out that within the trust networks, there are persons with relationships who link together constellations of the distributed network where there is little or low levels of trust. This can be described as a *trust broker* position. The role of trust broker is on the one hand founded on persons who actively build trust between groups where trust is low in the first place. This can be understood and analyzed in light of structural role theory, in the same way as information brokering. At the same time, this type of brokering is greatly dependent on the acknowledgment and respect of others within a network. This type of brokering must therefore be understood in light of an active presentation of trustworthiness, together with other people's positive interpretation and understanding of the mediators. Thus, in the articles, positional aspects are supplemented with relational aspects, where the symbolic aspects of the development of trust are also emphasized. Article B and C seeks to explain how such roles come about, and what it is that motivates people to take on such positions. Thus, the articles in this dissertation attempt to make use of some of the possibilities linked to structural role theory, and especially the significance of the broker role. At the same time, these articles seek to further develop this perspective such that it includes relationships with different kinds of content, and is based on other assumptions than self-interest.

7.3 Cohesion theory

As previously mentioned, trust has often been associated with denser networks, where it is possible to develop indirect relationships by involvement of "third parties". An important starting point for this is Simmel's description of the characteristics of three-part relationships (triads), in relation to two-part relationships (dyads). The significance of triads and other "dense networks" for the development of stronger communities has (re)appeared in several articles (Coleman 1988; Wellman and Wortley 1990). A main idea within this tradition is that opinions, attitudes, and understandings are constructed and reinforced within smaller social groups where relationships are relatively dense. Another is that such networks provide the basis for a reputation mechanism, where people are interested in maintaining the good opinion of other nodes in the network. This will often reduce the risk of betrayal and breach of trust. These ideas are further explored within sections of network theory.

An important theoretical starting point is firstly within *balance theory* in the way it is developed by Cartwright and Haray (1956) and Heider (1958). The essence of this theory is that people generally strive to reach a balance within their social network. The theory states that positive relationships are developed with people who are linked together based on shared likes, interests, or

characteristics. However, in a number of instances, such connections will not be made, or negative relationships will be developed. Unbalanced relationships arise when a wish for a positive relationship goes unanswered, or when a person has positive relationships with two persons who have negative relations between themselves. In circumstances where imbalance exists, people will attempt to establish new balance, either through establishing new relationships, or through ending some of the existing ones. Thus, a key aspect of this theory is the dynamic it describes concerning the creation of denser structures within informal social systems. A moderated version of balance theory has later been developed within the concept *transitivity*, where the requirement that relationships must have either positive or negative values is removed, while the relational orientation is maintained (Holland and Leinhardt 1977). Transitivity refers to the degree to which a network of relationships consists of triads that are balanced. Triads can be more or less balanced, and the degree of balanced triads can be measured as transitivity within networks.

An interesting implication of balance theory is that actors in networks will tend to cluster together in more densely balanced groupings. According to the postulates within balance theory, a person within a social system that contains the possibility for developing relations will gradually witness the formation of opposing groups and cliques. An organization that is totally balanced will – if balance theory in its most extreme form is to be followed - be totally divided up into two camps, without contact between them (Scott 1990). In actual social systems, usually such a development hardly ever occurs; instead, denser groups linked together with different types of social relationships can be found. Individuals will probably attempt to develop balanced relationships to different degrees, and the concept transitivity is here well-suited for finding degrees, or stages of transitivity within a network. As an extension of balance theory, similar ways of describing denser sub-groups within greater networks have been developed, including cliques, clans, and core/periphery structures (see table 7 for an overview of some core concepts and definitions).

7.3.1 Simmelian ties

Balance theory suggests that the formation of clicks will develop in groups where informal relationships have certain latitude. An important extension of these theories has examined the significance of cliques – and relationships within these – for the development of shared meaning. Krackhardt and Kilduff call such relationships *Simmelian ties* (Krackhardt 1999; Krackhardt and Kilduff 2002). Krackhardt defines this as being “a situation when two individuals are reciprocally and strongly tied to each other and reciprocally and strongly tied to at least one third party in common” (Krackhardt, p.186).

In accordance with Simmel’s descriptions of triads – and general balance theory – relationships that exist within such triads have a stronger common understanding of situations.

Krackhardt and Kilduff have studied the degree to which persons with such relationships actually have stronger shared understandings of networks around them. They find that people who have Simmelian ties have a more similar understanding of how the other networks in the organization look. Clicks can therefore be important for developing shared opinions and understandings about things.

Within the theory of Simmelian ties, triads are considered as more stable and robust than dyads. Whereas dyadic relationships can be difficult to deal with, triads will represent a greater degree of stability. In this way, they can be an important resource for groups and organizations. Studies have indicated that trust relations are strengthened within triads and other dense network structures. At the same time, there are indications that negative attitudes toward others outside of the group also can be reinforced within triads or larger clicks (Burt 1996, p 265). Therefore, Simmelian ties appear to be significant for the establishment of shared understandings and trust between those people who are part of the triad. Still, the existence of such ties does not guarantee greater general trust within a group or an organization.

A core idea for cohesion theory is that relations embedded in denser network units have other qualities than other relations. An interesting question related to this is what it is that makes such relations develop in the first place. Three important arguments have been especially pointed out within network studies. The first is linked to *similarity* along certain sociocultural dimensions, and often people will establish relationships with others who are similar to themselves in accordance with such dimensions. There is a significant amount of literature that has examined this and found that equality is important for creating a network. Similarity in relation to gender, age, education, and related variables have revealed themselves to be significant (McPherson, Smith-Lovin and Cook 2001). In general, such factors are more important for affective relationships, and less prominent within instrumental ones (Ibarra and Andrews 1993). The other condition that affects the formation of networks is *physical proximity*. People will establish relationships with the people with whom they associate on a daily basis. This last argument is especially significant for distributed groups. As mentioned previously, there is much support for this argument even within studies of ICT use in organizations (Rice 1982; Rice 1990). People who work near each other will communicate more and occasionally develop the same attitudes and opinions. Both of these factors seem to be important for the development of positive relationships. A third important condition that is considered to affect the formation of networks is *shared tasks* or interests. The fact that people engage in shared activities, will in itself help increase interactions and different types of relationships. Such shared topics of interaction are often described as *network focus* (Feld 1981).

7.3.2 Cohesion theory and the maintenance of trust

Cohesion theory has important implications for studies of trust within distributed groups. First, because it postulates that denser relationships and cliques are important for the developed of shared

opinions and a greater degree of confidence between actors within triads and cliques. In this way, it can be expected that trust will develop faster, and flow easier within cliques than outside of them. At the same time, it can be assumed that cliques are more easily formed where co-workers have physical proximity, are similar within central characteristics, and participate in shared activities.

In one of the articles (F), the degree to which denser network structures are significant for trust within the distributed groups is examined. An important finding here was that groups with high levels of trust had more pronounced core/periphery structures than those with low levels of trust. These integrated cores appeared to be important for the maintenance of trust within the group, assuming that it managed to maintain contact with the peripheral sectors of the network. Thus, the denser structures (cores) within distributed work groups may be important for maintaining stability and trust as stated in cohesion theory, given that these have certain configurations.

7.4 Cognitive network theory

A topic that is often discussed within network studies is what constitutes “the essence” of different social relationships. As mentioned previously, different sets of descriptions are used to distinguish between strong and weak ties; partially based on interactions; partially based on the content of the relationships. This has created problems in discussions about how effective different methods of analysis are at “measuring” different types of relationships (Bernhardt, Killworth and Sailer 1982). One reaction to these discussions has been that several network researchers have distanced themselves from behaviorist understandings of networks and relationships, and to a greater degree emphasized that subjective understandings of networks *in themselves* are interesting (Freeman 1992; Krackhardt 1987). On this basis, Corman and Scott (1994) have suggested more closely linking network theory to concepts and mechanisms developed within structuration theory. They have proposed their own cognitive network theory which is based on structuration theory along with somewhat different types of network theory.

In structuration theory, as it is described by Giddens (1984), the concepts system and structure are given a specific meaning: “systems” constitute existing patterns of social relationships, while “structure” refers to rules and resources that actors employ. Structure appears to be an inner dimension that is developed in close connection with the social practice in which the actors partake. Social networks can, according to Corman and Scott, be understood as being a structure, in the way it is described in structuration theory. In line with the principles of structuration theory, they argue that these structural networks actively affect communication and interaction, while at the same time they are gradually influenced by these actions. The authors argue that: “the network is an abstract structure

of perceived communication relationships that function as a set of rules and resources actors draw upon in accomplishing communication behavior” (Corman and Scott 1994, p 181).

The advantage of constructing such a cognitive perspective of social networks is that a clearer distinction between structural networks and acts of communication are established, and how they are linked together emerges. This can result in a more pronounced distinction between social networks and networks based on regular interactions, at the same time that a theory that opens up for descriptions and changes within social networks can be established. This is especially useful in relation to analyses of mediated interaction and trust in distributed workgroups.

7.4.1 Modalities

A central element of structuration theory is descriptions of how different mechanisms link systems and structures (modalities) together. According to Cormann and Scott, modalities can be described beginning with three mechanisms that are partially described within other sections of the network literature.⁶⁰ The first involves *reticulation*, which is a process where structural networks are used as the basis for initiating communication with others. As mentioned above, the social network is understood as being a cognitive structure that indicates who oneself and others have good or bad relationships with (i.e. it constitutes rules and resources). The second involves *activation* where shared activities, projects, or ideas help connect observable activities with structural qualities.⁶¹ The third modality involves *enactment*, where certain external occurrences or situations can activate a shared focus among the users, and thereby also establish social structures. The term “triggering events” is used here in order to explain how a latent structural network can be activated in certain situations.

The theory should be understood as a network theory that draws on central elements within structuration theory in order to more closely explain the formation of networks and the connection between communication and social networks. The theory is then no “translation” of structuration theory to the field of network theory, or the opposite. Parts of this theory have later been utilized to show how the formation of a network within a local church community was closely linked to the activities (i.e. activation) that took place (McPhee and Corman 1995).

⁶⁰ This includes Homan’s theory on groups, Feld’s theory on social foci, along with theories about triggering events described by Folger and Pool, among others (Feld 1981; Folger and Poole 1984; Homans 1950).

⁶¹ Here, the concept of focus is used, in the way it is described by Feld (1981). Foci can be described as “social, psychological, legal or physical entities around which activities are organized” (p. 1016).

7.4.2. Cognitive network theory and the distribution of trust

In most definitions of trust, it is described as an attitude, or a psychological state that emerges within situations that involve risk (See Chapter 2). This means that trust involves certain sets of positive expectations linked to other people's future conduct. In this way, it is possible to describe interpersonal trust as a *cognitive relationship*: that is, a relationship based on individual persons' perception of certain others. The connection between trust internal attitude and the external interaction patterns between people are seldom analyzed in empirical studies of distributed workgroups (Refer to the examination of empirical works in Chapter 5). This is also seldom studied within network studies of distributed groups, where primarily interaction-based relationships have been the focus. Cognitive network theory, in the way it has been described by Cormann and Scott, opens up for a better understanding of these relationships.

In light of cognitive network theory, trust and trust-based networks of relationships can be described as an underlying social structure. Trust networks exist on the one hand on a structural level as a *perceived network* - that is, understandings of whom oneself and others trust and mistrust.⁶² On the other hand, it is expressed through active acts of communication that are also a part of maintaining or changing the perceptions one has of the others at any point in time. The development of trust within a group can thus be understood as a form of structuration involving the regular connection between action and structure. Modalities connected to the three processes mentioned above (reticulation, activation, and enactments) can contribute to clarifying how trust is activated, reinforced, and built through shared actions and activities.

This perspective is used in two of the articles (D and E) in order to better understand the connections between trust structures and structures based on communication via different media and face-to-face communication. The case studies show that there are interesting differences in how various kinds of ICT are utilized in order to support or express affective and cognitive trust in the distributed groups.

7.5 Integrating the main theoretical ideas: trust from below

Focusing on trust as a relationship and structure within distributed groups makes it appropriate to use network-based theories in order to understand network formation, structural variation, and stability. So far in the chapter, I have presented three different network theories in order to clarify the development, maintenance, and distribution of trust in distributed work groups. This can be

⁶² The term "perceived networks" is taken from Cormann and Scott (1994). These authors also occasionally use the term "latent network."

understood as being three slightly different approaches toward studying trust within distributed groups, based on social network theory and methodology. The general ideas can be summarized through the points:

1. Trust in distributed groups can be strengthened through people who actively develop trust relationships over geographical distances. Such “active nodes” (trust brokers) are important for developing networks and build relationships where geographical distance exists or trust is at a low level.
2. Denser constellations within distributed groups, that interconnect partners at different geographical locations, can help stabilize and strengthen trust in distributed work groups. Denser constellations of collocated individuals, with few ties to the other (remote) participating locations, may strengthen distrust rather than trust.
3. Trust networks are cognitive structures that are closely related to the communication networks in the groups. Participants will deploy media actively to activate, support and make use of the different types of social networks. These communicative actions will simultaneously express and reinforce the trust networks.

These theoretical mechanisms are further explored and analyzed in the papers. A central connection between these theoretical ideas, however, is that they all build on a reflexive understanding of trust, taking the form of active relational development. This does not mean that trust in other areas, or from other “sources”, is entirely overlooked. Trust linked to institutional roles, ritual actions, norms, and rational calculation is still relevant. However, the mechanisms that are described here support the general view that trust in many contexts is also gradually developed through interpersonal relationships. This represents a bottom-up understanding of trust where it is focused on as an actor-driven process, more than (just) driven by norms, roles, and institutions.

It is possible to see these mechanisms as part of a progress line: Trust brokering establishes relationships, while integrated cores can contribute to stabilizing these relationships. Establishing new trust relationships require in most cases an active face-to-face communication, while ICT is used to reactivate, maintain, and potentially strengthen such relationships and structures. This idea is however not elaborated further in the subsequent papers.

7.6 Summary

Social network analysis enables an analysis of distributed work groups where the focus is directed at the social relationships that bind a group together over time. Within this perspective, trust is understood as being a special quality of social relationships, and also as the result of certain structural qualities of social networks. Different kinds of network theory are applied in this dissertation: In order to analyze the *development* of trust, positional role theory is used, and then particularly theories that deal with brokering across social and/or geographic distances. For analyzing the *maintenance of trust* in distributed groups, cohesion theory is used, where the focus is on the significance of denser structures for stabilizing trust. Finally, in analyzing the *distribution* of trust in groups, cognitive network theory is used to emphasize the interconnectedness of ICT-based and trust-based relationships and structures.

These theories are each well-known within the field of network theory- that is, among researchers who are familiar with and employ social network analysis. However, these theories are seldom used within studies of trust, or in studies of distributed groups. A key objective of the articles in this dissertation is to use the network theories to develop a new understanding of how trust is established, conveyed, and preserved in distributed groups. This means that in a number of instances these theories are further developed in line with the empirical findings that emerge. However, what the use of these theories in this dissertation has in common is that they are largely built on a reflexive understanding of trust, by emphasizing an actor-driven process of change.

8. Research strategy, data, and methods

The main research strategy that is employed in this dissertation is comparative case studies. In this chapter, I will more thoroughly describe this research strategy, the basis for the data, and the methodological techniques that are used in this dissertation. I will also assess that reliability and validity of the data.

8.1 Research strategy – case studies

Case studies is a research strategy is aimed at studying a limited number of phenomena within their natural context. Yin describes this as: “an investigation of a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident.” (Yin 2003, p.13).

Case studies are especially suitable for situations where a better understanding of certain social mechanisms, or the causes of certain outcomes, is desired. Within organizational studies, often organizations, departments, or groups are studied as cases. The case approach is thus a suitable starting point for analyzing and understanding the internal mechanisms linked to the development of trust in distributed groups. Within social network analysis, case studies are a key approach, especially within the more limited I-mode analyses (Breiger 2004). Qualitative and quantitative approaches are often combined in an analysis that aims to analyze relational structures, positional aspects, or changes over time.

Case studies can be used for purely descriptive purposes, in order to test out hypotheses or theories, and for developing new concepts and theory (Andersen 1997). In the last instance, this is usually referred to as *inductive case studies*, and has been a major approach for the studies that are presented here. Below, I will provide a more detailed description of how case studies can be used to develop theory.

8.1.1 Case studies as the basis for developing theory

An important issue that is linked to case studies is the possibilities for generalizing beyond the individual objects that are studied. Since case studies deal with a limited set of cases, the potential for statistical generalization is very limited. This is also not the intention of case studies. What is crucial for case studies is however the objective of being able to generalize on a more theoretical basis, so-called *analytical generalizing* (Yin 2003). Analytical generalizing aims to describe mechanisms or

processes that are relevant within a theoretical universe, not to get empirical results that are valid for a larger universe of cases. According to Yin, individual cases can be understood to be “laboratory experiments” where a person seeks to discover and explain what happens in certain social situations. In this way, repeated case studies become analogous to repeated experiments where researchers investigate whether the same mechanisms or processes repeat themselves in the same or entirely different situations. For studies that have multiple cases, this means that cases should be selected based on whether they can help interpret findings from previous studies. This is a principle that will be followed in this dissertation. Comparative case studies are used with the goal of identifying recurring dimensions and configurations.

The principle of analytical generalizing links case studies closely with theory and concept development. Even though there is broad consensus that case studies are especially well-suited for developing and further developing theory within different disciplines, there is significant disagreement about how this should be done. The most important difference concerns the degree to which preceding theory and concepts should be allowed to guide the collection of data (i.e. more or less inductive and deductive emphasis). On the one hand, an ideal exists of having the most open approach possible to the empirical data, where past models or theories guide the collection of data as little as possible. This ideal originates in ethnographic research traditions and within grounded theory (Glaser and Strauss 1967; Strauss and Corbin 1990). Eisenhardt expresses this perspective when she writes: “... most importantly, theory building research is begun as close as possible to the ideal of no theory under consideration and no hypotheses to test” (Eisenhardt 1989 p. 536).

On the other hand, there is an ideal that within case studies preceding theoretical assertions and models should be tested out. This perspective has been especially endorsed by Yin, who in this field has advocated separating the case studies strategy from the more ethnographic approaches. In his understanding, case studies should be directed towards testing the validity of different types of (rivaling) theories. Yin writes that: “the role of theory development prior to the conduct of any data collection is one point of difference between case studies and related methods such as ethnography and grounded theory” (Yin 2003, p. 28). Therefore, according to Yin, it is essential to be aware of these conditions before the research is carried out. Yin’s limiting of case studies to mere theory tests seems to considerably reduce the applicable range for case studies, while it also underemphasizes some of the significance of developing theories and concepts in the midst of the research process.⁶³ Still, it must be stressed that it will generally be difficult to avoid operating with prior concepts and thoughts when approaching a research field.

Ragin (1994) puts himself in a kind of middle-position when he describes the collection of data as an alternation between existing ideas and evidence generated through empirical research. The

⁶³ Czarniawska (1997) (1997) and Andersen (1997) critique Yin in this field.

research process is represented as being a continuous dialogue between previous analytical frames and images that emerges through empirical investigation. The decision about how fixed such analytical frames should be is a strategic research choice. However, it is important for the researcher to be aware of the analytical frames that are utilized, while also being aware of the fact that every theory and model can only capture parts of a phenomenon (Andersen 2002: 23). The ongoing dialogue between the analytical frames and the empirically generated representations will in the end culminate in genuine representations.

In this dissertation, I have mainly operated from a perspective that follows Ragin. My intention has been to develop new theories, or new representations, based on genuine case studies, not test out existing theories. Using qualitative and quantitative techniques, I have sought to develop a new understanding of the development and preservation of trust in distributed work groups. During this research process, I drew on somewhat different analytical frames on the data from what has been common in studies of trust in organizations. Concepts, metaphors, and theories from network studies have been an important source in this field. The purpose has been to build on or further develop theory as much as possible through proximity to the cases.

8.1.2 Case study design

Case studies can be shaped in the form of individual studies performed at a given point in time, or as comparative studies of several cases over time. This study uses cross-case design, where several similar cases are compared. In such comparative case studies, a distinction is usually made between studies that are case-based or variable-oriented (Miles and Huberman 1994; Ragin 1994). In this study, a “mixed strategy” is used, where case-based and variable-based methods are combined (Miles and Huberman 1994 p 176). Put briefly, this means that initially all cases are analyzed individually. Thereafter, the different cases are “stacked” together within a greater data-set, where the similarities and differences between cases are examined. In this second phase, the analysis thus becomes more variable-oriented and focused on developing theory. This is a strategy that can also be said to follow a “logic of replications” where each case is analyzed individually and eventually determines if new cases fit in, or deviate from certain patterns (Eisenhardt 1989, Yin 2003).

The case-based analyses are expressed in this dissertation through the articles that deal with individual cases. The variable-based analysis is most explicitly expressed in the last article, where general characteristics within all four cases are studied at the same time (Article F). The articles that discuss each individual case (within each topic) must still be viewed in context, since these cases support the same tendencies. Therefore, these must be read together, as parts of a complete comparative study.

8.2 The data

The work that is presented in this dissertation was carried out within a broader project financed by Forskningsrådet's (The Research Council of Norway) KIM (Communication, ICT and Media) program. In connection with this project, four large Norwegian companies were contacted with the goal of comparatively studying different distributed workgroups. Due to various practical reasons, it became difficult to make inroads into all of the companies in the way it was originally intended.⁶⁴ Therefore, the empirical basis became a set of distributed groups within the same organization, here called Nomo.⁶⁵ This business had newly acquired companies in other countries, and established a series of distributed workgroups with participants localized in different geographical locations. This represented a unique opportunity for the research project to study distributed cooperative groups in an organization that was undergoing a development of becoming more international.

After having talks with management representatives at Nomo, we agreed to locate a selection of suitable distributed groups. From the standpoint of the project, there were three conditions that were particularly emphasized. First, the criteria for distributed work had to be complied with, which meant that a significant proportion of the employees had to permanently work across distances, and ICT had to be frequently utilized. We wanted groups that were as typical and representative as possible of distributed work groups in Norwegian and international organizations. The second was that the groups had to have a certain strategic significance for the company, such that we had access to groups where establishment and cooperation were important.

Table 9. Overview of the cases used in the paper

	Omega	Beta	Delta	Gaia	Sum
Participants (N)	18	8	16	15	57
Interviews	14	6	10	10	40
Questionnaire*	17 (17)	7 (7)	15 (13)	15	54(37)
Paper references	A, B, D, F	F	C, E, F	F	

* Parentheses indicate the numbers of informants in the follow up survey. In Gaia, no follow up survey was conducted.

⁶⁴ Other companies however were studied within other parts of the project.

⁶⁵ Out of consideration to the organizations and informants, all of the names have been made anonymous in the articles and in this introduction. This is in accordance with the agreements that were entered into when the project started.

If the work was not important to the organization and those involved, then it could not be expected that sufficient motivation existed for getting cooperation to take place in the groups. The third criteria is that the groups had to be approximately the same size, such that there could be studied comparatively. We agreed to try and find groups of between 8 and 20 persons, and four distributed groups were marked out as especially interesting. Unfortunately, in one of these groups, the quantitative data was insufficient, due to low turn-out in participation in the questionnaire. This case was therefore eventually set aside. Instead, it was substituted by a new case – Gaia – a distributed group with researchers located in three different places in Norway. Gaia was originally used as a pilot-case in order to test out network methodology, but the collection of data was eventually expanded, such that Gaia became an acceptable case. Here, most of the qualitative interviews were conducted per telephone, after the execution of the project. As a case in this context, Gaia was however special, because it did not go beyond the national dimension, and because it was just not one individual organization.⁶⁶

The cases that were used in this study have thus been selected based on being the most representative of the topic being examined, but also due to practical considerations with regard to the collection of data. The four main cases have many similarities: All of the groups had worked across distances for about one year when the study began. This meant that everyone was well into their cooperative efforts when we began the study. Another main feature was that all of the groups carried out competency-based work within the field of IT. All of the participants had higher education in mostly economic, social science, or technical disciplines. Finally, all of the groups were composed of employees who were localized in two or more places, within different organizational frames. In three of the cases – Omega, Beta, and Delta – different national cultures were also involved. All of the groups were also active users of ICT in their daily cooperation.

Even though the groups had many similarities with regard to the composition of participants, duration, and field of work, significant differences emerged in the group-based level of trust and between the different relational network structures. Thus, a main focus of the work became attempting to understand the causes of these differences.

⁶⁶ Note that the author himself was included as a member of this group.

8.3 Methodological tools

The cases have been studied using multiple techniques. First, *individual interviews* were conducted with as many of the co-workers in the groups as possible.⁶⁷ The interviews are based on a semi-structured interview format, where a number of the main questions were prepared beforehand, but where the order of these varied. Input from the informants was followed up in order to capture as many experiences and thoughts as possible about working in distributed groups (a qualitative interview form is attached). The individual interviews were conducted both at Nomo's departments in Norway and Denmark. For Gaia, several of the interviews were conducted per telephone. In most of the interviews, recording equipment was used, and the interviews were later transcribed and analyzed using appropriate software (Nud*ist). After a first round of qualitative interviews, there was a period when central findings were examined, and summarizing notes composed. A consequence of this "break" was that we decided to focus more directly on trust and the creation of trust in the following interviews. It was also decided to focus more on the relational aspects of building trust, in order to follow up on findings from the quantitative studies. The goal was to carry out qualitative interviews with as many informants as possible in every group. However, it was difficult to conduct interviews with some of the informants due to job changes, or leaves of absence. In some instances, we also did not have the time to conduct all of the interviews we had planned. Still, we were able to conduct enough interviews to gain a good impression of the occurrences, attitudes and general perceptions within each case.

The other main technique that was used was *quantitative questionnaires*, distributed in electronic format to everyone via email. These were sent in two phases. The first questionnaire aimed at capturing several variables: firstly, variables involving affiliation, identity, trust, and how the participants perceive the group's performance; and secondly, other variables linked to the individual worker's social network, and the relational networks within the group (quantitative questionnaires are attached). A new questionnaire was sent out later (phase 2), where central indicators of trust, satisfaction, and performance were unchanged, along with indicators of cooperative frequency and the group's internal use of ICT. The mapping out of the employees' individual network was done away with during this phase, when it turned out to be difficult to exploit this to the fullest. Instead, a few questions about the group's internal relational trust were added

⁶⁷ Most of the interviews were conducted in cooperation with researcher John Willy Bakke from Telenor R&I

8.4 The process of collecting data

As a method, case studies are less formalized than for example quantitative surveys. However, during recent years, several contributions that aim to more closely define the central process that characterizes good case studies have emerged (Eisenhardt 1989; Miles and Huberman 1994; Ragin 1994; Yin 2003). Using Eisenhardt's summarization, six central elements in theory-developing case studies can be underlined: a) selection of case; b) selection of methods; c) analysis; d) developing hypotheses; e) connection to literature; and f) a summarizing analysis. All of these elements were followed up in our analysis, even though this was not sequentially performed (see figure 6 below, where the six elements are indicated by letter codes)

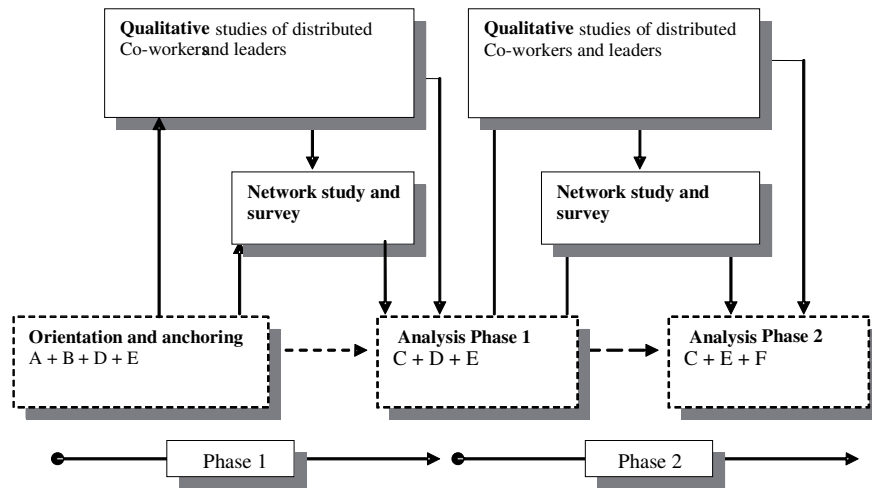
After an introductory *orientation and anchoring* of the study, a number of key topics and research questions were decided on. A methodological plan was developed with emphasis on the triangulation of different types of data. Thereafter, the collection of data itself fell into two main phases. *The first phase* included more open round of qualitative interviews and an initial round of quantitative data. Starting out from this first phase, we gained insight into the general situation in the four groups, issues that were especially relevant, and the challenges they were confronted with. Summarizing analyses of each case were written out, and a number of work hypotheses were developed. At this stage, presentations in the groups were carried out, with the opportunity for corrections and feedback.⁶⁸ During the *second phase*, an adjusted version of the questionnaire was sent out, and new qualitative interviews were conducted. The interviews during this phase however had a stronger orientation toward trust and the building of trust than the first phase. In this final phase, a new analysis was carried out on the basis of the entire material, and most of the articles in this dissertation were written based on this.

8.5 Reliability and validity

Reliability has to do with to the way in which the data was collected, and how reliable this data collection is. With regard to the qualitative data, this reliability is something that is primarily built up through documentation as the study is executed (Miles and Huberman 1994). The quality of the data in this study is strengthened by the fact that it is collected by several researchers, and the fact that reports are written in the form of notes and conference presentations along the way.

⁶⁸ All of the groups were offered presentations on the research, yet presentations were not conducted in more than two of the companies (Beta, Omega). The reason for this was time constraints from the participating company.

Figure 6. The main elements in the research process (Letters A-E indicate Eisenhardt’s six elements within theory-developing case studies)



An important basis for reliability in the quantitative material is that the data collection itself has proceeded correctly. In order to make the collection of data as structured and tidy as possible, an arrangement for electronic data collection via email (Questback) was utilized. The data was then recoded in the correct format for use in software for network analysis (Ucinet and DataMiner). The processes for this are more closely explained in the individual contributions. However, quantitative reliability is additionally linked to the degree to which the individual informants can be trusted to provide honest answers in the study. The question especially arises in connection with the informants’ self-reporting of different relationships within the workgroup. It is difficult to know this for sure, and it could be believed that some people (especially managers) could benefit from answering a number of the questions more positively, in order to pull the collective group’s score up. However, we took the opportunity to look at the quantitative data with the qualitative. The score on the scale of trust that was used and trust relationships in the network analysis can be assessed against qualitative assertions. The triangulation of these data generally indicated good consistency. It should also be stressed that the quantitative data is principally used in order to compare within and between the four groups. Even though self-reporting of social networks can have reliability-based weak points, this data is mostly

considered to be well-suited for this type of comparative analysis (Hartley, Brecht, Pagerly et al. 1977).

Validity involves whether the studies actually measure what they are intended to measure. Here, I will briefly comment on four main types: conceptual validity, internal validity, and external validity. *Conceptual validity* refers to the degree to which the study actually measures what the relevant concepts are intended to measure. In this study, trust is a central concept that is being measured on an interpersonal and group-based level. For measuring generalized trust in the group, an index is used of four questions that seek to capture cognitive and affective dimensions of the concept of trust.⁶⁹ These are based on an instrument developed by Pearce et al, and later adapted and used by Jarvenpaa and Leidner (Jarvenpaa and Leidner 1999; Pearce, Sommers et al. 1992). The following four questions are used, where the informants can indicate agreement or disagreement on a five-point scale.

1. We are usually considerate of one another's feelings
2. The people in my group are friendly
3. I can rely on those with whom I work in my group
4. Overall, I find the people in my group trustworthy

As discussed in a previous chapter (3.5), this type of survey-method can be critiqued for basing itself on the informants' own understanding of what it means "to be trustworthy". The degree to which this actually reflects group-based trust is difficult to say. Nonetheless, the group's general desire to have positive expectations of others is controlled against qualitative data. What is key here are the events and thoughts that come up about cooperating in groups. In this way, the methodical triangulation also becomes important to improve the validity here. Still, this score is used only as an indicator for comparing groups with each other, and not as a complete gauge of generalized trust in the groups.

With regard to *interpersonal trust*, two different indicators are used that seek to capture an affective and a more rational dimension (cognitive):

1. If you were planning to apply for a job similar to the one you have today, but in another company, who would you prefer to discuss this with?
2. Who in your group would you talk to if you needed a professional advice in your daily work?

⁶⁹ This score is only used in article F

The logic behind the first question is that the act of disclosing one's intention to change jobs indicates a certain disloyalty towards a company or group, and this thereby opens up for a situation that can be exploited by the other person. In this way, it involves main components in the concept of trust, like the exposure of one's own vulnerability in a situation characterized by risk. This is an indicator of trust that has also been employed by others (Burt and Knez 1996). The second question is meant to capture relationships involving a more professional trust relation linked to carrying out professional tasks. These cannot capture all aspects of the concept of trust. Here, I also view these as indicators of trust dimensions, not as complete measurements of trust relationships. In the studies, however, these indicator questions were double-checked with subsequent qualitative data. Relationships that emerged as especially strong in the first phase of data collection were followed up with exhaustive qualitative questions.

The internal validity refers to the degree to which a study can support the explanatory mechanisms that are laid out in the analysis. This pertains in particular to studies that attempt to promote explanations that exist behind certain causes, and to a lesser degree to purely exploratory or descriptive studies. Some central mechanisms are emphasized in this material, dealing with the establishment, maintenance, and mediation of trust. What primarily strengthens the validity here is that the findings are replicated within different cases. For example, evidence is found for the trust brokering described here within two different groups. The findings do not preclude the fact that other explanations can be valid, but indicate that a relational trust-building mechanism is actually found in these groups. The same type of replication takes place with regard to studies of media-use and trust within two of the groups.

A condition that can weaken the internal validity of the comparative portion of the study is that one of the cases is somewhat divergent. Gaia is a research group that does not work across national borders, but across three different institutions in Norway. It is also more like a project than a permanent group. These limitations has, however, been taken into consideration in the article where Gaia is included (Article F).

The external validity refers to whether the findings are valid beyond the individual cases. In this field, one of the strengths of these cases is that they are done within organizations and groups within the Norwegian and Nordic business. The cases are in many ways representative of the way distributed groups are described in the literature: they are knowledge workers who work in international corporations, supported by relatively advanced communication technologies ((Sadowski-Rasters, Duysters and Sadowski 2006; Townsend, DeMarie and Hendrickson 1998). As mentioned previously, most studies in this field thus far have been performed through experiments, and often using groups of students. The opportunities for generalizing beyond these cases therefore seems to be fairly reasonable, at least in relation to other studies that are found in this area.

8.6 Summary

This dissertation is based on comparative case studies where the objective has been to better understand trust-related mechanisms within distributed groups. Trust, its development, and communication have been empirically studied through the triangulation of different types of methods: qualitative interviews, quantitative measurements, and social network analysis. The aim of the case studies has been to understand the trust-related processes within the four cases and to attempt to locate general mechanisms across the cases. At first glance, the cases have many similarities, but the studies showed significant variation in modes of cooperation, the building of relationships, and levels of group-based trust. It also has been a goal to try and understand the dynamic linked to the development of trust-bearing relationships and communication within the groups, through a combination of different methodological techniques. In most of the following articles, the cases are studied individually, using all of the above-mentioned techniques. However, in one of the articles (F), all four cases are included in a collective comparative analysis.

9. Main findings and implications

This chapter will lay out key results and findings from the study. These are presented and discussed in their entirety in the subsequent articles; only the summarized results will be presented here. I will present these with reference to the three research questions in the dissertation: establishment, distribution and preservation of trust in distributed workgroups.

The first article (A) of the dissertation, “The development, distribution and maintenance of trust in distributed work groups: A social network approach”, explains how a network perspective can enrich research on cooperation in distributed groups, and particularly studies of trust. Here, three areas are highlighted as being interesting for further research related to the development, distribution, and maintenance of trust. The article is mainly a theoretical piece that demonstrates the usefulness of an especially methodical and analytical approach. In this context, data material from Omega is used to illustrate and demonstrate some of the possibilities in this area (this case is otherwise more thoroughly analyzed in Articles B and D). This article can be read as an introduction to the five articles that follow. The main conclusion – which is also proposed earlier in this introduction – is that a network perspective provides an important advantage to studies in this field. Further use of the network perspective and the possibilities it has to offer can therefore supplement existing research on trust in distributed groups.

9.1 The development of trust

The two following articles draw attention to the trust-building processes within distributed work. Article B; “Building Trust in Networked Environments: Understanding the Importance of Trust Brokers”, the way in which trust building can be strengthened through the existence of one or more “active nodes” within a group is described. The term *trust broker* and *trust brokering* is clarified and elaborated by referencing to two different theoretical traditions: on the one hand, social network analysis that has especially developed the concept of information brokers; and, on the other hand, studies of trust-building as an active process driven by actors’ self-presentation. Trust brokering is thereby described as a process that involves both positional and relational aspects. The article further emphasizes how trust relationships within distributed groups can be developed in both a rational (cognitive) and affective direction. This theoretical framework is then used in order to analyze results from Omega. Social network analyses are performed with regard to the groups’ affective and cognitive trust networks, and the employees’ positionings within these networks are used as the basis for localizing nodes that are especially active in trust-building activities. These persons’ active trust-

building efforts across different locations are thereafter analyzed using qualitative data. The results show first that cognitive and affective trust brokers were relatively simple to localize within this group. Secondly, it is evident that the cognitive trust brokers (i.e. those who established professional relationships across distance) were more numerous than the affective trust brokers. In addition, persons who were central trust-builders along one dimension of trust, were not always so along the other. The study further shows some of the activities initiated by the trust brokers in order to develop trust over distance. What was especially important was one's motivation toward repeated interaction and physical encounters. Being perceived as interested and having good credibility was decisive for whether a person could operate as an affective trust broker.

The following article (C), "Flow, bridges and brokers: Exploring the development of trust relations in a distributed work group", also deals with building trust within distributed work groups. Similar to the previous article, attention is directed at positional aspects of the networks, and how certain people were especially active in establishing trust relations. However, this article studies this using another case as its basis, namely Delta. Also at Delta we find that some employees operated as active trust brokers, but primarily along the cognitive dimension. In relation to article B, however, this piece more deeply analyzes the broker role through distinguishing between three different positional broker roles: "gatekeepers", "representatives" and "consultants". Like at Omega, this study also indicates that those who hold cognitive broker roles do not necessarily also mediate affective trust. On the other hand, affective trust brokers usually also serve as mediators of cognitive trust in both cases. Also at Delta, we find indications of an active effort toward building trust among those who serve as brokers, and thereby also evidence for emphasizing a reflexive understanding of building trust within such groups. A great deal of affective trust was locally anchored here based on participation in earlier projects and events.

9.2 Distribution of trust

As described previously, a network-based understanding of trust, better than most other approaches, can reveal how trust is distributed within a distributed work group. From a network perspective, trust is a characteristic of a relation, but also a large group. Trust can be understood as a cognitive resource that more or less "flows" within a given network of distributed employees. An interesting question is related to where trust is localized in such a network and the connection this has to other relationships. It is especially interesting to try and understand the significance of ICT and face-to-face communication in relation to trust. In the article D, "Trust, friendship and expertise: The use of email, mobile dialogues and SMS to develop and sustain social relations in a distributed work group", attention is directed at how communication media are used to support different relationships

within a distributed work group (Omega). The article first establishes a distinction between interaction-based (face-to-face communication and mediated interaction), subjective relations (trust, friendship, and expertise) and formal relations, based on cognitive network theory. The relationship between the different variables within Omega is then analyzed using qualitative and quantitative network data. The results first show that the use of email, conversations, and SMS in general followed a pattern that was very similar to the formal relations and expertise relations (i.e. cognitive trust).⁷⁰ Professional relationships were then important for the use of the media. Secondly, the results indicate that the structures of affective trust relations are very similar to the structures we find for SMS-communication, friendship and face-to-face communication, while email and mobile telephone conversations are more strongly related to the relationships of professional expertise. Trust relations seemed then to be supported by other types of media than the professional and formal relationships. The interview material provides tentative explanations for why the media follows different patterns in this field. One factor that is emphasized is that email and mobile telephony are often used in sequences where email messages are followed up by conversations and vice-versa. Another important condition is that SMS is often considered to be a form of communication that is more characterized by risk, where the chances for misunderstandings are relatively large. This form of communication requires that a trust-based relationship already exists between the two parties.

The other article in this section (E), “Interpersonal trust and mobile communication: A social network approach”, bases itself on the same theoretical framework as the previous article, where trust is understood as being a “cognitive resource”. This theoretical framework is the starting point for a qualitative and quantitative analysis of trust and communication within Delta. Similar to the studies of Omega described above, we find in this case that the different trust relationships are supported by different types of communication media: while email and mobile communication are most strongly related to cognitive trust (i.e. expertise-based trust), sending text messages is more often utilized within affective trust relations. Cognitive trust flowed rather freely across distances, and was often supported by email and mobile telephone conversations. Affective trust on the other hand was most common within a local area, supported by face-to-face conversations and text messages (as was demonstrated above, however, there were some instances where trust brokering contributed to mediating affective trust over distance barriers). We find in the qualitative data further support for understanding “narrow band media” like SMS as being more risky than email and mobile conversations.

⁷⁰ Note that cognitive trust relations in this article are described as “expertise relations”.

9.3 The maintenance of trust

The last section focuses on how trust can be preserved and reinforced within groups of distributed workers. The article F; “Core/periphery structures and trust in distributed work groups: a comparative study” goes further than the other articles in comparing the cases. The four cases, Omega, Delta, Gaia, and Beta are grouped according to a score of group-based trust. The differences between cases with high and low levels of trust are then analyzed with a main focus directed at the groups’ internal structures of *strong professional ties*.⁷¹ The results indicate several interesting differences between the cases: First, a pronounced core/peripheral structure is evident in the groups with higher levels of group-based trust (Omega and Gaia). In both of these cases, I find strong *integrating cores* that link the different sections of the group together. These cores have somewhat different configurations, but both seem to have an integrating effect, since they link together the different locations involved. In contrast, the groups with lower levels of trust (Delta and Beta) developed “opposing cores” based on the central locations that were involved. This means that the leader of the group was part of several “subgroups” within the networks. Based on the qualitative material, the articles describe some of the mechanisms that were active in developing trust within Omega and Gaia. These include opportunities for immediate coordination, making work tasks visible, along with the moderating of conflicts. In a further perspective, this article indicates that distributed groups can benefit from having a core/periphery structure, since these cores are operative and integrating.

9.4 Contributions to research

The works that are presented in this dissertation address research within several areas, and three will be emphasized here: research on trust in distributed groups; research on the usage of ICT in distributed groups; and research on social networks in distributed communities and work groups. Here, I will briefly comment on how these articles contribute to these areas.

With regard to organizational research on *trust in distributed groups*, such research has been dominated by experiments performed among student groups. Here, the research has been based on rational understandings of trust, where little consideration has been paid to organizational conditions or the active “trust work” that is often performed within the groups. This research has in particular focussed on trust based on immediate impressions, and the idea that a task-based trust (i.e. swift trust) is sufficient for such groups. This research has, however, generally had limited external validity. The

⁷¹ Strong professional bonds are understood to be a combination of high interaction and the presence of important professional discussions between parties.

articles in the first part of the dissertation advocate a new perspective where active trust-building is emphasized. Based on a reflexive understanding of trust in distributed groups, social network analysis is used in order to study the development of cognitive and affective trust in distributed groups. The work combines methods and strategies that are well-established within network studies with concepts and theories used within the field of trust. This combination has not been utilized in previous studies, which makes it possible to gain new insight into and understanding of trust-building mechanisms within such groups. The description of trust as being an active process, propelled by individual trust brokers, does not break with the existing theories, but represents a supplementary theoretical and methodological perspective. The description of “trust brokers” has similarities with other concepts that emphasize the significance of persons who actively operate to develop relationships in networks or connect previously separate social groupings. This pertains to, for example, “facilitators” (McEvily and Zaheer 2004; Pauleen and Yoong 2001), “brokers” (Fernandez and Gould 1994; Gould and Fernandez 1989), and “boundary spanners” (Friedman and Podolny 1982; Tushman 1977; Tushman and Scanlan 1981). Nonetheless, the concept of trust brokers diverges from these concepts in its explicit thematization of interpersonal trust-building, developed based on a reflexive understanding of trust. The likelihood that these types of active trust builders are significant for distributed groups is supported by the results provided in the first part of the dissertation. It is an explicit strength of these studies that they base themselves on empirical studies of actual distributed groups within a Nordic company.

Presently, research aimed at understanding *the use of ICT in distributed groups* within the labor market is performed within several underlying fields of research. However, a weakness of this research lies in the fact that it often examines the effect of technologies individually, without taking into consideration the “mix” of different media that is used in most instances. Another weakness is that it often views media-use as a general characteristic of a group, and not linked to the social relations within the group. The articles in part two of this dissertation attempt to develop an understanding of media-use, where it is viewed as a tool for supporting social relationships. This opens up for a more “fine-grained” understanding of how different types of relationships are initiated, maintained, and/or strengthened using different combinations of technological tools. Bringing trust in as a factor within such relations has hardly ever been previously done. The research that is presented here elaborates and expands upon previous relational studies of media-use in virtual groups, but also goes against certain findings from these studies (see the discussion in Article D). While previous studies have found a positive linear correlation between relational strength and the number of media being used, the two articles presented here indicate that some strong relationships can manage with extremely simple technical tools. In Omega and Delta, SMS was the most important medium for affective trust relationships. In such strong relationships, where trust was already present, one could manage with media that in other relationships would be considered to be too risky and unsafe.

Research that is done on *social networks* contributes to a renewed understanding of structures within distributed and virtual organizations. Previous research in this area has been concerned with the structural formations that emerge in new network-based organization and companies, and what coordination-based structures are most effective. Existing studies have laid out empirical evidence that both supports the significance of more centralized, and more integrated (dense) networks.⁷² Divergent findings have created some confusion with regard to the question of the structural lay out of distributed work groups. Based on the comparative in-depth study in Article F, an alternative perspective is advanced, where core/peripheral structures are considered to be vital for understanding the differences between groups with high and low levels of trust. This inductive and explorative study therefore contributes to a professional discussion around structural networks in virtual groups and organizations.⁷³

Much of the research that has been carried out within social network analysis is quantitative and oriented towards testing of hypotheses. The more inductive and triangulating form that characterize the pieces in this dissertation supplement the research through more thorough descriptions of how networks are established and formed. This is, as previously mentioned, a field where more research and development of theory has been sought after. In this context, I have drawn on works executed within existing network theory, and sought to link these to a reflexive understanding of trust. My contribution in this context is to show the utility of a structural framework in practical and empirical analyses of trust, communication, and media-use in distributed groups.

9.5 Implications for organizations

The articles in this dissertation have implications for organizations that are using distributed work groups, or who plan to do so. First, the articles here, similar to several preceding studies, emphasize the fact that *trust is a decisive factor* for groups that work together over distances, supported by the use of ICT. In some of our cases, we saw how mistrust triumphed over trust. Several managers at Nomo expressed disappointment and surprise over the fact that the distributed groups often became arenas for sustained conflicts. Focus on the dangers of mistrust was generally low, and there was poor preparedness for strengthening trust in the group. The findings in this study point toward the fact that trust must be actively built up in situations where groups must cooperate over geographical and organizational boundaries. If groups are left to their own devices, it is likely that the

⁷² See article F for a closer discussion of these contributions.

⁷³ The fact that a core/periphery structure can have precedence in network organizations has however been displayed in previous theoretical discussions (see Castells 2001, p. 81).

groups enter into a declining spiral of mistrust. The more complex the constellations are, and the greater the cultural barriers, the more actively one must work in this area.

Organizations can choose to draw on several resources if they want to strengthen trust within distributed groups. As was discussed previously in this introduction, trust can be developed based on several “sources”, including general norms within organizations, institutional roles, or based on actors’ rational choice to cooperate with others. All of these conditions can be important platforms from which to establish trust in organizations and distributed groups. Still, an additional important source is the active trust building that takes place on an interpersonal level between actors in the groups, and this dissertation has stressed some of the central mechanisms within such a reflexive perspective. First, this has to do with the existence of *active nodes* which establish relationships across geographical and organizational boundaries. Such actors are important for establishing contact across boundaries, and involve new persons in their social networks. In contrast to Simmel’s descriptions of “*tertius gaudens*” (i.e. the middlemen who harvest personal benefits by standing in a position between to separate actors) trust brokers are concerned with linking separate parts of the network together through bringing in a third partner. In this way, more integrated structures and constellations are developed. Organizations can strategically give somebody the task of operating as trust brokers, or they can indirectly provide support to people who work in this way. A more conscious use of active nodes in trust networks could be combined with other trust-building measures. For example, it could be imagined that a company appoints active trust brokers to such groups, at the same time as it establishes groups with common professional backgrounds and shared understandings of roles.

The other trust-building mechanism that is discussed here is the significance of integrating cores consisting of people who have trust-bearing relationships with each other. Such constellations can seem stabilizing and help the group preserve a certain degree of trust, even if the density of the relations are not generally very high, and the distance between the nodes is great. Organizations and groups can utilize this knowledge in establishing distributed groups. Different strategies can be called to mind here: within the distributed groups, formal core groups can be appointed that have a particular responsibility for integrating different sectors of the distributed network; distributed groups can be composed by participants who already have established trust-bearing relationships; groups can be supported so that denser constellations within previously established distributed groups are formed.

A third main topic in this dissertation is how different *forms of communication are actively utilized* in order to support trust relations in distributed groups. A main finding is that simpler text media such as SMS and email are often important for supporting affective relations, while many cognitive trust relations are supported by conversations and email in combination. Still, face-to-face communication is critical for affective trust, especially during early phases of the development of relationships. Thus, the findings indicate that physical meetings are important during early phases where trust is established; later, technology and channels that allow for informal dialogues to be

maintained alongside the formal meetings will be important. We see that text messages on mobile phone and instant messaging on PCs also fulfill an important function within the realm of work. These forms of communication can be used to establish an informal communication channel that make people “visible” to each other. In this way, they play an important role for maintaining trust in distributed groups, or for reactivating prior trust-bearing relations. This can be actively utilized in organizations that seek to develop technologies that support trust in distributed groups.

9.6 Summary

An important motivation for the work in this dissertation has been what was described in the introduction as “the trust paradox of distributed work”. In its most extreme form, this means that the qualities that distributed groups require, at least theoretically speaking, are simultaneously qualities that are difficult to develop, because such groups per definition imply a great degree of geographical distance between the people involved.

As demonstrated previously, existing research has suggested somewhat different “solutions” to this problem. A main argument has been that such groups are able to manage with simpler forms of trust (swift trust) that are immediately established based on positive expectations and early impressions. However, this study, as well as other studies performed within distributed groups in knowledge-based businesses, suggests that a quick, immediate trust often is insufficient (Pauleen and Yoong 2001). Distributed groups are often established in situations with turbulent organizational relationships where mistrust can easily take root, and therefore it is necessary to have stronger and more trust-bearing relations across distances so that the groups will function satisfactorily.

This dissertation has, using a network-based understanding of distributed groups as a point of departure, shown how trust in some cases took hold within distributed groups, in spite of geographical distance and organizational and cultural boundaries. These studies indicate that an essential element for trust to develop in such contexts is that certain strong interpersonal trust relationships develop across the boundaries. *How* these relations are developed is however not inconsequential, and this dissertation points out two conditions that are particularly important: first, that affective and cognitive relations are developed that connects local groupings; and second, that core constellations are established within groups that can stabilize trust over time. For the persons who act as trust brokers, repeated interactions and face-to-face communication are apparently necessary, at least in the initial stages. The pieces have also demonstrated how communication within groups is significant to the process of supporting cognitive and affective trust, and that this is done using a varied set of communication-technologies. Nevertheless, face-to-face communication is vital especially in the building of affective trust. As described previously, however, it is unnecessary for all of the

participants in a network to have equally strong relationships; what is most important is that there are some trust-bearing relationships that connect central parts of a network.

Many authors have emphasized the opinion that organizations increasingly take the form of social networks with many different ramifications and connection points (Barney 2004; Castells 1996; Miles and Snow 1992). If such a description is correct and different persons within the organization can be developed in an appropriate way, it is important to understand how networks that combine different sections of an organization can be developed. This especially pertains to trust-bearing networks within distributed groups. Still, in such network-based units and departments, it is seldom possible or desirable that everyone has strong relations to everyone else. As Galbraith writes: "Everyone-to-everyone networks in large organizations are neither possible nor desirable. The relationships need to be established at key interfaces" (Galbraith 2006, p. 193).

The articles in this dissertation come with concrete suggestions about how distributed groups can develop their relations in a suitable way, based on empirical studies. These findings should however be regarded as preliminary and should be followed up further by studies of other distributed groups. Still, it is my hope that the concepts and mechanisms that are laid out in the following articles can constructively contribute to a renewed understanding of trust in distributed work groups.

References

- Adler, Paul S, and Charles Heckscher. 2006. "Towards Collaborative Community." Pp. 11-105 in *The Firm as a Collaborative Community*, edited by C Heckscher and P Adler. New York: Oxford University Press.
- Adler, Paul S. 2001. "Market, hierarchy, and trust: The knowledge economy and the future of capitalism." *Organization Science* 12:215-234.
- Ahuja, Maju, and Kathleen M. Carley. 1999. "Network Structure in Virtual Organizations." *Organization Science* 10:741-57.
- Alba, Richard D., and Charles Kadushin. 1976. "The Intersection of Social Circles: A new measure of social proximity in networks." *Sociological Methods and Research*:77-102.
- Allen, Tom. 1977. *Managing the flow of technology*. Cambridge: MIT press.
- Andersen, Svein. 1997. *Case studier og generalisering. Forskningsstrategi og design*. Bergen: Fagbokforlaget.
- Arrow, Holly, Joseph E. McGrath, and Jennifer L. Berdahl. 2000. *Small Groups as Complex Systems: Formation, Coordination, Development, and Adaptation*. Thousand Oaks, CA: Sage.
- Axelrod, Robert. 1984. *The Evolution of Cooperation*. New York: Basic Books.
- Bacharac, Michael, and Diego Gambetta. 2001. "Trust in signs." Pp. 148-184 in *Trust in Society*, edited by K.S. Cook. New York: Russel Sage Foundation.
- Barber, Bernard. 1983. *The Logic and Limits of Trust*. New Brunswick: Rutgers University Press.
- Barney, Darin. 2004. *The Network Society*. Cambridge: Polity.
- Bauman, Zygmunt. 2000. *Liquid Modernity*. London: Polity press.
- Bavelas, Alex. 1950. "Communication patterns in task-oriented groups." *Journal of Acoustical Society of America*:725-730.
- Beck, Ulrich. 1993. *Risk Society. Towards a New Modernity*. London: Sage.
- Bélanger, France. 1999. "Communication Patterns In Distributed Work Groups: A Network Analysis." *IEEE Transactions on Professional Communications* 42:261-275.
- Bell, Bradford S., and Steve W.J. Kozlowski. 2002. "A typology of virtual teams: Implications for effective leadership." *Group and Organization Management* 27.
- Bell, Daniel. 1976. *The Coming of Post-Industrial Society: A Venture in Social Forecasting*. New York: Basic Books.
- Berger, Peter L., and Thomas Luckmann. 1966. *The Social Construction of Reality*. Garden City: Doubleday.
- Bernard, Russel H. 2000. "Social Research Methods: Qualitative and Quantitative Approaches." London: Sage.
- Bernhardt, Russel H., Peter Killworth, and Lee Sailer. 1982. "Informant accuracy in social network data V." *Social Science Research*:30-66.
- Bijker, Wiebe E., and John Law. 1992. "General Introduction." in *Shaping technology/Building Society: Studies in sociotechnical change*, edited by W.E. Bijker and J. Law. Cambridge, MA: MIT press.
- Blau, Peter M. 1964. *Exchange and Power in Social Life*. New York: Wiley.

- Bleskestad, Bente. 1992. "Bruk av prosjekter i norsk næringsliv. Prosjektbegrepet i stillingsannonser 1970-1990." Oslo: Institutt for Sosiologi, Universitetet i Oslo.
- Boissevain, Jeremy. 1974. *Friends of Friends. Networks, Manipulators and Coalitions*. Oxford: Basil Blackwell.
- Borgatti, Stephen, and Martin Everett. 1999. "Models of core/periphery structures." *Social Networks*:375-395.
- Borgatti, Stephen, Martin Everett, and Linton Freeman. 2002. "Ucinet 6 for Windows." Harvard: Analytic Technologies.
- Bradach, Jeffrey L., and Robert G. Eccles. 1989. "Price, Authority, and Trust: From Ideal Types to Plural Forms." *Annual Reviews in Sociology*:97-117.
- Breiger, Ronald. 1974. "The duality of persons and groups." *Social Forces* 53:181-190.
- . 2004. "The Analysis of Social Networks." in *Handbook of Data analysis*, edited by Melissa Hardy and Alan Bryman. London: Sage.
- Brockhoff, Klaus. 1998. *Internationalization of research and development*. New York: Springer.
- Brown, Houghton G., Marshall Scott Poole, and T.L Rogers. 2004. "Interpersonal Traits, Complementarity and Trust in Virtual Collaboration." *Journal of Management of Information Systems* 20:115-137.
- Brown, J.S, and P. Duguid. 2001. "Knowledge and organization: A social-practice perspective." *Organizational Science*:198-213.
- Burt, Ronald. 1992. *Structural holes*. Cambridge: Harvard University Press.
- . 2001. "Structural Holes versus Network Closure as Social Capital." Pp. 31-56 in *Social Capital: Theory and Research*, edited by Nan Lin, Karen S. Cook, and Ronald S. Burt: Aldine de Gruyter.
- . 2005. *Brokerage and Closure. An Introduction to Social Capital*. New York: Oxford University Press.
- Burt, Ronald, and M. Knez. 1996. "Trust and Third-Party Gossip." Pp. 68-89 in *Trust in Organizations. Frontiers of Theory and research*, edited by R M Kramer and T R Tyler. Thousand oaks: Sage.
- Buskens, Vincent. 1998. "The social structure of trust." *Social Networks*:265-289.
- Bø, Inge, and Per Morten Schiefloe. 2007. "Sosiale landskap og sosial kapital. Innføring i nettverkstenkning." Oslo: Universitetsforlaget.
- Carmel, Erran. 1999. *Global software teams: collaborating across borders and time-zones*. Upper Saddle River, NJ: Prentice Hall.
- Carrington, Peter J, John Scott, and Stanley Wasserman (Eds.). 2005. *Models and Methods in Social Network Analysis*. Cambridge, New York: Cambridge University Press.
- Cartwright, David, and Frank Haray. 1956. "Structural balance: A generalization of Heider's theory." *Psychological Review*:277-292.
- Castells, Manuel. 1996. *The rise of the network society; the information age: Economy, society and culture*. Malden MA: Blackwell.
- . 2001. "The Internet Galaxy: Reflections on the Internet, Business and Society." Oxford: Oxford University press.
- Castells, Manuel, M Fernández-Ardévol, J.L Qiu, and A. Sey. 2007. *Mobile Communication and Society. A Global Perspective*. Cambridge MA: The MIT press.

- Chidambaram, Laku, and Robert P. Bostrom. 1996. "Group Development (I): A Review and Synthesis of Development Models." *Group Decision and Negotiation*:159-187.
- Clark, Bruce H., and David B. Montgomery. 1998. "Deterrence, reputation and competitive cognition." *Management Science*:62-82.
- Cohen, David, and Larry Prusak. 2001. *In good company: How social capital makes organizations works*. Boston, MA: Harvard Business School Press.
- Coleman, James. 1988. "Social capital in the creation of human capital." *American Journal of Sociology*:95-120.
- Coleman, James S. 1990. *Foundations of Social Theory*. Cambridge MA: Harvard University Press.
- Cook, John, and Toby Wall. 1980. "New work attitude measures of trust, organizational commitment and personal need non-fulfilment." *Journal of Occupational Psychology* 53:39-52.
- Corman, Steven R., and Craig R. Scott. 1994. "Perceived Networks, Activity Foci and Observable Communication in Social Collectives." *Communication Theory* 4:171-190.
- Cross, Rob, and Andrew Parker. 2004. *The Hidden Power of Social Networks*. Boston, Ma.: Harvard Business School Press.
- Cummings, Jonathon N., and Sara Kiesler. 2005. "Collaborative Research Across Dicipinary and Organizational Boundaries." *Social Studies of Science* 35:703-722.
- . 2007. "Coordination costs and project outcomes in multi-university collaborations." *Research Policy* 36:1620-1634.
- Cummings, Larry L., and Peter Bromiley. 1995. "The organizational trust inventory: OTI." in *Trust in Organizatons*, edited by R. Kramer and T. Tyler. Thousand oaks: Sage.
- Currall, Steven C., and A. C. Inkpen. 2006. "On the complexity of organizational trust: a multi-level co-evolutionary perspective and guidelines for future research." Pp. 235-246 in *Handbook of Trust Research*, edited by R Bachmann and A Zaheer. Cheltenham: Edward Elgar.
- Czarniawska, Barbara. 1997. *Narrating the Organization. Dramas of Institutional Identity*. Chicago and London: The University of Chicago Press.
- Daft, Richard L, and R. H Lengel. 1984. "Information Richness: A New Approach to Managerial Behavior and Organizational Design." Pp. 191-233 in *Research in Organizational Behavior*, edited by L. L. Cummings and B. M. Staw. Homewood: JAI Press.
- Daft, Richard L, Robert H Lengel, and L.K Trevino. 1987. "Message equivocality, media selection, and manager performance: Implications for information systems." *MIS Quarterly* 11:355-366.
- Denstadli, Jon Martin, and Tom E. Julsrud. 2003. "Videokonferanser i næringslivet: Økt bruk, færre reiser?" Oslo: Transportøkonomisk Institutt.
- DeSanctis, Gerardine, and Peter Monge. 1999. "Introduction: Communication processes for virtual organizations." *Organization Science (Special Issue)*:693-703.
- DiMaggio, Paul J., and Walter W. Powell. 1991. "The Iron Cage Revisted: Institutional Isomorphism and Collective Rationality in Organizational Fields." Pp. 63-82 in *The New Institutionalism in organizational analysis*, edited by P.J. DiMaggio and W.W. Powell. Chicago: University of Chicago Press.
- Dirks, Kurt T., and Donald L. Ferrin. 2001. "The role of trust in organizational settings." *Organizational Science* 4:450-467.
- Drucker, Peter. 1994. *Post-capitalist Society*. New York: Harper Collins.
- Duarte, Deborah L., and Nancy Tennant Snyder. 2006. "Mastering Virtual Teams." Josey-Bass.
- Duffy, Francis. 1997. *The New Office*. London: Conran Octopus.

- Eisenhardt, Kathleen M. 1989. "Building Theories from Case Study Research." *Academy of Management Review* 14:532-550.
- Ekbia, Hamid, and Rob Kling. 2005. "Network Organizations: Symmetric Cooperation or Multivalent Negotiation?" *The Information Society*:155-268.
- Elden, Max. 1983. "Democratization and Participative Research in Developing Local Theory." *Journal of Occupational Behaviour* 4:21-33.
- Eurostat. 2007. "Europe in Figures. Eurostat Yearbook 2006-2007." Pp. http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1090,30070682,1090_33076576&_dad=portal&_schema=PORTAL. Brussel.
- Feld, Scott L. 1981. "The Focused Organization of Social Ties." *The American Journal of Sociology* 86:1015-1035.
- Fernandez, Roberto M, and Roger V Gould. 1994. "A dilemma of state power: Brokerage and influence in the national health policy domain." *American Journal of Sociology*:1455-91.
- Ferrin, Donald L., and Kurt T. Dirks. 2003. "The use of rewards to increase and decrease trust: Mediating processes and differential effects." *Organisational Science* 14:18-31.
- Field, John. 2003. *Social Capital*. London.
- Folger, Joseph., and Marshall S. Poole. 1984. "Working through conflicts: A communication perspective." Glenview: Scott Foresmann.
- Forsyth, Donelson R. 2006. *Group Dynamics*: Thomson Wadsworth.
- Freeman, Linton C. 1979. "Centrality in social networks: Conceptual clarification." *Social Networks*:215-39.
- Friedman, Raymond A., and Joel Podolny. 1982. "Differentiation of Boundary Spanning Roles: Labor Negotiations and implications for Role Conflict." *Administrative Science Quarterly* 1:28-47.
- Fukuyama, Francis. 1995. "Trust. The Social Virtues and the Creation of Prosperity." *New York*.
- Gabarro, John J. 1990. "The Development of Working Relationships." Pp. 79-110 in *Intellectual Teamwork. Social and Technological Foundations of Cooperative Work*, edited by Jolene Galegher, Robert Kraut, and Carmen Egido. Hillsdale, New jersey: Lawrence Erlbaum Ass. Publ.
- Gabbay, Shaul M., and Roger T. A. J. Leenders. 2001. "Social Capital of Organizations: From Social Structure to the Management of Corporate Social Capital." Pp. 1-20 in *Social capital of Organizations*, edited by S. M. Gabbay and R. Th. A. J. Leenders. Oxford, UK: Elsevier Science.
- Galbraith, Jay R. 2006. *Mastering the Law of Requisite Variety with Differentiated Networks*. New York: Oxford University Press.
- Gambetta, Diego (Ed.). 1988. *Trust: Making and Breaking Cooperation*. Oxford: Blackwell.
- Garfinkel, Harold. 1963. "A Conception of, and Experiments with, "Trust" as a Condition of Stable Concerted Actions." Pp. 187-238 in *Motivation and Social Interaction. Cognitive Determinants.*, edited by O.J Harvey. New York: The Ronald Press Company.
- . 1967. *Studies in Ethnomethodology*. Englewood Cliffs: Prentice Halls.
- Gaver, William. 1991. "Technology affordances." Pp. 97-84 in *CHI 91*. New Orleans.
- Ghosh, Tanu, JoAnne Yates, and Wanda Orlikowski. 2004. "Using Communication Norms for Coordination: Evidence from a Distributed Team." Pp. 115-128 in *Proceedings of the 25th International Conference on Information Systems (ICIS)*. Washington D.C.
- Giddens, Anthony. 1984. *The Constitution of Society*. Berkley / Los Angeles: University of California Press.

- . 1991. *Modernity and self-identity*. Cambridge: Polity Press.
- . 1994. "Risk, trust, reflexivity." Pp. 184-197 in *Reflexive Modernization*, edited by U. Beck, A. Giddens, and S. Lash. Cambridge UK: Polity Press.
- Glaser, Barney, and Anselm Strauss. 1967. *The Discovery of Grounded Theory: Strategies for qualitative research*. Chicago: Aldine Publishing Company.
- Goffman, Erving. 1959. *The Presentation of Self in Everyday Life*. Garden City, NY: Doubleday, Anchor books.
- . 1963. *Behavior in Public Places: Notes on the Social Organization of Gatherings*. NY: The Free Press.
- . 1967. *Interactional Ritual: Essays on Face-to Face Behaviour*. Garden City, NY: Doubleday, Anchor books.
- . 1971. *Relations in Public: Microstudies of the Public order*. New York: Doubleday, Bantam Books.
- Gould, Roger V., and Roberto M. Fernandez. 1989. "Structures of Mediation: A Formal Approach to Brokerage in Transaction." *Sociological Methodology* 19:89-126.
- Granovetter, Mark S. 1973. "The Strength of Weak Ties." *American Journal of Sociology*:1287-1303.
- Grey, Chris, and Christina Garsten. 2001. "Trust, Control and Post-Bureaucracy." *Organization Studies* 22:229-250.
- Grimen, Harald. 2000. "Luhmann om förtroende (etterord)." Pp. 169-225 in *Förtroende. En mekanism för reduktion av social komplexitet*, edited by Niklas Luhmann. Göteborg: Daidalos.
- Groth, Lars. 1999. *Future Organizational Design. The Scope for the IT-based Enterprise*. New York: John Wiley.
- Handy, Charles. 1995. "Trust and the Virtual Organization. How do you manage people whom you not see?" *Harvard Business Review* 73:40-50.
- Hannemyr, Gisle. 2005. *Hva er Internett*. oslo: Universitetsforlaget.
- Hansen, Morten T., J.M. Podolny, and J. Pfeffer. 2001. "So Many Ties, So Little Time: A Task Contingency Perspective on Corporate Social Capital." *Research in the Sociology of Organizations*:21-57.
- Hardin, Russel. 2006. *Trust*. Cambridge: Polity Press.
- Hartley, Chris, M. Brecht, P. Pagerly, G. Weeks, A. Champanis, and D. Hoecker. 1977. "Subjective time estimates of work tasks by office workers." *Journal of occupational Psychology*:23-36.
- Hartley, Peter. 1993. *Interpersonal communication*. London: Routledge.
- Haythornthwaite, Caroline. 2002. "Strong, Weak, and Latent Ties and the Impact of New Media." *The Information Society* 18:385-401.
- . 2005. "Social Networks and Internet Connectivity Effects." *Information Communication and Society* 8:125-147.
- Heckscher, Charles. 1994. "Defining the Post-Bureaucratic Type." Pp. 14-62 in *The Post-Bureaucratic Organization. New Perspectives on Organizational Change*, edited by C. Heckscher and A. Donnelon. Thousand Oaks, CA: Sage.
- Heider, Fritz. 1958. *The Psychology of Interpersonal Relations*. New York: Wiley.
- Herz, Jc. 2002. "Harvesting the Hive: How online games drive innovation." in *Edventure. Release 1.0*.
- Hildreth, Paul, and Chris Kimble. 2004. *Knowledge Networks: Innovation through Communities of Practice*. Hershey: Idea Group Publishing.

- Hinds, Pamela, and Sara Kiesler. 2002. *Distributed Work*. Cambridge, Massachusetts: MIT press.
- Hinds, Pamela, and Cathleen McGrath. 2006. "Structures that Work: Social Structure, Work Structure and Coordination Ease in Geographically Distributed Teams." in *CSCW'06*. Banff, Alberta, Canada.
- Holland, Paul W., and Samuel Leinhardt. 1977. "Transitivity in structural models of small groups." Pp. 49-66 in *Social networks: A developing paradigm*, edited by S. Leinhardt. New York: Academic Press.
- Homans, George C. 1950. *The Human Group*. New York: Harcourt Brace.
- Huisman, Mark, and Marijtje A. J. van Duijn. 2005. "Software for Social Network Analysis." Pp. 270-316 in *Models and Methods in Social Network Analysis*, edited by Peter J. Carrington, John Scott, and Stanley Wasserman. Cambridge: Cambridge University Press.
- Hutchby, Ian. 2001. *Conversation and Technology*. Cambridge, MA: Polity.
- Ibarra, Herminia, and S.B Andrews. 1993. "Power, social influence, and sensemaking: Effects of network centrality and proximity on employee perception." *Administrative Science Quarterly*:277-303.
- Jackson, Paul, and J.M Van derWilen. 1998. *Teleworking: International Perspectives. From Telecommuting to the Virtual Organisation*. London: Routledge.
- Jarvenpaa, Sirkka L., and Dorothy E. Leidner. 1999. "Communication and Trust in Global Virtual Teams." *Organization Science* 10:791-815.
- Johansen, Svein T, and Marcus Selart. 2006. "Expanding the Role of Trust in Organizational Change." Pp. 258-279 in *New Perspectives on Organizational Change and Learning*, edited by Rune Lines, Inger G. Stensaker, and Ann Langley. Oslo: Fagbokforlaget.
- Jones, Robert, and Robert Oyung. 2005. *Working Virtually: Challenges of Virtual Teams*. Hershey: Cybertech Publ.
- Julsrud, Tom, and Sigmund Akselsen. 2001. "Prosjektbasert samarbeid i norsk arbeidsliv. En komparativ analyse av 12 bransjer." Kjeller: Telenor Research & Development.
- Julsrud, Tom E. 2002. "Arbeidslivets Nomader." Fornebu: Telenor R&D.
- Kanawattanachai, Prasert, and Youngjin Yoo. 2002. "Dynamic nature of trust in virtual teams." *Strategic Information Systems*:187-213.
- Katz, Nancy, David Lazer, Holly Arrow, and Noshir Contractor. 2005. "The Network Perspective on Small Groups." Pp. 277-312 in *Theories of Small Groups*, edited by M. Scott Poole and A B. Hollingshead. Thousand Oaks, California: Sage.
- Katz, Nancy, and David Lazer. 2005. "Building effective intra-organizational networks: the role of teams." Cambridge.
- Kiesler, Sara, and Jonathon N. Cummings. 2002. "What Do We Know about Proximity and Distance in Work Groups? A Legacy of research." Pp. 57-82 in *Distributed Work*, edited by P Hinds and S Kiesler. Cambridge, Mass.: The MIT Press.
- Kilduff, Martin, and Wendip Tsai. 2003. *Social Networks and Organizations*. London: Sage.
- King, John L, and Robert L Frost. 2002. "Managing Distance over Time: The Evolution of Dis/Ambiguiation." Pp. 3-26 in *Distributed Work*, edited by P Hinds and S Kiesler. Massachusetts: MIT press.
- Koku, Emmanuel F., and Barry Wellman. 2002. "Scholarly Networks as Learning Communities: The Case of TechNet." Pp. 299-338 in *Designing Virtual Communities in the Service of Learning*, edited by Sasha Barab and Rob Kling. Cambridge: Cambridge University Press.

- Kollock, Peter. 1994. "The Emergence of Exchange Structures: An Experimental Study of Uncertainty, Commitment, and Trust." *The American Journal of Sociology* 100:313-345.
- Krackhardt, David. 1992. "The strength of strong ties: The importance of philos in organizations." Pp. 216-239 in *Network and Organizations; Structure, Form and Action*, edited by N Nohria and R Eccles. Boston: Harvard University Press.
- . 1999. "The ties that torture: simmelian tie analysis in organizations." *Research in the Sociology of Organizations* 16:183-210.
- Krackhardt, David, and D. Brass. 1994. "Intraorganizational Networks. The Micro Side." Pp. 207-229 in *Advances in Social Network Analysis*, edited by S Wasserman and J Galaskiewicz. Thousand Oaks: Sage.
- Krackhardt, David, and J R Hanson. 1993. "Informal Networks: The Company behind the Chart." *Harvard Business Review* 71:104-111.
- Krackhardt, David, and Martin Kilduff. 2002. "Structure, Culture and Simmelian ties in entrepreneurial firms." *Social Networks* 3:279-290.
- Krackhardt, David, and R N Stern. 1988. "Informal Networks and Organizational Crises: An Experimental Simulation." *Social Psychology Quarterly* 51:123-140.
- Kramer, Roderick M., and Karen S. Cook. 2004. "Trust and Distrust in organizations: Dilemmas and Approaches." Pp. 1-17 in *Trust and Distrust in organizations. Dilemmas and Approaches*, edited by R.M. Kramer and K. S Cook. New York: Russel Sage Foundation.
- Kramer, Roderick M., and Tom R. Tyler. 1996. "Whither Trust." Pp. 1-15 in *Trust in Organizations: Frontiers of Theory and Research*, edited by R.M Kramer and T.R Tyler. Thousand Oaks: Sage Publications.
- Kraut, Robert, S.R Fussel, S.E. Brennan, and J. Siegel. 2002. "Understanding Effects of Proximity on Collaboration: Implications for Technology to Support Remote Collaborative Work." Pp. 137-163 in *Distributed work*, edited by P. Hinds and S. Kiesler. Cambridge: MIT press.
- Lafferty, William. 1984. "Workplace Democratization in Norway: Current Status and Future Prospects with Special Emphasis on the Role of the Public Sector." *Acta Sociologica*, 27:123-138.
- Lane, Christel. 1998. "Introduction: Theories and Issues in the Study of Trust." Pp. 1-30 in *Trust Within and Between Organizations*, edited by C. Lane and R. Bachmann. Oxford: Oxford University Press.
- Lau, Dora C., and Jack K. Murnighan. 1998. "Demographic diversity and faultlines: The compositional dynamics of organizational groups." *Academy of Management Review*:325-340.
- Lawler, Edward J., and Jeongkoo Yoon. 1996. "Commitment in exchange relations: Test of a theory of relational cohesion." *American Sociological Review* 61:89-108.
- Leaman, Adrian, and Iain Borden. 1993. "The Responsible Workplace: user expectations." Pp. 16-32 in *The responsible workplace. The redesign of work and offices*, edited by F. Duffy, A. Laing, and V. Crisp. Oxford: Butterworth Architecture, Estates Gazette.
- Lencioni, Patrick M. 2002. *The Five Dysfunctions of a Team*. London: Jossey-Bass.
- Lewicki, Roy L., and Barbara B. Bunker. 1996. "Developing and Maintaining Trust in Work Relationships." Pp. 114-139 in *Trust in Organizations. Frontiers of Theory and research*, edited by R. Kramer and T. Tyler. Thousand Oaks: Sage.
- Licoppe, Christian, and Zbigniew Smoreda. 2004. "Are social networks technologically embedded? How networks are changing today with changes in communication technology." *Social Networks*:317-335.
- Lin, Nan. 1999. "Building a Network Theory of Social Capital." *Connections* 22:28-51.

- Ling, Richard. 2004. *The Mobile Connection. The cell phone's impact on society*. San Fransisco: Elsevier, Morgan Kaufmann.
- Lipnack, Jessica, and Jeffrey Stamps. 2000. *Virtual Teams. People Working Across Boundaries with Technology*. New York: John Wiley.
- Lorraine, Francois, and Harrison C. White. 1971. "Structural Equivalence of Individuals in Social Networks." *Journal of Mathematical Sociology*:49-80.
- Luhmann, Niklas. 1979. *Trust and Power*. New York: Wiley.
- . 1988. "Familiarity, confidence, trust: Problems and alternatives." Pp. 94-107 in *Trust: Making and Breaking Co-operative Relations*, edited by D. Gambetta. Oxford: Basil Blackwell.
- . 2006. *Förtroende. En mekanism för reduktion av sosial komplexitet*. Göteborg: Daidalos.
- Lundin, Rolf A., and Christophe Midler. 1998. "Evolution of project as empirical trend and theoretical focus." Pp. 1-11 in *Projects as arenas for renewal and learning processes*, edited by Rolf A. Lundin and C. Midler. Norwell, MA: Kluwer Academic Publishers.
- Lysgaard, Sverre. 1967. *Arbeiderkollektivet. En studie i de underordnedes sosiologi*. Oslo: Universitetsforlaget.
- Malone, Thomas W. 2004. *The Future of Work: How the New Order of Business Will Shape Your Organization, Your Management Style and Your Life*. Harvard: Harvard Business School Press.
- Mangham, Iain L., and Michael.A Overington. 1987. *Organizations as Theatre: A Social Psychology of Dramatic Appearances*. Chichester: John Wiley & Sons.
- Marchington, Mick, D Grimshaw, J Rubery, and H Willmott (Eds.). 2005. *Fragmenting Work. Blurring Organizational Boundaries and Disordering Hierarchies*. Oxford: Oxford University Press.
- Marquardt, Michael J., and Lisa Horvath. 2001. *Global Teams*. Palo Alto, CA: Davis-Black Publ.
- Marsden, Peter V. 1982. "Brokerage Behavior in Restricted Exchange Networks." Pp. 201-218 in *Social Structure and Network Analysis*, edited by Peter V. Marsden and Nan Lin. Beverly Hills: Sage.
- Martin, Joanne. 2002. *Organizational Culture. Mapping the Terrain*. Thousand Oaks, CA: Sage.
- Mayer, Roger C., J.H Davis, and F.D Schoorman. 1995. "An integrated model of organizational trust." *Academy of Management Review* 3:709-734.
- Mayo, Elton. 1945. *The human problems of industrial civilization*. Cambridge MA: Harvard University Press.
- Maznevski, Martha L., and Katherine M. Chudoba. 2000. "Bridging Space Over Time:Global Virtual Team Dynamics and Effectiveness." *Organizational Science* 11:473-492.
- McAllister, Daniel J. 1995. "Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations." *Academy of Management Journal* 1:24-59.
- McEvily, B., V. Perrone, and A. Zaheer. 2003. "Trust as an organizing Principle." *Organization Science* 1:91-103.
- McEvily, Bill, Roberto A. Weber, Cristina Bicchieri, and Violet T. Ho. 2006. "Can groups be trusted? An experimental study of trust in collective entities." Pp. 52-67 in *Handbook of trust Research*, edited by R Bachmann and A Zaheer. Cheltenham: Edward Elgar.
- McEvily, Bill, and A. Zaheer. 2004. "Architects of Trust: The Role of Network Facilitators in Geographical Clusters." Pp. 189-213 in *Trust and Distrust in Organizations. Dilemmas and Approaches*, edited by R.M. Kramer and K. S Cook. New york: Russel Sage Foundation.

- McKnight, D. Harrison, L L Cummings, and N L Chervany. 1995. "Trust formations in new organizational relationships." in *Information and Decision Sciences Workshop*. University of Minnesota.
- McPhee, Robert, and Steven R. Corman. 1995. "An activity-based theory of communication networks in organizations, applied to the case of a local church." *Communication Monographs* 62:132-151.
- McPherson, M, L Smith-Lovin, and J M Cook. 2001. "Birds of a Feather. Homophily in social networks." *Annual Review of Sociology*:415-444.
- Mehra, Ajay, Martin Kilduff, and Daniel J. Bass. 2001. "The social networks of high and low self-monitors: implications for workplace performance." *Administrative Science Quarterly*:121-146.
- Melsingset, Sigrun Lossius. 2007. "Nordmenn mest tillitsfulle." in *Aftenposten*, 27th of October. Oslo.
- Merton, Robert K. 1968. *Social Theory and Social Structure*. New York: Free Press.
- Meyerson, Debra, Karl Weick, and Roderick Kramer. 1996. "Swift Trust and Temporary Groups." Pp. 166-195 in *Trust in Organizations. Frontiers of Research and Theory*, edited by R Kramer and R Tyler. Thousand Oaks, CA: Sage.
- Miles, Matthew B., and A. M. Huberman. 1994. *Qualitative Data Analysis: an expanded sourcebook*. Thousand Oaks: Sage.
- Miles, Raymond E., and Charles C. Snow. 1992. "Causes of Failure in Network Organizations." *California Management Review*:53-72.
- Mokken, Robert J. 1979. "Cliques, clubs and clans." *Quantity and Quality* 13:161-173.
- Monge, Peter R., and Noshir S. Contractor. 2003. *Theories of Communication Networks*. New York: Oxford University Press.
- Moon, Jae Yun, and Lee Sproull. 2002. "Essence of Distributed Work: The Case of the Linux Kernel." Pp. 381-404 in *Distributed Work*. Cambridge MA: The MIT Press.
- Munkvold, Bjørn E. 2003. "Collaboration Technology: Overview and Current Trends." Pp. 7-27 in *Implementing Collaboration Technologies in Industry*, edited by Bjørn E. Munkvold. Springer.
- Möllering, Guido. 2006a. "Trust, institutions, agency: towards a neoinstitutional theory of trust." Pp. 355-376 in *Handbook of Trust Research*, edited by R. Bachmann and A. Zaheer. Cheltenham: Edward Elgar.
- . 2006b. *Trust: Reason, Routine, Reflexivity*. Amsterdam: Elsevier.
- Nardi, Bonnie, S Whittaker, and H Schwarz. 2000. "It's Not What You Know, It's Who You Know: Work in the Information Age." *First Monday* 5:http://firstmonday.org/issues/issue5_5/nardi/index.html.
- Nesheim, Torstein. 2006. "Grenseløse bedrifter." Pp. 76-90 in *Arbeidsliv i omstilling*, edited by P Heum, T Nesheim, O Nordhaug, and K G Salvanes. Bergen: Fagbokforlaget.
- Nesheim, Torstein, and Karen M Olsen. 2006. "Nye grenser i arbeidslivet." Pp. 35-53 in *Arbeidsliv i omstilling*, edited by P Heum, T Nesheim, O Nordhaug, and K G Salvanes. Bergen: Fagbokforlaget.
- Nissenbaum, Helen. 2004. "Will Security Enhance Trust Online, Or Supplant It?" Pp. 155-185 in *Trust and distrust in organizations. Dilemmas and approaches*, edited by R. M. Kramer and K. S. Cook. New York: Russel Sage Foundation.
- Nohria, Nitin, and James D. Berkley. 1994. "The Virtual Organization. Bureaucracy, Technology, and the Implosion of Control." Pp. 108-128 in *The Post Bureaucratic Organization.*, edited by C. Heckscher and A. Donnellon. Thousand Oaks, CA: Sage.

- Norman, Donald. 1998. *The Design of Everyday Things*. London: MIT press.
- O'Leary, Michael, Wanda Orlikowski, and JoAnne Yates. 2002. "Distributed work over the Centuries.Trust and Control in the Hudson bay Company." Pp. 27-54 in *Distributed Work*, edited by P Hinds and S Kiesler. Cambridge, Mass.: MIT Press.
- O'Leary, Micael Boyer, and Jonathon N. Cummings. 2007. "The Spatial, Temporal, and Configural Characteristics of Geographic Dispersion in Teams." *MIS Quarterly* 31:433-452.
- Orlikowski, Wanda. 2001. "Improvising Organizational Transformation Over Time: A Situated Change Perspective." Pp. 223-274 in *Information Technology and Organizational Transformation. History, Rethoric, and Practice*, edited by J Yates and J Van Maanen. Thousand Oaks, Ca: Sage.
- . 2002. "Knowing in Practice: Enacting Collective Capability on Distributed Organizing." *Organizational science* 13:249-273.
- Panteli, Niki, and Elizabeth Duncan. 2004. "Trust and temporary virtual teams: alternative explanations and dramaturgical relationships." *Information Technology and People* 17:423-442.
- Pauleen, Davis J, and Pak Yoong. 2001. "Relation building and the use of ICT in boundary-crossing virtual teams: a facilitators perspective." *Journal of Information Technology* 16:205-220.
- Pearce, WB, S M Sommers, A Morris, and M Frideger. 1992. "A configural approach to interpersonal relations: Profiles of workplace relations and task interdependence." Irvine, CA: Graduate School of Management, University of California.
- Piccoli, Gabriele, and Blake Ives. 2003. "Trust and the Unintended Effects of Behavior Control in Virtual Teams." *MIS Quarterly* 27:365-395.
- Podolny, Joel, and J Baron. 1997. "Resources and relationships, social networks and mobility in the workplace." *American Sociological Review*:673-693.
- Polzer, Jeffrey T., C. Brad Crisp, Sirkka L. Jarvenpaa, and Jerry W. Kim. 2006. "Extending the faultline model to geographically dispersed teams: how colocated subgroups can impair functioning." *Academy of Management Journal* 49:679-692.
- Poole, Marshall Scott. 1999. "Organizational Challenges for the New Forms." Pp. 453-471 in *Shaping Organizational Form. Communication, Connection, and Community*, edited by Gerardine DeSanctis and Janet Fulk. Thousand Oaks, CA: Sage.
- PTT. 2007. "Statistikk, første halvår 2007." in *Nøkkeltall*. Oslo: Norwegian Post and Telecommunications Authorities.
- Putnam, Robert. 2000. *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon Schuster.
- Quan-Haase, Anabel, and Barry Wellman. 2006. "Hyperconnected Net Work: Computer-Mediated Community in a High-Tech Organization." Pp. 281-333 in *The Firm as a Collaborative Community. Reconstructing Trust in the Knowledge Economy*, edited by C Hekscher and P Adler. New York: Oxford University Press.
- Ragin, Charles A. 1994. *Constructing Social Research*. Thousand Oaks, CA: Sage.
- Rice, Ronald E. 1990. "Computer-mediated communication system network data: theoretical concerns and empirical examples." *International Journal of Man-Machine Studies*:627-647.
- Rogers, Everett, and Frederic Schoemaker. 1971. *Communications of Innovations*. New York: Free Press.
- Rogers, Everett M., and D. Lawrence Kincaid. 1981. *Communication Networks. Toward a new paradigm for research*. New york: The Free Press.

- Rotter, Julian B. 1967. "A new scale for the measurement of interpersonal trust." *Journal of Personality* 35:651-665.
- Rousseau, Denise M., S.B. Sitkin, R.S. Burt, and C. Camerer. 1998. "Not So Different After All: A Cross-Disipline View of Trust." *Academy of Management Journal* 3:393-404.
- Sadowski-Rasters, Gaby, Geert Duysters, and Bert M. Sadowski. 2006. *Communication and Cooperation in the Virtual Workplace*. Cheltenham: Edward Elgar.
- Sarker, Suprateek, and Sundeep Sahay. 2004. "Implications of space and time for distributed work: an interpretive study of US-Norwegian system development teams." *European Journal of Information Systems*:3-20.
- Schütz, Alfred. 1967. *The Phenomenology of the Social World*. Evanston: North-Western University Press.
- Scott, John. 2000. *Social Network Analysis: A handbook*. Thousand Oaks CA.: Sage.
- (Ed.). 2006. *Sociology. The Key Concepts*. London: Routledge.
- Sellen, Abigail J., and Richard H.R. Harper. 2002. *The myth of the paperless office*. Cambridge, MA: The MIT press.
- Sennett, Richard. 1998. *The Corrosion of Character. The Personal Consequences of Work in the New Capitalism*. London: W.W. Norton & Company.
- Shapiro, Debra, Blair H. Sheppard, and Lisa Cheraskin. 1992. "Business on a handshake." *Negotiation Journal* 8:365-377.
- Shaw, Marvin. 1964. "Communication networks." Pp. 111-147 in *Advances in Experimental Social Psychology*, edited by L. Berkowitz. New York: Academic Press.
- Short, John A., Ederyn Williams, and Bruce Christie. 1976. *The social psychology of the telecommunications*. London: Wiley.
- Silverstone, Roger, and Leslie Haddon. 1996. "Design and domestication of information and communication technologies: Technical change and everyday life." in *Communication by Design: The Politics of Information and Communication Technologies*, edited by R. Silverstone and R. Mansell. Oxford: Oxford University Press.
- Sparrowe, Raymond, R Liden, S Waynes, and M Kraimer. 2001. "Social networks and the performance of individuals and groups." *Academy of Management Journal* 44:316-325.
- SSB. 2007. "Bruk av informasjons- og kommunikasjonsteknologi (IKT) i næringslivet." edited by Statistisk Sentralbyrå. Oslo, Norge.
- Strauss, Anselm, and Juliet Corbin. 1990. *Basics of Qualitative Research*. Newbury Park, CA: Sage.
- Sydow, Jörg. 2006. "How can system trust systems? A structuration perspective on trust-building in inter-organizational relations." Pp. 377-392 in *Handbook of Trust Research*, edited by R. Bachmann and A. Zaheer. Cheltenham, UK: Edward Elgar.
- Thomas, Domininc, and Robert Bostrom. 2005. "Virtual Team Leader as Technology Facilitator: The Missing Role." in *The Southern Association for Information Systems Conference (SAIS)*. Georgia, US.
- Tichy, Noel, and Charles Fombrun. 1979. "Network Analysis in Organizational Settings." *Human Relations* 32:923-965.
- Tilly, Charles. 2005. *Trust and Rule*. Cambridge: Cambridge University Press.
- Townsend, Anthony M., Samuel M. DeMarie, and Anthony R. Hendrickson. 1998. "Virtual teams: Technology and the workplace of the future." *Academy of Management Executive* 12:17-29.
- Tushman, Michael L. 1977. "Special Boundary Roles in the Innovation Process." *Administrative Science Quarterly* 22:587-605.

- Tushman, Michael L., and Thomas J. Scanlan. 1981. "Characteristics and External Orientation of Boundary Spanning Individuals." *The Academy of Management Journal* 24:83-98.
- Walsh, John P., and Nancy G. Maloney. 2002. "Computer Network Use, Collaboration Structures, and Productivity." Pp. 433-455 in *Distributed Work*, edited by P. Hinds and A. Kiesler. Cambridge MA: The MIT Press.
- Walther, Joseph B. 2002. "Time Effects in Computer-Mediated Groups: Past, Present, and Future." Pp. 235-253 in *Distributed Work*, edited by Pamela Hinds and Sara Kiesler. Massachusetts: MIT press.
- Wasserman, Stanley, and Katherine Faust. 1994. *Social Network Analysis. Methods and Applications*. Cambridge: Cambridge University Press.
- Wasserman, Stanley, and Garry Robins. 2005. "An introduction to Random graphs, Dependency graphs, and p*." Pp. 148-160 in *Models and Methods in Social Network Analysis*, edited by Peter J. Carrington, John Scott, and Stanley Wasserman. Cambridge: Cambridge University press.
- Weisband, Suzanne. 2002. "Maintaining Awareness in Distributed Team Collaboration: Implications for Leadership and Performance." Pp. 311-333 in *Distributed Work*, edited by P. Hinds and S. Kiesler. Cambridge MA: The MIT Press.
- Wellman, Barry. 1988. "Structural analysis: from method and metaphor to theory and substance." Pp. 19-61 in *Social Structures: a network approach*, edited by B Wellman and S.D. Berkowitz. New York: Cambridge University Press.
- . 2001a. "Computer Networks As Social Networks." *Science* 293:2031-34.
- . 2001b. "Physical Place and Cyberplace: The Rise of Personalized Networking." *International Journal of Urban and Regional Research* 25:227-252.
- . 2002. "Little Boxes, Glocalization, and Networked Individualism?" Pp. 10-25 in *Digital Cities II: Computational and Sociological Approaches*, edited by Makoto Tanabe, Peter van den Besselaar, and Toru Ishida. Berlin: Springer.
- Wellman, Barry, Anabel Quan-Haase, Jeffrey Boase, Whenhong Chen, Keith Hampton, Isabel Isla de Diaz, and Kakuko Miyata. 2003. "The Social Affordances of the Internet for Networked Individualism." *Journal of Computer Mediated Communication* 8:<http://jcmc.indiana.edu/vol8/issue3/wellman.html>.
- Wellman, Barry, and S. Wortley. 1990. "Different Strokes from Different Folks: Community Ties and Social Support." *American Journal of Sociology*:558-88.
- Wenger, Clare. 1991. "A Network Typology: From Theory to Practice." *Journal of Aging Studies* 5:147-162.
- Wenger, Etienne. 1998. *Communities of Praxis. Learning, Meaning and Identity*. Cambridge: Cambridge University Press.
- . 2000. "Communities of Practice and Social Learning Systems." *Organization* 7 (2):225-246.
- White, Harrison C., S.A. Boorman, and R. Breiger. 1976. "Social structure from multiple networks.I. Blockmodels of roles and positions." *American Journal of Sociology*:730-779.
- Wiesenfeld, Batia, Sumita Raghuram, and Raghu Garud. 1989. "Communication Patterns as Determinants of Organizational Identification in a Virtual Organization." *Journal of Computer Mediated Communication* 3:<http://jcmc.indiana.edu/index.html>.
- Wilson, Jeanne M., Susan G. Straus, and Bill McEvily. 2006. "All in due time: The development of trust in computer-mediated and face-toface teams." *Organizational Behavior and Human Decision Processes*:16-33.

- Winner, Langdon. 1993. "Upon Opening the Black Box and Finding it Empty: Social Constructivism and the Philosophy of Technology." *Science Technology & Human Values* 18:362-378.
- Wolff, Kurt H. (Ed.). 1950. *The Sociology of Georg Simmel*. New York: The Free Press.
- Wong, Loong. 2008. "Trust in E-Commerce: Risk and trust Building." Pp. 176-193 in *Computer-Mediated Relationships and Trust*, edited by L.L. Brennan and V.E. Johnson. Hershey: IGI Global.
- Woolcock, Michael. 2001. "The Place of Social Capital in Understanding Social and Economic Outcomes." *Isuma: Canadian Journal of Policy Research* 2:1-17.
- Yin, Robert. 2003. *Case Study Research. Design and Methods*. Thousand Oaks: Sage.
- Yoo, Youngjin, and Maryam Alavi. 2005. "Electronic Mail usage Patterns of Emergent Leaders in Distributed Teams." *Sprouts: Working papers of Information Environments, Systems and organizations* 2:140-159.
- Zaheer, Srilata, and Akbar Zaheer. 2006. "Trust across borders." *Journal of International Business Studies*:21-29.
- Zand, Dale E. 1997. *The Leadership Trial. Knowledge, Trust, and Power*. Oxford: Oxford University Press.
- Zolin, Roxanne, P. J. Hinds, R. Fruchter, and R.E. Levitt. 2004. "Interpersonal Trust in Cross-Functional Global Teams. A longitudinal Study." *Information and Organization* 1:1-26.
- Zolin, Roxanne, and Pamela Hinds. 2004. "Trust in Context: The Development of Interpersonal Trust in Geographically Dispersed Work." Pp. 214-238 in *Trust and Distrust in Organizations. Dilemmas and Approaches*, edited by Roderick M. Kramer and Karen S. Cook. New York: Russel Sage Foundation.
- Zucker, Lynne G. 1977. "The role of institutionalization in cultural persistence." *American Sociological Review* 42:726-743.
- . 1986. "Production of Trust. Institutional sources of economic structure, 1840-1920." Pp. 53-111 in *Research in Organizational Behavior*, edited by B.M. Staw and L.L. Cummings. Greenwich: JAI press.

First paper (A)

The development, distribution and maintenance of trust in distributed workgroups: a social network approach

Tom Erik Julsrud^a and Per Morten Schiefloe^b

^a Telenor Research & Innovation, N-1331 Fornebu, Norway

^b Norwegian University of Science and Technology, N-7491 Trondheim, Norway

Abstract: An increasing number of teams and groups have members who are distributed at multiple sites, often working in different departments or organisations, sometimes also in different countries. Although separated in space, such units must collaborate and deliver results and value to their organisations. It is now generally acknowledged that trust is a core asset for such groups, as it can help to reduce conflicts and enhance knowledgesharing and efficiency. This article argues that a network approach can be useful for developing a deeper understanding of trust in such groups. The network approach is particularly useful in providing an understanding of the development, distribution and maintenance of trust across organisational, geographical and cultural boundaries. These aspects are described and illustrated in a case study of a distributed work group in an international telecommunications company.

Keywords: distributed work; virtual teams; trust; small groups; social networks; trust networks.

Reference: Julsrud, T.E. and Schiefloe, P.M. (2007) 'The development, distribution and maintenance of trust in distributed work groups: a social network approach', *Int. J. Networking and Virtual Organisations*, Vol. 4, No. 4, pp.351–368.

1. Introduction: trust and collaboration in distributed settings

In contemporary organizations it is increasingly necessary for individuals to manage collaboration over distance. For knowledge based companies operating in an international context, there is a particular need to interconnect knowledge while being situated in different physical environments, both in ad-hoc based teams and in more permanent work groups (Adler and Heckscher 2006; Brown and Duguid 2001; Castells 1996; Knoke 2001). Compared to moving individuals, or even whole departments, the establishment of *distributed work groups* appears as an efficient, flexible and inexpensive solution. Distributed work groups can be established almost overnight, and by the exploitation of cheap and simple communications technologies like telephone meetings, e-mails and Instant Messaging (IM) such groups can start their work almost immediately. If necessary more sophisticated systems for collaboration can be included, such as video-conferencing systems, computer based collaboration systems or virtual meeting rooms. Advocates of virtual work have argued that the current rise of global terrorism and global infectious diseases like SARS will make distributed work even more common during the next years and it will soon be the standard way of working in global organizations, rather than the exception (Gignac 2005; Jones and Oyung 2005). Rising travelling costs is another important argument for the establishment of distributed work groups.

However, collaboration in distributed work groups is not without problems: Cumulative research has documented that the risk of communication breakdown and low performance is higher for distributed work groups than for co-located activities (Cummings and Kiesler 2005; Kiesler and Cummings 2002). It is often difficult to get individuals situated at different locations to work together with a high degree of commitment.

Recently several researchers have found that *trust* is an important factor for stabilizing such groups, and also for enhancing efficient work forms (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002; Piccoli and Ives 2003; Wilson, Straus and McEvily 2006; Zolin and Hinds 2004). In general trust can be described as “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another” (Rousseau, Sitkin, Burt et al. 1998). The need for trust usually emerges in situations where it is necessary to take some kind of risk (Luhmann 1979), and in distributed work risk levels tend to escalate due to reduced opportunities for direct observation and control. Common problems like coordination failures or “free riding” (social loafing) tend to be more difficult to discover due to the lack of visibility, and there is an increased risk that collective work assignments are not solved properly, and for rising costs and delays. Trust within the distributed group is believed to be a necessary factor for coping with these and other challenges typical for distributed work.

During the last decade empirical studies of trust in organizations and groups have accumulated, and there is solid evidence that trust has positive effects on the collaboration and the sharing of knowledge (Dirks and Ferrin 2001). Despite the wide consensus on the positive outcomes of trust for knowledge building and performance, there are different views of what the *sources* of trust are in distributed groups: It has been argued that trust depends on the timing and temporality of interaction within the group (Maznevski and Chudoba 2000; Zolin, Hinds, Fruchter et al. 2004), as well as on the managerial style (Panteli 2005; Piccoli and Ives 2003) and the individuals' psychological dispositions (Brown, Poole and Rogers 2004). Little attention has so far been directed towards what we may call the structural aspects of trust, i.e. the patterns of trusting relations within the group. This paper argues that analysing the internal relational structures of distributed work groups is a promising approach to understanding trust in distributed groups, as it draws attention to the particular *constellation of trust-based relations* within the group. Compared to other approaches it has the advantage of providing a more fine-grained understanding of internal relational dynamics within a group. In this article we will point at three aspects where a network approach in particular has a potential to contribute; the initial establishment of trust, the distribution of various trust forms within a group, and the maintenance of trust over time. We will explain these options further by referring to a recent case study of a distributed work group, and suggest how these dimensions can be explored in future research.

The article starts (chapter 2) with a brief overview of how small work groups can be analyzed as social networks, drawing on previous studies of small-group networks, and of how trust can be studied as structural networks. Central concepts and terms related to the network approach are outlined, and some important types of trust are discussed. In the next section (chapter 3) we will present a recent case of distributed workers (Omega) involving a group of technical developers in a Nordic ICT company. The development, distribution and maintenance of trust networks are then discussed with reference to this case (chapter 4). Finally (chapter 5), we will discuss how these issues may be further investigated, and potential implications for organizations implementing distributed work.

2. Structural perspectives on distributed work and trust

Social network analysis is a theoretical and methodological approach that has its roots in anthropology, sociology and social psychology. A common feature of social network studies is a focus on social structures constituted by a set of social relations connecting actors. This stands out in contrast to traditional social science approaches, which for the most part are occupied with studying individuals' attributes or ideas (Breiger 2004; Scott 2000). In contrast to other structurally oriented

paradigms in the social sciences, the network approach sees social structure in a bottom-up fashion, generated by patterned networks of interpersonal relations (Wellman 1988). A particular advantage with network analysis is that it is able to capture the dynamics in the interplay between individuals and the social structures they are part of. Methods for analysing network structure have been growing rapidly in the last decades, and multiple techniques for analysing all kinds of network patterns are available through software packages like UCInet, Pajek, DataMiner, etc. (Huisman and Duijn 2005).

As an object for social network research *work groups* are at the same time old and new: On the one hand, small-group networks have been studied thoroughly by early social psychological scholars like Bavelas, Leavitt and Shaw (Bavelas 1950; Leavitt 1951; Shaw 1964). These researchers conducted several laboratory experiments where the main interest was in finding the most efficient structure for small groups related to different tasks. On the other hand, even though the network approach to small group studies has been limited since these early trials, there are signs of a renewed interest for applying network studies of small groups (Kadushin 2005; Katz, Lazer, Arrow et al. 2005; Sparrowe, Liden, Waynes et al. 2001).

The new interest for network studies of small groups is reflected in a growing interest for applying social network approaches in studies of *distributed* groups, and what is often termed virtual teams. Network approaches for studies of distributed work have been applied to understand, among other things, coordination structures and mediated communication patterns (Ahuja and Carley 1999; Bélanger 1999; Cummings and Cross 2003; Haythornthwaite 2001; Hinds and McGrath 2006; Koku and Wellman 2002). A central issue driving these studies has, on the one hand, been to investigate how distributed work groups differ from co-located groups, and on the other hand, what kind of structures are most efficient for coordinating work in distributed settings. So far, however, little attention has been given to the more affective ties within distributed groups, such as trust, friendship and perceived closeness⁷⁴. Most current research is also based on comparing larger numbers of teams, rather than focusing on the complexity of ties within single cases.

When studying networks in such settings, three aspects stand out as central; 1) The structural pattern of relations, which, at least in theory, may be illustrated as network maps; 2) the qualitative aspects of relations, such as strength or intimacy; and 3) the transactional content of relations, i.e. what kinds of activities are taking place between the participants.

⁷⁴ An exception is found in the recent work of Hinds and McGrath (2006), who also include “closeness” in their study of 33 distributed R&D teams.

2.1 Trust in networks

Within the field of social network studies, trust is approached in two ways; as a relational quality of a dyad and as an outcome of a particular network structure. First, seen as a *dyadic quality*, trust is basically a positive mental attitude towards specific others in a situation containing uncertainty and risk. In network literature other terms than trust are however frequently applied to capture the quality of a trusting relationship: Granovetter introduced the term *strong ties* to denote relations that have a combination of long duration, high emotional intensity, intimacy and reciprocity (Granovetter 1973). The duality of strong and weak ties has dominated much later network research, although with emphasis on the value of weaker ties for individuals as well as for organizations and groups. Krackhardt has applied the term *philos* to describe a particular type of strong ties which are found in organizations, resulting from high levels of interaction, affection and time (Krackhardt 1992). Others have used generic terms like “friendship” to denote a trustful tie or a strong tie in an organization (Lin and Ensel 1989). Trusting ties have been proved to be important for transferring tacit knowledge in organizations (Hansen 1999) and organizations characterized by strong and trusting ties have been shown to be better able to cope with rapid changes than those characterized by weaker ties (Krackhardt and Stern 1988).

The other main approach to trust in network studies is to see trust as a *product* of larger and interconnected networks of ties, creating what is known as network closure. Drawing on balance theories, Coleman’s discussions on social capital suggest that closed network structures are crucial for the development of social norms and stability within a group (Coleman 1988; Heider 1958). The rationale behind the closure argument is that a dense network structure increases the possibilities for exchange of information, overview and control. It is easier to trust someone if this person is a friend of your own best friend, or if you know that this person depends on having a good reputation in the community that you both belong to (Burt and Knez 1996; Buskens 1998).

The two approaches to trust, focusing on dyadic ties and/or on larger network structures, should be seen as complimentary and not opposing ideas. Trustful relations are embedded in larger networks of ties, which can facilitate or weaken dyadic trustfulness. Most important, however, the network approach suggests how trust in small groups might be transmitted from an individual level to larger and denser trust structures. Involving a third person can help to strengthen the trust in a dyadic relation, but at the same time it helps to move trust up on a higher level (Coleman 1988).

2.2 Types of interpersonal trust

In this paper we will approach trust both as a dyadic and as a structural phenomenon. Relying on the definition of trust given above as based on “positive expectations of the intentions or behaviour of another” we will, however, disconnect this from other indicators such as interaction frequencies or duration. We will apply indicators of trust which try to capture these positive expectations. It is important to bear in mind that trusting ties are not equivalent to “strong ties”: Strong ties are usually also trusting ties, but trust may also be an attribute of weaker ties.

Trust denotes a quality of a relation, but it may also be conceived as a “flow” within the relational structures of a (distributed) group. The advantage of this approach, compared to the conventional strong tie approach, is that it is more directly focussed on measuring trust, and therefore also more in line with how most researchers look at interpersonal trust (Bachmann and Zaheer 2006; McEvily, Perrone and Zaheer 2003). Further, it opens for the possibility of comparing and exploring the trust flow with other interaction based relationships.⁷⁵

There are different types of interpersonal trust discussed in the literature. One important distinction is drawn between cognitive and affective foundations of trust (Lewis and Weigert 1985; McAllister 1995). Cognitive trust refers to the calculative and rational characteristics demonstrated by the trustee, including reliability, integrity and competence. This type of trust is often based on various attributes such as professional roles (doctors, engineers, professors). Affective trust, on the other hand, is based on emotional elements and social skills of trustees, involving emotional bonds between individuals. The boundaries between cognitive and affective trust forms are usually not clear cut, and the two terms are usually considered as dimensions of interpersonal trust (Rousseau, Sitkin et al. 1998). Also, the balance between these dimensions is not fixed, but tends to change as relationships develop over time (Lewicki and Bunker 1996).

Approaching interpersonal trust as attributes of networks, we will here consider affective and cognitive trust as two slightly different types of “flow” in a network of social relations. These flows can, however, to a certain degree be described and analysed as separate relations and networks. In a work group, the cognitive trust networks comprise relations based recognition of formal and job-related qualifications, such as knowledge and expertise. Affective networks, on the other hand, are comprised of employees tied to each other by emotional bonds. In a specific work group cognitive and affective networks can overlap, to a smaller or larger degree.

⁷⁵ Tichy and Formbrun (1979) distinguish between four central types of flow in organizational social networks: exchange of goods; affect and liking; information and ideas, and; influence and power (Tichy and Formbrun 1979).

3. Case and methodology

We will in this section demonstrate how social network analysis can be used as a strategy to explore and analyse trust in distributed groups further, covering both the cognitive and the emotional dimensions. As illustrations we will rely on a case of distributed workers operating in a highly networked Nordic ICT company.

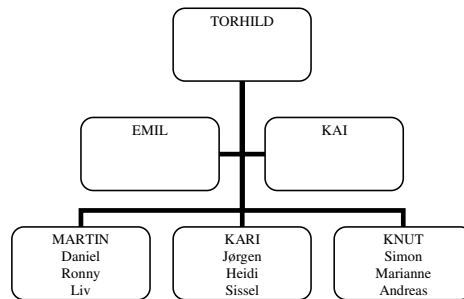
3.1 About Omega

NOMO⁷⁶ is a Norwegian ICT provider with a fairly strong position in the Nordic markets. Approximately one year prior to our study, the company acquired and merged with a smaller Danish company to get an even stronger position in the Scandinavian market. A major objective for the company after the acquisition was to integrate its operations across the national markets to create market synergies. This led to the setting up of a number of permanent work groups encompassing employees in different locations in Norway and Denmark. Since different functions now had to be coordinated across distances and national boundaries, distributed work was initiated and formalized in several different areas. The analysis in this paper will focus on one such group; Omega.

The core task of Omega was to manage and develop products for a particular segment of NOMO's customers. The group consisted of 16 product managers; 12 in Norway and four in Denmark, with the manager located at the headquarters in Norway. Virtually all respondents had previous employment within the respective organizations, and most of them made deliberate efforts to maintain relations with previous colleagues. The work in the group evolved around development projects that ran across different groups similar to Omega, but the Omega group was supposed to be the "professional home" for the employees, according to the manager. Within the group three professionals were responsible for sub-units within the groups, reporting to the leader of the group, Torhild. In addition, Torhild had two independent professionals responsible for separate fields of expertise. This simple formal structure is indicated in figure 1. Yet, despite this typical hierarchical structure the work was conducted in a highly informal way, with much informal interaction and immediate coordination between the members in the groups. The three sub-units indicated areas of expertise, rather than restricted fields of responsibilities. Thus, Omega had a structure more similar to an ad-hocracy than a bureaucratic hierarchy (Mintzberg 1981).

⁷⁶ Note that all names of companies, groups and individuals are pseudonyms.

Figure 1 Omega's formal structure



The work was divided between two main workplaces; one at the NOMO headquarters in Norway and one at the Danish department. At both sites, the employees had a mobile work style, where open offices were used in combination with portable PCs and mobile phones. The work form implied that some of the employees had relatively frequent interaction face-to-face, while others met only when the group had their meetings.

3.2 Data gathering

The group was investigated by a combination of qualitative and quantitative data. The study started with an explorative qualitative study and was followed up by a quantitative study targeted at more specific issues evolving out of the explorative phase. Yet, in the initial phase a general questionnaire was distributed to get baseline information about satisfaction, performance and interaction patterns. In this article we will mainly use the group-based network data, supported by data from the qualitative interviews.

The network data was gathered through retrospective reports of the frequency of communication during one week after working as a distributed group for a period of 12 months. An e-mail questionnaire was used to capture the individual relational data. Before the distributed group was established, no ties existed across the two national units.

Table 1 Network indicators used in the network analysis

Relation	Indicator
Cognitive trust	Whom in your group would you talk to if you needed a professional advice in your daily work?
Affective trust	If you were planning to apply for a job similar to the one you have today, but in another company; whom would you prefer to discuss this with?
Interaction	Whom in your group have you contacted during the last seven days, and how often? (daily, weekly, monthly)
Formal	Formal relational structure as indicated by organizational chart

The data was coded as regular 1-mode social network data in socio-matrices for valued data. All network data were analysed with UCINET software and NetDraw (Borgatti, Everett and Freeman 2002).⁷⁷

Different kinds of relations were analysed in the network study. We will here focus on three central relational aspects; cognitive trust, affective trust, interaction and formal relations. The indicators used to identify these relations are described in table 1. The affective trust indicator was based on an indirect question of preferred partner to discuss a potential job shift. This hypothetical situation involved exposure of individual vulnerability as it would reveal information that could possibly be harmful to the trustee (if he or she does not get the job). The cognitive indicator was based on whom the trustee would turn to if in need of professional advice. As a supplement, we will here use indicators of daily interaction through different kinds of media and face-to-face interaction, as well as representation of the formal network structure (based on the organizational chart). We emphasize that the questions used are only indicative for the two kinds of trust relations, and not measuring them thoroughly. Note also that the indicator on interaction does not distinguish between face-to-face meetings and communication or cooperation through mediated channels.

3.3 General network measures

We will use a limited number of measures to describe the networks and network positions: *Indegree centrality* indicates the number of incoming lines for each node in a directional node-by-node network (Freeman 1979; Wasserman and Faust 1994b). As such it is a widely used measure of node centrality. The indegree of a node n_i in an ordered set of nodes is then the number of arcs that terminate at n_i . *Centralization* is used as a measure of the general level of centralization in a graph

⁷⁷ Closer description of social network measures and techniques can be found in Wassemann and Faust (1994).

based on the in- and outgoing ties. The centralization is indicated as the degree of inequality or variance in the network as a percentage of that of a perfect star network of the same size (Hanneman 2001). Another central structural indicator is network *density*, measured as the number of actual connections as a proportion of the maximal possible connections, going from 0 to 1. For a directed graph the density is calculated as the number of arcs (L) divided by the possible number of arcs. *Cliques* is a widely used concept used to denote sub-units within a larger network that are highly interconnected. In directed networks, cliques are usually found by focussing on those ties that are reciprocated, and we will here use the Bron and Kerbosch (1973) algorithm to find all cliques larger than three (as is the default option in UCINET). We will here use the existence of cliques to indicate denser sub-units within the trust networks.

In order to describe the network structure of a distributed work group, there is a particular need to map relations that cross geographical boundaries. For this purpose the *E-I Index*, as developed by Krackhardt and Stern, is helpful (Krackhardt and Stern 1988). This indicator compares the number of external ties with the number of internal ties for groups within a network, ranging from -1 to +1. Given a partition of a network into a number of mutually exclusive groups, the E-I index is the number of ties external to the groups minus the number of ties that are internal to the group divided by the total number of ties. Maximum collaboration across the boundaries is then +1 (all links are external), while equally divided links will give an index equal to zero.

4. Analysing trust in distributed networks

Trust networks consist of individuals that have trustful relations to one another, and the structure of these relations are not necessarily overviewed or reflected upon by the participants themselves. Even so – or perhaps just for this reason – they are important as indicators of where the “flows of trust” go, and how they develop over time. We will here point at how this approach can provide a deeper understanding of three central processes; 1) development of trust, 2) variations in the distribution of trust; and 3) maintenance of trust.

4.1 Development of trust

The establishment of trust has been much discussed, and several earlier studies have found that cognitive trust forms (i.e. swift trust) can be established surprisingly quickly in distributed settings, despite a lack of common history (Jarvenpaa and Leidner 1999; Mayer, Davis and Schoorman 1995). A network approach to trust considers this as embedded in particular relations, consisting of

more or less trustful ties. The central issue is how trust starts to flow within a distributed network, where there is few trustful ties before the collaboration starts up. A role-oriented analysis of trust networks can help illuminate which individuals in the distributed group that are active in forging cognitive and affective trustful ties, especially in the early stages of collaboration. This perspective draws attention to the roles of individuals in building trust through simple relational structures. As such it may supplement existing studies with a closer understanding of the individual “trust builders” within a group.

Indicators of node centrality, like Freeman’s Degree, are but one analytical tool that can be used to track the most active nodes in a trust network. As can easily be seen from the Omega network, Martin was the person most of the other members tended to trust in the affective network (Indegree = 3), while Kai was the most central person in the cognitive network with 11 InDegrees (see table 2).

In Omega, however, several nodes had strikingly different positions in the two trust networks. Comparing indegree centrality indicates that one of the “independent” sub-unit managers (Kai) was the most attractive node in the interaction network and also in the cognitive trust network. This person was however not included in the affective trust network. In this network Martin, Marianne, Emil and Torhild are the only ones with “indegrees” above two. The divergent centrality in these networks opens for a question of whether we may find different trust builders in each of the trust networks. Even though it has been documented that two trust forms are closely related (McAllister 1995), it is possible to imagine that individuals have qualities that make them more or less trustworthy along these two dimensions.

Analysis of roles in networks is one of the best developed areas within social network analysis through elaborations of the structural equivalence techniques (Knoke and Kuklinksi 1982; Lorraine and White 1971; Wasserman and Faust 1994a). Such approaches may be applied to further explore roles in a distributed trust-network. For the purpose of this article it is sufficient to emphasize the usefulness of locating trust nodes in distributed groups, as these nodes may act like trust generators in the network. Still, we would stress that in distributed groups it is of particular interest to locate individuals that “connect” between dispersed units, since they may enhance the flow of trust within the larger group. In network terms individuals with roles that connect or mediate between two (or more) units, are usually described as *brokers*. In general information brokerages occur when the contact between two nodes in a triad (A, C) depends on a third node (B). When A, B, and C belong to two different groups, different kinds of brokerage across boundaries are possible, including “gatekeepers”, “representatives” and “consultants” (Fernandez and Gould 1994).

	C-trust		A-trust		Interaction	
	Indegree	Outdegree	Indegree	Outdegree	Indegree	Outdegree
Kai	11.00	2.00	0.00	0.00	7.00	0.00
Torhild	10.00	4.00	2.00	0.00	5.00	4.00
Martin	5.00	6.00	3.00	0.00	5.00	4.00
Knut	6.00	4.00	0.00	0.00	1.00	6.00
Kari	5.00	5.00	0.00	2.00	4.00	8.00
Marianne	3.00	3.00	2.00	2.00	1.00	1.00
Ronny	1.00	10.00	0.00	1.00	0.00	1.00
Daniel	3.00	2.00	1.00	0.00	2.00	2.00
Jørgen	2.00	4.00	0.00	0.00	0.00	1.00
Andreas	2.00	5.00	0.00	0.00	0.00	1.00
Emil	2.00	4.00	2.00	2.00	5.00	0.00
Erika	4.00	5.00	0.00	3.00	3.00	9.00
Heidi	2.00	4.00	1.00	1.00	2.00	0.00
Sissel	4.00	6.00	1.00	0.00	3.00	3.00
Simon	2.00	3.00	1.00	2.00	0.00	2.00
Liv	0.00	3.00	0.00	0.00	4.00	3.00
MEAN	4.125	4.125	0.813	0.813	2.813	2.813
SD	2.943	1.900	0.950	1.014	1.975	2.721

Table 2. Degree centrality for affective trust (A-trust), cognitive trust (C-trust) and daily interaction

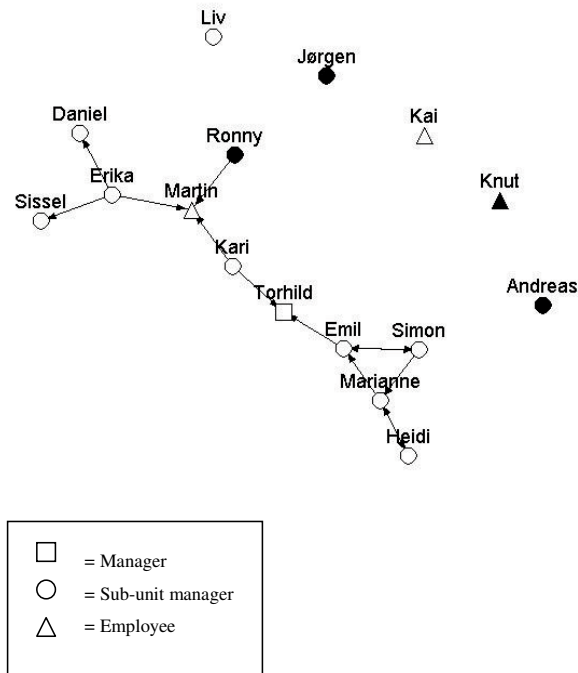
In trust networks these roles may take on a slightly different meaning as the content is not information per se, but perceived emotional closeness towards others. Still the idea of brokerage might be a useful term to understand the role of individuals that may transmit trust across dispersed units in a group (Julsrud and Bakke 2007). In Omega, Martin was most central, but also the only one that had an affective trust relation across the national boundaries (see figure 2). As such, he was the only person who acted like a “trust broker” in this distributed network.

4.2 Variation in the distribution of trust

Trust is rarely equally distributed in groups, and a network approach is useful for detecting, visualizing and analyzing variations in the flow of trust. Although existing studies have recognized that trust tends to be more easily distributed in local settings (Kiesler and Cummings 2002), there has been few attempts to study systematically the distribution of different forms of trust. First, however, we should recognize that *density* of trusting ties represents a general indicator of the general trustfulness within a group, ranging from 0 (no trusting relations) to 1 (all nodes trust each other). As an indicator of interpersonal trust in a group, density of trust ties is based on actual ties, rather than “general feelings” of trustfulness towards others in the group. The significantly higher density of cognitive trust in Omega indicated that the cognitive trust is easier to foster in distributed work settings than is affective trust (see table 3).

Other aspects of the trust networks, such as *network centralization*, give additional information of important network structures. Not surprisingly cognitive trust has a much more centralized structure than affective trust, compared to general interaction. Clearly, then, there is a limited number of experts that are trusted, while the general interaction has a less centralised structure. The low E-I index indicates that the cognitive trust network also is more boundary crossing than the highly local, affective trust network. The affective trust tended to flow within the local units where the face-to-face interaction is high, while the cognitive trust flow is less constrained by these boundaries. The network approach opens for systematic comparison of similarities and differences between trust flows and the circulation of other kinds of resources and interactions. Alignment with functional and task oriented networks is here one particularly important aspect: If none of the trust networks aligns with task related networks, this might indicate a structural divergence that could be critical for further collaboration within the group.

Figure 2. The affective trust network in Omega (White node = informant at the Norway headquarter; black node = Informant at the Danish headquarter)



One way to test associations between networks is by QAP correlations or regressions.⁷⁸ For Omega it was clear that the cognitive trust was significantly associated with the formal network structure, while this was not the case for the affective trust network. This network was however closely related to the interaction network. This indicates that for Omega the affective trust flow followed less predictable patterns than the cognitive form, and was more closely related to the daily interaction

⁷⁸ UCINETs QAP correlation procedure is based on permutation of rows and columns together with one of the input matrices, and then correlating the permuted matrix with the other matrix. This is repeated hundreds of times to build up a distribution of correlations under the null hypothesis of no relationships between the matrices. A low p-value (< .05) suggests a strong relationship unlikely to have occurred by chance (Borgatti and Everett 2002)

Table 3 Selected structural network indicators for Omega

Relation	Scale	Ties	Density	Centralization (InDegree)	E-I Index	Cliques (No)
Interaction	Daily	74	0.188	29.778	-0.568	10
A-trust	Yes/no	22	0.054	15.556	-0.818	1
C-trust	Yes/no	98	0.282	48.889	-0.250	22

Table 4 QAP correlations for Omega

	Formal	C-trust	A-Trust
C-trust	0.316**		
A-trust	0.068	0.113*	
Interaction	0.339**	0.346**	0.115*

Note: * $p < 0.05$ ** $p < 0.01$. [Jaccard coefficients are applied here since this involves binary data]

4.3 Maintenance of trust

Single relations of trust can develop into larger network structures when third parties are included in the relationships. As noted above, inclusion of third persons in dyads is often an important element in building trust on a wider scale, and thus stabilizing trust within a social group (Coleman 1988). As such, interpersonal trust develops in to denser structures of trust that might help to stabilize the group. Denser sub-units of trust within a group, such as cliques, clans or cores are indicators of constellations that are more established network constellations than dyadic ties. Triads and cliques are usually considered as more stable than dyadic ties, but also as important containers of culture and identity (Erickson 1988; Kilduff and Corley 2000; Krackhardt and Kilduff 2002). Such sub-units may represent important constellations for development of meaning and attitudes, as well as culture and social identities.

Still, trust cliques are not necessarily positive for distributed groups: if there are local cliques that are weakly connected to the other parts of the group, they may be arenas where expressions of distrust towards others in the group is strengthened (Burt and Knez 1996). The ideal situation is probably boundary-crossing cliques, i.e. cliques involving partners from several of the participating

sites, where trustfulness can be cultivated across the dividing lines between two or more distributed partners.

In Omega there were one affective trust clique involving Marianne, Simon and Emil, all located in the Norwegian part of NOMO. These three employees represented an important trust-unit in the distributed group, based on earlier collaborations and commitments. Relating this trust clique to central parts of the Danish units could be one important step towards a stronger, boundary crossing trust unit in Omega. On the other hand, the connection from Martin to Ronny could be stabilized by involving a third person closer (Kari or Erika), and thus expanding into a denser boundary crossing clique.

5. Opening up the black box of distributed work

Studies of trust in distributed groups have usually focussed on detecting factors that may help to explain how distributed groups might succeed, or not. Distributed work groups are typically treated as a black box, where trust figures as a general output factor, explained by other factors (e.g. managerial style, interaction pattern, use of ICT), or as a general input factor used to explain particular outcomes of a distributed group (e.g. efficiency, knowledge sharing). Analysing trust in this way tends to neglect the relational side of trust; as a quality embedded in particular interpersonal relations. The promise of the network approach is to “open the black box” and explore the structural patterns within a distributed work group (Haythornthwaite 2002). This study has intended to give a first description of how analyses of trust networks can enrich our understanding of the dynamic nature of trust within a distributed group.

5.1 Implications

The central theme developed in this article is that a social network approach to trust can supplement existing approaches in the research field of distributed work, accentuating the structural dimension of trust. Analysis of internal trust network suggests new ways to understand development, distribution and maintenance of trust within highly distributed groups. As such, this approach supplement and pursues existing research in the field. Regarding the *establishment of trust* in distributed groups, it has been found that trust often is developed quickly despite little common history and little time together (Jarvenpaa and Leidner 1999; Mayer, Davis and Schoorman 1995; Zolin and

Hinds 2004). The network approach gives new insight into this question by emphasizing the role individuals may have in building trust within and across geographic locations. In particular existence of trust brokers are recognized as crucial for developing trust in dispersed groups.

When it comes to the *distribution of trust* a network approach can give new and important insights as to how different types of trust follow different patterns. While earlier studies have found that cognitive trust (i.e. swift trust) is more easily established in distributed and temporary groups (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002), a network approach can analyse in details how cognitive and affective trust interrelates. This field should be further explored in later studies, in combination with role oriented approaches indicating positions in different networks. Further studies of trust flows in distributed groups can also bring new insight into how trust flows align with mediated interaction, face-to-face interaction and the flow of knowledge, ideas and information.

Finally, in distributed work groups cohesive subunits indicate fields where trust is particularly strong and durable. Such units represent important resources that can be used to *maintain trust* within a group, in particular if these denser sub units include individuals from different local units. Existence of such constellations may also shed light on, and perhaps helps to explain, why trust in distributed groups sometimes remain surprisingly stable over time despite little interaction (Zolin, Hinds et al. 2004).

5.2 Limitations

Some areas have been rather superficially treated in this contribution: The analytical focus has been on the internally oriented networks of interpersonal trust, and as such we have not taken fully into consideration the importance of trust as situated in norms, routine and culture; aspects that have been much emphasized in neo-institutional organizational theories (Powell 1996; Zucker 1977). Such factors are of course still important in the development and establishment of trust in groups. Still, there are studies indicating that interpersonal ties and networks are getting increasingly important in new “post-bureaucracies” and in highly distributed workplaces (Grey and Garsten 2001; Hedin 2001).

We should also note that this study has deliberately focussed on the internal relations within a group. A broader and more comprehensive analysis should include also the flow of trust that goes beyond the single group, and the weaker relational constructs. In general, further efforts should be made to relate trust as structural networks closer to pre-existing structure-oriented perspectives on groups and organizations (Barley 1990; Katz and Lazer 2005; Kilduff and Tsai 2003; Monge and Eisenberg 1987). The empirical study supporting the argumentation in this paper is based on relations measured after one year of collaboration within a single case, applying relatively simple network

measures and concepts. A stronger methodological design would involve repeated studies of interaction and trust over time to capture more of the structural changes, and also the inclusion of several cases. We should also note that a more comprehensive approach might have included not only trusting ties but also negative ties (i.e. distrust). These issues we leave for later work taking up the thread laid out here.

6. Conclusions

Trust represents one particular important asset for distributed work groups, affecting the groups' general performance, as well as the ability to handle knowledge sharing and knowledge development. A social network approach draws attention to the way trust flows through particular relations within a group. As we have argued here trust relations can have different "colours", either as expertise based cognitive trust, or as affective based relationships. Analysing the flow of trust in combination with other types of transactional content is helpful to further understand how trust is developed, distributed and sustained within distributed groups. Compared to existing analysis of trust in distributed groups, the network approach accentuates structure rather than timing, interaction patterns or individual attributes. As such it represents an important supplement to existing theories and a novel and exciting field to applying social network techniques and concepts.

References

- Adler, Paul S, and Charles Heckscher. 2006. "Towards Collaborative Community." Pp. 11-105 in *The Firm as a Collaborative Community*, edited by C Heckscher and P Adler. New York: Oxford University Press.
- Ahuja, Maju, and Kathleen M. Carley. 1999. "Network Structure in Virtual Organizations." *Organization Science* 10:741-57.
- Bachmann, R, and A Zaheer. 2006. "Introduction." Pp. 1-12 in *Handbook of Trust Research*, edited by R Bachmann and A Zaheer. Cheltenham: Edward Elgar.
- Barley, S.R. 1990. "The alignment of technology and structure through roles and networks." *Administrative Science Quarterly*:61-103.
- Bavelas, Alex. 1950. "Communication patterns in task-oriented groups." *Journal of Acoustical Society of America*:725-730.
- Bélangier, France. 1999. "Communication Patterns In Distributed Work Groups: A Network Analysis." *IEEE Transactions on Professional Communications* 42:261-275.
- Borgatti, Stephen, Martin Everett, and Linton Freeman. 2002. "Ucinet 6 for Windows." Harvard: Analytic Technologies.
- Breiger, Ronald. 2004. "The Analysis of Social Networks." in *Handbook of Data analysis*, edited by Melissa Hardy and Alan Bryman. London: Sage.
- Brown, Houghton G., Marshall Scott Poole, and T.L Rogers. 2004. "Interpersonal Traits, Complementarity and Trust in Virtual Collaboration." *Journal of Management of Information Systems* 20:115-137.
- Brown, J.S, and P. Duguid. 2001. "Knowledge and organization: A social-practice perspective." *Organizational Science*:198-213.
- Burt, Ronald, and M. Knez. 1996. "Trust and Third-Party Gossip." Pp. 68-89 in *Trust in Organizations. Frontiers of Theory and research*, edited by R M kramer and T R Tyler. Thousand oaks: Sage.
- Buskens, Vincent. 1998. "The social structure of trust." *Social Networks*:265-289.
- Castells, Manuel. 1996. *The rise of the network society; the information age: Economy, society and culture*. Malden MA: Blackwell.
- Coleman, James. 1988. "Social capital in the creation of human capital." *American Journal of Sociology*:95-120.
- Cummings, Jonathon N., and Rob Cross. 2003. "Structural properties of work groups and their consequences for performance." *Social Networks*:197-210.
- Cummings, Jonathon N., and Sara Kiesler. 2005. "Collaborative Research Across Dicipinary and Organizational Boundaries." *Social Studies of Science* 35:703-722.
- Dirks, Kurt T., and Donald L. Ferrin. 2001. "The role of trust in organizational settings." *Organizational Science* 4:450-467.
- Erickson, Bonnie. 1988. "The relational basis of attitudes." Pp. 99-121 in *Social Structures. A Network Approach*, edited by B. Wellman and S D. Berkowitz. Cambridge: Cambridge University Press.

- Fernandez, Roberto M, and Roger V Gould. 1994. "A dilemma of state power: Brokerage and influence in the national health policy domain." *American Journal of Sociology*:1455-91.
- Freeman, Linton C. 1979. "Centrality in social networks: Conceptual clarification." *Social Networks*:215-39.
- Gignac, Francine. 2005. *Building Successful Virtual Teams*. Norwood: Artec House.
- Granovetter, Mark S. 1973. "The Strength of Weak Ties." *American Journal of Sociology*:1287-1303.
- Grey, Chris, and Christina Garsten. 2001. "Trust, Control and Post-Bureaucracy." *Organization Studies* 22:229-250.
- Hanneman, Robert. 2001. "Introduction to Social Network Methods." Dep. Of Sociology. University of California, Riverside.
- Hansen, Morten. 1999. "The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits." *Administrative Science Quarterly*:82-111.
- Haythornthwaite, Caroline. 2001. "Exploring Multiplexity: Social Network Structures in a Computer-Supported Distance learning Class." *The Information Society*:211-226.
- . 2002. "Strong, Weak, and Latent Ties and the Impact of New Media." *The Information Society* 18:385-401.
- Hedin, Astrid. 2001. "The Politics of Social Networks." in *Lund Political Studies*. Lund.
- Heider, Fritz. 1958. *The Psychology of Interpersonal Relations*. New York: Wiley.
- Hinds, Pamela, and Cathleen McGrath. 2006. "Structures that Work: Social Structure, Work Structure and Coordination Ease in Geographically Distributed Teams." in *CSCW'06*. Banff, Alberta, Canada.
- Huisman, Mark, and Marijtje A. J. van Duijn. 2005. "Software for Social Network Analysis." Pp. 270-316 in *Models and Methods in Social Network Analysis*, edited by Peter J. Carrington, John Scott, and Stanley Wasserman. Cambridge: Cambridge University Press.
- Jarvenpaa, Sirkka L., and Dorothy E. Leidner. 1999. "Communication and Trust in Global Virtual Teams." *Organization Science* 10:791-815.
- Jones, Robert, and Robert Oyung. 2005. *Working Virtually: Challenges of Virtual Teams*. Hershey: Cybertech Publ.
- Julsrud, Tom E., and John W. Bakke. 2007. "Building Trust in Networked Environments: Understanding the Importance of Trust Brokers." Pp. 117-138 in *Computer-mediated Relationships and Trust: Organizational and Managerial Effects*, edited by Linda Brennan and Victoria Johnson. Hershey PA: Idea Group Publ.
- Kadushin, C. 2005. "Networks and Small Groups." *Structure and Dynamics:eJournal of Anthropology and Related Science* 1.
- Kanawattanachai, Prasert, and Youngjin Yoo. 2002. "Dynamic nature of trust in virtual teams." *Strategic Information Systems*:187-213.
- Katz, Nancet, David Lazer, Holly Arrow, and Noshir Contractor. 2005. "The Network Perspective on Small Groups." Pp. 277-312 in *Theories of Small Groups*, edited by M. Scott Poole and A B. Hollingshead. Thousand Oaks, California: Sage.
- Katz, Nancy, and David Lazer. 2005. "Building effective intra-organizational networks: the role of teams." Cambridge.
- Kiesler, Sara, and Jonathon N. Cummings. 2002. "What Do We Know about Proximity and Distance in Work Groups? A Legacy of research." Pp. 57-82 in *Distributed Work*, edited by P Hinds and S Kiesler. Cambridge, Mass.: The MIT Press.

- Kilduff, Martin, and Kevin G. Corley. 2000. "Organizational Culture From a Network Perspective." Pp. 211-221 in *Handbook of Organizational Culture and Climate*, edited by N Ashkanasy, C P M Wilderom, and M F Peterson. New York: Sage.
- Kilduff, Martin, and Wendip Tsai. 2003. *Social Networks and Organizations*. London: Sage.
- Knoke, David. 2001. *Changing Organizations. Business Networks in the New political Economy*: Westview Press.
- Knoke, David, and James H Kuklinksi. 1982. *Network Analysis*. London: Sage.
- Koku, Emmanuel F., and Barry Wellman. 2002. "Scholarly Networks as Learning Communities: The Case of TechNet." Pp. 299-338 in *Designing Virtual Communities in the Service of Learning*, edited by Sasha Barab and Rob Kling. Cambridge: Cambridge University Press.
- Krackhardt, David. 1992. "The strength of strong ties: The importance of philo in organizations." Pp. 216-239 in *Network and Organizations; Structure, Form and Action*, edited by N Nohria and R Eccles. Boston: Harvard University Press.
- Krackhardt, David, and Martin Kilduff. 2002. "Structure, Culture and Simmelian ties in entrepreneurial firms." *Social Networks* 3:279-290.
- Krackhardt, David, and R N Stern. 1988. "Informal Networks and Organizational Crises: An Experimental Simulation." *Social Psychology Quarterly* 51:123-140.
- Leavitt, H.J. 1951. "Some effects of certain communication patterns on group performance." *Journal of Abnormal and Social Psychology*:38-50.
- Lewicki, Roy L., and Barbara B. Bunker. 1996. "Developing and Maintaining Trust in Work Relationships." Pp. 114-139 in *Trust in Organizations. Frontiers of Theory and research*, edited by R. Kramer and T. Tyler. Thousand Oaks: Sage.
- Lewis, J.D., and A. Weigert. 1985. "Trust as a social reality." *Social Forces* 63:967-985.
- Lin, Nan, and W.M. Ensel. 1989. "Life stress and health: Stressors and resources." *American Sociological Review*:382-399.
- Lorraine, Francois, and Harrison C. White. 1971. "Structural Equivalence of Individuals in Social Networks." *Journal of Mathematical Sociology*:49-80.
- Luhmann, Niklas. 1979. *Trust and Power*. New York: Wiley.
- Mayer, Roger C., J.H Davis, and F.D Schoorman. 1995. "An integrated model of organizational trust." *Academy of Management Review* 3:709-734.
- Maznevski, Martha L., and Katherine M. Chudoba. 2000. "Bridging Space Over Time: Global Virtual Team Dynamics and Effectiveness." *Organizational Science* 11:473-492.
- McAllister, Daniel J. 1995. "Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations." *Academy of Management Journal* 1:24-59.
- McEvily, Bill, V. Perrone, and A. Zaheer. 2003. "Trust as an organizing Principle." *Organization Science* 1:91-103.
- Mintzberg, Henry. 1981. *Structure in Fives: Designing Effective Organizations*: Englewood Cliffs, Prentice Hall.
- Monge, P.R., and E.M. Eisenberg. 1987. "Emergent communication networks." Pp. 304-342 in *Handbook of organizational communication. An interdisciplinary perspective*, edited by F. M. Jablin, L.L. Putnam, K.H. Roberts, and L.W. Porter. Newbury Park, CA: Sage.
- Panteli, Niki. 2005. "Trust in Global Virtual Teams." in *Ariadne*. www.ariadne.ac.uk/issue43/panteli/: University of Bath, UK.
- Piccoli, Gabriele, and Blake Ives. 2003. "Trust and the Unintended Effects of Behavior Control in Virtual Teams." *MIS Quarterly* 27:365-395.

- Powell, Walter. 1996. "Trust-based Forms of Governance." Pp. 51-67 in *Trust in Organizations. Frontiers of Theory and research*, edited by R. Kramer and T. Tyler. Thousand oaks: Sage.
- Rousseau, Denise M., S.B. Sitkin, R.S. Burt, and C. Camerer. 1998. "Not So Different After All: A Cross-Disipline View of Trust." *Academy of Management Journal* 3:393-404.
- Scott, John. 2000. *Social Network Analysis: A handbook*. Thousand Oaks CA.: Sage.
- Shaw, Marvin. 1964. "Communication networks." Pp. 111-147 in *Advances in Experimental Social Psychology*, edited by L. Berkowitz. New York: Academic Press.
- Sparrowe, Raymond, R Liden, S Waynes, and M Kraimer. 2001. "Social networks and the performance of individuals and groups." *Academy of Management Journal* 44:316-325.
- Tichy, Noel, and Charles Fombrun. 1979. "Network Analysis in Organizational Settings." *Human Relations* 32:923-965.
- Wasserman, Stanley, and Katherine Faust. 1994a. *Social Network Analysis. Methods and Applications*. New York: Cambridge University Press.
- . 1994b. *Social Network Analysis. Methods and Applications*. Cambridge: Cambridge University Press.
- Wellman, Barry. 1988. "Structural analysis: from method and metaphor to theory and substance." Pp. 19-61 in *Social Structures: a network approach*, edited by B Wellman and S.D. Berkowitz. New York: Cambridge University Press.
- Wilson, Jeanne M., Susan G. Straus, and Bill McEvily. 2006. "All in due time: The development of trust in computer-mediated and face-toface teams." *Organizational Behavior and Human Decision Processes*:16-33.
- Zolin, Roxanne, P. J. Hinds, R. Fruchter, and R.E. Levitt. 2004. "Interpersonal Trust in Cross-Functional Global Teams. A longitudinal Study." *Information and Organization* 1:1-26.
- Zolin, Roxanne, and Pamela Hinds. 2004. "Trust in Context: The Development of Interpersonal Trust in Geographically Dispersed Work." Pp. 214-238 in *Trust and Distrust in Organizations. Dilemmas and Approaches*, edited by Roderick M. Kramer and Karen S. Cook. New York: Russel Sage Foundation.
- Zucker, Lynne G. 1977. "The role of institutionalization in cultural persistence." *American Sociological Review* 42:726-743.

Second paper (B)

Building trust in networked environments: Understanding the importance of trust brokers

Tom Erik Julsrud^{ab} and John Willy Bakke^b

^a Norwegian University of Science Technology, N-7491 Trondheim, Norway

^b Telenor Research & Innovation, N-1331 Fornebu, Norway

Abstract: As organizations grow and become multi-national, distributed work, i.e. work where members are located in different sites, cities or countries usually follows (Hossain and Wigand 2004; Jarvenpaa and Leidner 1999; Meyerson, Weick and Kramer 1996; Panteli 2005; Zolin and Hinds 2002). Yet, such teams and groups have fewer opportunities to build social networks as is common in traditional groups, such as time spent together and frequent informal interaction. The “paradox of trust” in distributed work then, is that while trust is a “need to have”-asset” for distributed work groups – in particular for knowledge work – it is also difficult to foster due to the lack of physical co-location (Handy 1995). This article argues that one way to deal with the paradox is to recognize the importance of trust as generated through individuals that have trustful ties that cross central boundaries; i.e. trust brokers. Based on a relational approach to trust in groups, as well as empirical studies of distributed work groups, we argue that trust brokers can help to establish trust quickly and make the group operate in more robust and sustainable ways.

Keywords: Trust, trust brokers, trust brokering, distributed work, social networks.

Reference: Julsrud, Tom E., and John W. Bakke. 2007. "Building Trust in Networked Environments: Understanding the Importance of Trust Brokers." Pp. 117-138 in *Computer-mediated Relationships and Trust: Organizational and Managerial Effects*, edited by Linda Brennan and Victoria Johnson. Hershey PA: Idea Group Publ.

1. Introduction

Over the last two decades, a rich stream of research has emphasized the importance of *trust* for large scale organizational processes as well as individual employees. As organizations become more and more knowledge-oriented, trust has moved to the centre of attention as a supplement, and also as a corrective for *control* as a coordinative mechanism. As recently argued by Adler and Heckscher, this seems to be especially important for organizations that are engaged in innovations and knowledge based work (Adler and Heckscher 2006): “Knowledge work ... requires that each party offer something with no guarantee that they will get anything specific back in return. They must trust that the other has useful competence and knowledge that will help in their joint effort; that the other can understand her own ideas well enough to engage them productively...” (Ibid, p. 30)

Another aspect of modern organizations that may make trust even more critical for the functioning of organizations is the increase of more geographically dispersed physical structures. As organizations grow and become multi-national, *distributed work*⁷⁹, i.e., work where members are located in different sites, cities or countries, usually follows. According to a recent Nordic study every third Nordic manager in knowledge intensive businesses plans to reorganize their workplaces, and over 50 % of these managers considered “distributed and mobile work” as a relevant option (Julsrud, Bakke, Bjerrum et al. 2004).

There are several reasons for establishing and upholding distributed organizations: In addition to having distributed work as an instrument for establishing presence in different regions and markets, as in the case of regional offices, distributed work may also be a way of saving facilities costs, and costs related to work travels. Setting up distributed work groups may also help organizations save expenses, as compared to the co-location of groups and employees. Distributed organizations may also be part of a strategy for developing new knowledge in teams, by including people from various organizational units. Distributed groups by definition represent groups with participants situated in different physical settings, organizational and national cultures. To the extent that these people also include differences in knowledge and points of view, distributed work groups can be “hubs” for development of knowledge and innovations (Cummings 2004). The challenge is to get such groups work together with a limited amount of physical contact, although supported by a diverse set of communication tools.

⁷⁹ There is no single way to define distributed work groups. We will here follow Zolin and Hinds and define this in a general way, as group-based work where members are located in different cities or countries, supported by use of information and communication technology (Zolin and Hinds 2002).

1.1 The paradox of trust in distributed work groups

At a general level, the phenomenon of trust can be described as, “a willingness of a party to be vulnerable to actions of another party based on the expectations that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” (Mayer et al 1995, p. 3). Whereas collaborating in distributed work groups is emerging as a common way of working, the ability to “monitor or control the other party” is drastically reduced, and in essence this is what makes trust a core asset for organizations practicing distributed work. There is a risk that distributed work may become fragmented if people cannot work together with a sense of comfort, or if they feel that they must constantly use time and efforts on controlling the distant colleagues or employees. The “paradox of distributed work” is that while, in general, trust is a “need to have” asset for distributed work groups, in particular, for knowledge work, it is also difficult to foster due to the lack of physical co-location (Handy 1995). Distance reduces the abilities to interact and to gradually develop trust over time. Even if interaction on web-based infrastructures and software applications like e-mail and instant messaging (IM), as well as mobile communication provides rich opportunities for instant communication, it often lacks the differentiating cues that influences judgments about trustfulness⁸⁰ (Nissenbaum 2004).

We will in this chapter argue that one way to deal with the paradox of trust in distributed work is to focus on the role of *trust brokers*. Based on a relational approach to trust in groups, we argue that trust can be enhanced by centrally located trust brokers that establish and sustain ties over distances and across boundaries. We will first clarify the concept of trust brokers, drawing on literature in the broad fields of social network analysis and organizational trust. We propose that trust brokering should be understood as an activity involving persistent elaboration of relations based on position in a social network. Next, we will describe trust-broker activities based on a case study of distributed workers within a large Nordic ICT-company. Deploying a combination of qualitative analysis and social network data, we found that trust brokers were important for the positive development of trust within this group. In the last section we will discuss how trust brokering mechanisms can be used strategically by organizations as a way of enhancing the development of trust in distributed groups.

The purpose of this study then, is to demonstrate how certain qualities of the relations between actors play important roles in the establishment of trust in computer-mediated work environments, and other forms of distributed work. The concept of trust brokering, we argue, is a key to understanding the construction of trust across distance.

⁸⁰ This discussion of networked environments has even wider implications, since the development of organizations and organizational units with more limited timeframes presents challenges quite similar to the ‘paradox of trust’ in distributed work.

1.2 A note on the methodology

This chapter is based on an empirical field study of distributed work groups in a Nordic ICT-company. Over a period of 15 months, a sample of five groups were followed closely. These groups worked in established, distributed work groups with employees situated in different places and countries, and they were also working together with people in other organizational units.

This study has been guided by an inductive approach, trying to understand how trust was built up in the groups over time (Eisenhardt 1989; Ragin 1994). In this process in-depth interviews of participants were combined with formal questionnaires. The network techniques were applied to assist us in building an understanding of both the roles individuals had in the distributed social networks, and of the flow of information within the networks. Social networks were mapped by distributing a list of collaborators to each participant, so that adjacency matrixes could be constructed. This approach contrasts and supplements much of the former research in this area, which to a large extent has, had a focus on testing selected theoretical hypotheses.

One of the core findings from this inductive approach was that individual employees figured as important “nodes” active in the process of developing trust across the boundaries. We will here label this as *trust brokering*, and we will in this chapter explain further the mechanisms and activities involved with trust brokering.

2. Trust brokering – concept and dimensions

Trust brokering can be described as an activity - informally or formally - targeted at creating trustful relations between two or more groups⁸¹. As a working definition, we will here describe it as: *the active building of trust across distinct groups and/or subgroups, through the development of social relations*. Thereby, trust brokering refers to an activity within an organization, whereas the term trust broker refers to the corresponding role.

Reflecting the definition of trust cited above, trust brokering may be seen as an activity aiming at increasing positive expectations and reducing negative expectations about other parties in

⁸¹ The term has been used by former authors to coin individual actors work to integrate different units. For instance Cohen and Prusak (Cohen and Prusak 2001) describe this as “someone who vouch for people and make introductions to help spread trust throughout an organization”. (p. 35). The term “Network facilitators” has been described by McEvily and Zaheer (McEvily and Zaheer 2004) as organizations and institutions deliberately and intentional act to promote and sustain trust (p.208). The term “knowledge brokers” has in a similar way been applied to describe organizations that support innovation by connecting, recombining and transferring to new contexts otherwise disconnected pools of ideas (Haragadon 1998).

particular groupings. As indicated by the definition, trust brokering relates to trust building as an activity in the development of relations across distance, between distinct social groups. In cases where distributed work is based on collaboration between employees belonging to multiple organizations, departments or locations, the integration of such units becomes an important challenge. We will in this section explain how trust can be understood as a relational concept with cognitive and affective aspects, and that trust brokering can be analyzed from its relational and positional aspects.

2.1 Cognitive and affective dimensions of trust

Trust may be seen as a multidimensional construct with both cognitive and affective dimensions (Lewis and Weigert 1995). The *cognitive dimension* refers to the calculative and rational characteristics demonstrated by trustees, such as reliability, integrity, competence and responsibility. *Affect-based trust*, on the other hand, involves emotional elements and social skills of trustees.

The affective aspects of trust have in particular been studied in close relationships, but they have also been found to be important in work-related relationships (McAllister 1995, Boon and Holmes 1991). It has also been argued that in temporary and distributed groups the cognitive aspects are most important, because there are fewer opportunities to develop affective ties (Meyerson et al 1996, Jarvenpaa and Leidner 1999, Kanawattanachai and Yoo 2002). Yet recent studies of trust in organizations tends to emphasize the importance of also capturing the affective side of the concept (Kramer and Tyler 1996). Hence the term trust brokering should strive to capture both cognitive and affective dimensions, and we will in this article include both these dimensions.

2.2 A relational approach to trust

When trust is defined “a willingness of a party to be vulnerable to actions of another party based on the expectations that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” (Mayer et al 1995, p. 3), trust is defined as a relational concept, referring to characteristics of both the trustor and the trustee. In actual studies, trust is nevertheless often seen as a characteristic of the trustee alone: Measures of individuals’ trust levels may then be compared, or aggregated as a group characteristic, for example, when groups are rank-ordered according to the dimension of high trust / low trust (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002; Piccoli and Ives 2003)

In this article, where we investigate how trust-based relations develop within a group of distributed workers, we will deploy the relation-based approach to trust, also on the methodological level. This approach gives the benefits of exploring in depth the structure of relations within a group and the roles that are related to position in these networks. To reflect the cognitive and the affective

aspects of trust, this paper explores relations based on preferred collaboration partners when it comes to solving difficult work issues, as well as relations based on discussing a potential change of job situation. The affective and cognitive trust relations will be combined with relations based on both mediated and face-to-face daily interaction.

2.3 Two aspects of trust brokering

The concept of trust brokering, as defined above, addresses two central issues: the establishment of trustful relationships, and the “bridging” of formerly weakly connected groups or sub-groups within a larger structured network. While the first issue mainly has been elaborated by psychologically oriented studies of organizational trust (Kramer and Tyler 1996; Lewicki and Bunker 1996; Mayer, Davis and Schoorman 1995; McKnight, Cummings and Chervany 1995), the latter has been discussed in particular within social network oriented approaches (Burt 2005; Coleman 1988; Granovetter 1973; Kilduff and Tsai 2003; Krackhardt and Kilduff 2002). The “relational” and “positional” aspects of trust brokering, will be discussed briefly below.

2.3.1 Relational aspects of trust brokering

A trust broker may be seen as an individual that actively seeks to establish trustful ties across groups with low levels of trust, whereas trust brokerage may be seen as the outcome of trust brokering activities – or of activities that have the establishment of trust brokerage as a by-product.⁸² In traditional network terms, trustful relations are usually described as “strong ties” (Granovetter 1973; Krackhardt 1992; Krackhardt and Brass 1994). Strong ties are often found in denser social units like in families and between close friends or partners, while weaker ties exist between acquaintances. A strong tie is usually seen as a provider of more trustful relationships than a weak one. As argued by Mark Granovetter, the strength of ties is the outcome of “the combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services that characterize the tie” (Granovetter, 1973:1361). A wide range of research has indicated the value of having a broad network of weak ties. There are also studies exploring the more obvious phenomenon, that strong ties are also important. According to David Krackhardt, the “strength of the strong ties” is that they help reduce risks in insecure environments, and predict the behavior of others (Krackhardt 1992). This indicates a close conceptual relation between strong ties and trustful relations, and empirical studies corroborate that stronger ties usually are more trustful than weaker ties (Burt and Knez 1996).

⁸² On the concept of by-products of social activities, see Elster (1983).

Few studies in the social network tradition have explored the *activities* that are involved in the development of trust and trustfulness between individuals. although this issue has been developed and discussed within general studies of trust within organizations (Dirks and Ferrin 2001; Kramer and Cook 2004; Lewicki and Bunker 1996; Mayer, Davis and Schoorman 1995). Summing up different studies, Mayer and his colleagues proposes three central factors that influence the general trustworthiness of a person: ability, benevolence and integrity (Mayer, Davis and Schoorman 1995). *Ability* refers to the competence and skills the party is believed to have or display on a certain task. If people are believed to have certain skills their trustworthiness is usually high. This is probably particularly important in situations involving knowledge based work. *Benevolence* refers more directly to the expected motivation the trustee has to help or support the other party. In certain situations the relationship between the parties is of a kind that supports benevolence, such as between teacher and pupil. Thus benevolence refers to the particular role a party has and his relations to the trustor (i.e. the person that is to be trusted). And finally, the *integrity* of the trustor is believed to be important for the trustworthiness of a person. If the party is believed to adhere to a set of principles that has acceptance for the trustor, this affects the perceived integrity. But also knowledge about earlier achievements and actions may affect perceived integrity. Thus, the trustworthiness of a certain person builds on how a trustor understands the particular person's competence, intentions and personal integrity⁸³.

It is, however, important to note that these forms of understanding are not evolving in a social vacuum; they are affected by the particular context and the situation within which the relationships take place. Particular qualities of institutional systems like organizations and states will in most cases affect the willingness and possibilities to trust the other part (Mishira 1996). Sudden changes in organizations can, for instance, create power differences and destabilize trust between individuals. Similarly, duration of interaction over time is believed to be important for the emergence of trustful relationships. Based on these three core concepts, one may say that contextual factors and interaction over time is likely to affect the understanding of the other part's ability, benevolence and integrity.

2.3.2 Positional aspects of trust brokering

Trust brokering is not only about developing trust between individuals but in particular about connecting individuals with low trust across boundaries. Social network studies have traditionally used the term "brokers" and "brokerage" to describe individuals who actively profit from connecting information and/or people belonging to different groups or networks (Boissevain 1974; Burt 2005; Cross and Prusak 2002). Brokers are described as individuals who try to get personal advantages from

⁸³ In addition there are also factors related to the trustor (the person that are going to trust the other part) that affects the perceived trustworthiness of a person. The term "propensity to trust" is usually used to denote the general willingness of a party to trust others (Brown, Poole and Rogers 2004; Mayer, Davis and Schoorman 1995). Not only differences in personalities but also individual experiences and values can affect the willingness to trust others in general.

negotiating information between parties. As described by Boissevain: “A broker is a professional manipulator of people and information who brings about communication for profit” (Boissevain 1974).

In technical terms the *information broker* then, can be described as a person having an active transmitter-role, mediating information between two other roles; sources, and destinations. S/he gets information or messages from one “source-node” and transmits it over to a “destination-node”. Based on the position within these groups, the information broker can act as a coordinator, consultant, gatekeeper, representative, or liaison. (Fernandez and Gould 1994). Table 2.1 presents these different positions. In all these positions, the information broker is active in transmitting or trading information between actors across the boundaries of two or more groups (or within a group). A high level of brokerage activities indicates a central position between two or three groups, which is fundamental for the exploitation of opportunities provided by the “structural holes”, understood as gaps in the social worlds across which there are no current connections.. According to Burt, these holes in the networks can be connected by savvy entrepreneurs who thereby gain control over the flow of information across these gaps (Burt 2002, 2005).

A *trust broker* may in principle be located in every one of Fernandez and Gould’s positions. Nevertheless, information brokerage and trust brokerage are in principle distinctively different since the latter is less focused on getting access to information and more oriented towards developing ties and relations across distances. This implies a difference of *relational quality*, as well as a difference of *network structure*; information brokerage in terms of self-interest is best achieved when there is only one connection between two network components (or groups) and the tension between these groups can be exploited at the maximum (Burt 2005).

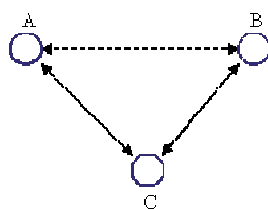
Table 2.1 Information broker positions (Based on Fernandez and Gould 1994).

ROLE TYPE	DESCRIPTION
Coordinator	<i>Indicates brokerage within the same group</i>
Consultant	<i>Indicates brokerages where the broker belongs to one group, and the other two belong to a different group</i>
Gatekeeper	<i>The source node belongs to a different group than the broker and the destination node</i>
Representative	<i>Indicates that the destination node belongs to a different group than the broker and the source node</i>
<i>Liaison</i>	<i>Indicates that each node belongs to a different group</i>

Trust brokerage, on the other hand will seek to develop more relations, and move towards a “closure” of networks. There is also an important difference related to *motivation*: The goal of trust brokering is to develop trustful relations, not to exploit information from different sources. Thereby, it is more driven by a motivation of creating a common understanding and identity within a group. The trust broker can, similar to the information broker, be positioned differently between groups, but the difference between source and destination is less important in trust brokerage, since it is always a question of brokering in both directions, since brokering is a bi-directional activity.⁸⁴

The trust broker then, as describes above, is a role in a network that is directed towards develop stronger relations between distant units, and to develop more cohesive structures within the group. An important element in the development of trustful relations in network theories may be the use of third parties, i.e. individuals outside the dyad that can ensure the trustfulness of the other (Coleman 1988, Granovetter 1973). If persons B and C have a strong relationship, this can be used as a platform to develop trust further. If C also has a strong tie to A, s/he may display a middleman position between B and A that opens for trust brokering (See figure 2.1). Given that A has an interest to establish or develop a trustful relation to B, person C can be used as transmitter or mediator of trust, ensuring that A is trustful and has “good intentions”. The trustworthiness B has to C then “spills over” to A. Related to the relational qualities described above, we can say that brokering involves the mediation of trustful relations in a network by acting as a middleman between more weakly connected nodes. It is in particular the integrity that can be affected by trust brokering; ensuring that the new person is trustworthy may affect the person’s integrity.

Figure 1. Inclusion of a third party (C) in a dyadic relation (A & B)



⁸⁴ The idea of structural holes has been criticised for not paying sufficient attention to content of the relations. Analysing different types of relations in a high technological engineering company, Podolny and Baron found that structural holes were advantageous for strategic network content, but not for relations involving social support and trustfulness (Podolny and Baron 1997).

An important point is that even though the role as a middleman can be performed in a passive way, there is an opportunity for C to act purposeful, as a trust-connector, when he is aware of the needs and capabilities of A and B. He will then not only act as a guarantor for the relationship, but will also create the new “triadic” unit, ABC. Trust brokers can enhance the denser network structures that are usually perceived as important for the establishment of common norms and security (Coleman 1988). Compared to the two dyadic relationships AC and CB, the triad ABC will in most cases appear as a social unit with other properties than the dyad, which would more likely induce trust. According to general network theory, a triad is usually more likely to induce trust than a dyadic relationship (Krackhardt 1999; Krackhardt and Kilduff 2002; Wolff 1950).

2.3 Summing up

The discussion above demonstrates that trust brokering involves both relational and positional aspects: On the one hand, the performance of particular actions and communication help to build up trustfulness across boundaries. Central elements here are exposure and demonstration of individual integrity, ability and/or benevolence. On the other hand trust brokering involves the connecting of stronger ties within the group and, in particular, across boundaries. This could be done directly by elaborating on relations, or indirectly by involving third parties. In addition we have noted that relational trust in general involves both cognitive and affective aspects.

This general outline of trust brokering then suggests recognizing this as a position in network, but also as a position that requires particular actions to enhance relations and ties. One implication of this general attempt is to go beyond the strong structural approach that often is associated with network theories, and to “bring the individual back in” using social network analyses in organizations (Kilduff and Corley 2000).

3. Development of trust-based relations in Omega

The case company, NOMO, is a Scandinavian ICT company with several thousand employees in more than ten countries⁸⁵. The company has experienced a significant growth in the last years, and investments, mergers and acquisitions have made it one of the largest European companies within its business area.

⁸⁵ Please note that all names are pseudonyms, as well as the names of the group (Omega) and the organization (NOMO)

Previously, the different national activities of NOMO were relatively independent, but when central divisions of NOMO were merged with ICT companies in Sweden and Denmark, closely interlinked forms of distributed work were initiated across both national and organizational boundaries.⁸⁶ A key motivation for the merger was to create synergies across the former divisions, while still keeping contacts with the respective local markets. The transformation from a national ICT company towards a larger multinational company created new challenges for the company. One manager in NOMO told us that:

“...the main challenge for NOMO now is to get the different units work together as one company, not to keep on starting “national wars” to get local advantages every time there is a potential conflict...”. (John, Norwegian HR-manager)

To understand more about collaboration within the multinational, distributed groups, a study of distributed work across the former organizational boundaries was launched. Five different distributed work groups were studied in depth over a period of 18 months.⁸⁷ We used evidence from one group of product developers – Omega – to illustrate how trust brokerage was important for the development of trust. The study started 15 months after the merger, and involved structured analysis of interaction within the group, as well as qualitative interviews with the employees and managers involved.

We will first describe the development within the group during the study period before we turn to a closer description of the networks of trust we found within the group. We will then move on to discuss further some of the most essential nodes and relations within these networks. Thus we try to capture both the positional as well as the relational dimensions of trust brokering, as described in the former chapter

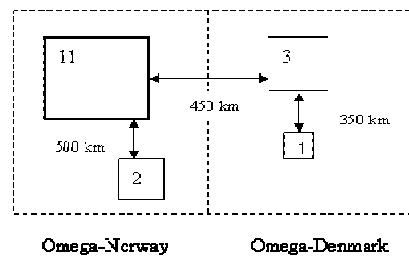
3.1 From crisis to the (re)establishment of trust

The core task for the group of 17 developers on Omega was to develop new products for users of computer related services. They were not only located in two of the countries, Norway and Denmark, but they were also at different physical locations within the two countries. In total, people in the group were situated at four different locations (see figure 3.1).

⁸⁶ In technical terms, the Norwegian unit acquired the Swedish and Danish units, but the term *merger* was commonly used, both by the interviewees and in internal publications, hence this term is used throughout the presentation of the case.

⁸⁷ Results from this study is reported elsewhere. See (Julsrud, Schiefloe, Bakke et al. 2006)

Figure 2. Location of employees in Omega (number of employees inside boxes)



The interviews showed that the merged group had experienced a tough initial phase, characterized by numerous intrigues and conflicts. There were underlying conflicts about which product lines that were to be continued in the future; many of the Danish employees felt their products were rejected in favor of the Norwegian product lines. The challenges were, however, not due to the increased distance between the product developers, but rather to a more complex organizational model, where the local marketing units had been given more control of the product development. The product developers needed to establish relations with employees in market units in three countries to get resources for developing products. This proved to be difficult as long as the group did not manage to develop a common understanding.

The reorganization initially created a situation that seemed to make the group drift towards mistrust, rather than trust. Underlying much of the conflicts were changes of tasks in Denmark due to the merger. For many of the Danish employees, this was perceived as unpleasant changes, involving a lot of uncertainty. The product development group, which used to be a highly independent and strong unit within the former Danish firm, now experienced problems with being integrated in the larger and more complex NOMO. The understanding of the goals of the group as well as their individual task was low in the first period. In particular the Danish employees reported of differences in understanding the new organizational model as well as their role in it:

“We simply did not know what to do. All the old was taken away, and projects were closed. I will call this chaos, and very close to an untenable situation. Satisfaction surveys confirmed our problems, and all the “warning-lamps” were blinking...” (Ronny, Danish employee)

The situation called for action, and 12 months after the merger it was decided to reorganize the group by establishing minor, more specialized units within the groups. A new Norwegian leader (Torhild,) was recruited from another division in NOMO, with an objective of facilitating the integration of the groups of developers in Denmark and Norway. When we conducted the interviews, the degree of satisfaction with the new structure was high. The reorganization of Omega was accompanied by changes in the larger NOMO group, involving clearer assignments of tasks, both within the Danish and the Norwegian group of product developers, and to the market units. Although problems with the market units persisted, most of the interviewees emphasized that the group was now moving in a more positive direction than before. Thus, 15 months after the merger, most employees expressed positive attitudes to the new Omega group:

“There has been a dramatic improvement in our group during the last couple of months. We have now better people in our management group, and the motivation within the group is much higher. The roles and the responsibilities for the various tasks and assignments are now more clearly defined”
(Kai, Norwegian employee)

According to Kai, this attitude was shared by most employees: The group had managed to reorient their collaboration in a more positive direction.

3.2 Positional aspects of trust brokering

In order to better understand the collaboration patterns and the relations within the group, a social network survey was conducted. The following two questions were used to capture cognitive and affective aspects of trust (C-trust and A-trust):

1. Who in your group would you talk to if you needed a professional advice in your daily work?
2. If you were planning to apply for a job similar to the one you have today, but in another company, whom would you prefer to discuss this with?

In addition, questions that captured the general daily and weekly interaction was used, including face to face communication, as well as the use of e-mails, telephone conversations and text messages (SMS) on mobile phones (the enterprise deployed mobile phones as the primary work telephone):

1. How often have you sent /received e-mails to/from this person the last 7 days?
2. How often have you sent/received SMS to/from this person the last 7 days?
3. How many mobile phone calls have you had with this person the last 7 days?
4. How often have you been in contact with this person during the last 7 days?

All network data was gathered through retrospective reports of the frequency of communication⁸⁸. The data was then coded as regular 1-mode social network data in sociomatrices for valued data. The data was used to conduct different analysis, using UCINET software to further explore the trust network vis-a-vis other relational networks⁸⁹. We will here refer to some of the findings, and use the directed graphs to illustrate how certain persons in Omega were central in the two trust-based relational networks. We will, also use some simple measures on centrality and density of the networks. *Indegree* centrality indicates the number of incoming lines for each node in a node-by-node network, while *outdegree* centrality indicates the number of outgoing lines (Freeman 1979). This is a frequently used indicator on prestige and popularity in valued networks, and in this particular study it indicates whom the other in the group tends to trust. The *density* of a network is measured as the number of actual connections as a proportion of the maximal possible connection, going from 0 to 1.

The cognitive trust network had a dense structure, with connections criss-crossing the group, whereas the affective network was looser: For the C-trust network the density was 0.2821, while for the affective trust network, the density was only 0.0542, showing that the general level of cognitive trust was much higher than the level of affective trust. This finding corroborates much former research on trust in distributed group, finding that across distance, cognitive trust is easier established than affective trust.

The head of the department, Torhild, proved to be central in both the trust networks and in the interaction-based network (Table 3.1 provides data on the degree of centrality for C-trust, A-trust and daily interaction.) In the interviews, she was acknowledged for playing an important role in connecting the local units. The material also showed that a small group of other individuals – with no formal positions – proved to be central in these networks. In particular Kai and Martin figured as central in both the C-trust network and the interaction network.

⁸⁸ Such self-reported frequency data are not expected to be objectively accurate, but are expected to allow comparison across relations, and to indicate relative strength of interactions within a group (Bernhardt, Killworth and Sailer 1982; Hartley, Brecht, Pagerly et al. 1977)

⁸⁹ Closer description of social network measures and techniques can be found in Wassermann and Faust (Wasserman and Faust 1994) and in the UCINET software manuals (Borgatti, Everett and Freeman 2002).

Table 3.1. Indegree and outdegree centrality indicators for position in the cognitive trust network (C-trust), affective trust network (A-trust) and the general interaction network in Omega.

	C-trust		A-trust		Interaction	
	Indegree	Outdegree	Indegree	Outdegree	Indegree	Outdegree
Kai	12,00	3,00	0,00	0,00	6,00	4,00
Torhild	10,00	3,00	2,00	0,00	8,00	3,00
Martin	6,00	3,00	3,00	0,00	7,00	4,00
Knut	5,00	3,00	0,00	0,00	1,00	5,00
Kari	4,00	2,00	0,00	2,00	5,00	6,00
Marianne	3,00	2,00	2,00	2,00	3,00	1,00
Ronny	2,00	2,00	0,00	1,00	0,00	1,00
Daniel	1,00	3,00	1,00	0,00	1,00	5,00
Jørgen	1,00	3,00	0,00	0,00	1,00	1,00
Andreas	1,00	3,00	0,00	0,00	1,00	0,00
Emil	1,00	2,00	2,00	2,00	1,00	0,00
Erika	0,00	3,00	0,00	3,00	3,00	7,00
Heidi	0,00	3,00	1,00	1,00	3,00	1,00
Sissel	0,00	3,00	1,00	0,00	3,00	2,00
Simon	0,00	3,00	1,00	2,00	2,00	1,00
Liv	0,00	3,00	0,00	0,00	2,00	3,00
Mathias	0,00	2,00	-	-	2,00	7,00
MEAN	2,71	2,56	0,813	0,813	3,00	3
SD	3,54	0,76	0,950	1,014	2,223	2,301

Table 3.2. Degree of centrality for interaction through e-mail, mobile dialogues and SMS in Omega.

Node	E-mail	Mobile	SMS	SUM
Knut	19	15	11	45
Martin	20	10	11	41
Torhild	24	8	7	39
Kai	17	12	9	38
Kari	19	8	5	32
Marianne	13	10	5	28
Erika	14	6	6	26
Jørgen	8	8	6	22
Sissel	14	3	3	20
Mathias	7	6	7	20
Liv	10	4	5	19
Simon	9	5	4	18
Ronny	8	6	4	18
Heidi	10	5	2	17
Daniel	9	3	5	17
Andreas	6	6	3	15
Emil	8	3	1	12
MEAN	11,889	6,941	5,529	
SD	5,801	3,244	2,746	

All the participants in the group knew someone whom they would trust to give them professional advice, indicating a certain amount of coherence in the group. Yet, when it comes to affective trust, 9 of the 17 employees did not consider anyone in the group as “trustworthy”.

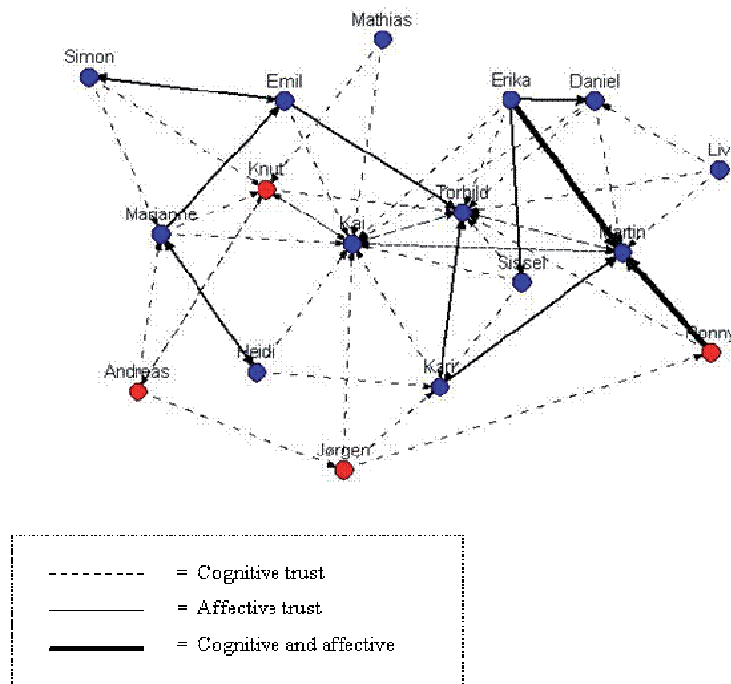
In addition the nodes that tended to be central in the C-trust network did not appear as highly central in the A-trust network; Kai, for instance, was highly central in the cognitive network, but not included in the affective trust network. Emil, on the other hand, was trusted by two individuals in the group on the affective dimension, but only by one in the cognitive network. Other employees – like Heidi – were only having indegree ties in the affective network. The indicators for daily interaction showed that Torhild, Martin and Kai were the most central partners for communication within the group, as well as for the cognitive trust network. Of these three persons, Torhild and Martin were also central in the affective trust network (Table 3.1). An analysis of communication patterns through mediated channels of communication indicates that the affective trust network follows the cognitive trust networks closely.

A rough measure of the centrality of the network members can be established by looking at the aggregate level of communication, established by adding the incoming and outgoing lines for each partner in the network, while ignoring the direction of communication (Freeman 1979)⁹⁰. Table 3.2 presents this measure of centrality for all three communication channels. The material shows interesting differences between the networks, based on e-mail, telephone conversations and text messages (SMS) on mobile phones: The manager, Torhild, was most central in the e-mail network, indicating that this perhaps was a more formal medium. Knut was active in the mobile communication interaction, including the use of SMS, even though he had very low centrality in the affective trust network. This is an indicator that interaction frequency is not necessarily closely linked to centrality in trust networks.

The network survey indicated that the manager (Torhild), as well as Kai and Martin were most central in the cognitive trust network. Knut, on the other hand, was central in the mediated information flow, but not in particular as a cognitive trust partner. The outdegree interaction table also suggested that he was a sender, more than a receiver of information and messages. As illustrated in figure 3.2, the centrality of Kai, Torhild, and Martin was based on their relations to both Danes and Norwegians. Two of the twelve persons seeking advice from Kai were from the Danish part of the group, and three of the Norwegians would ask Knut for advice, even though he came from the Danish part of NOMO. As such these could be considered as trust brokers along the cognitive dimension. When it comes to the affective trust relations, only Martin displayed ties that crosses the national boundary. He was the only person that fills the role as an affective trust broker in this group.

⁹⁰ We will here prefer symmetrical rather than directional ties to reduce complexity in the presentation, even though this represents a reduction in the richness of the empirical material. A more thorough analysis of the mediation of the social relation should however analyze directional as well as symmetrical ties.

Figure 3. Affective and Cognitive trust relations in the Omega-network. (Danish employees red, Norwegian blue).



3.3. Relational aspects of trust brokering

The network measures and the accompanying diagram showed clearly that some nodes were more central in the interconnected networks of Omega. This finding confirms several earlier studies of social networks of teams and groups, when individual variations in centrality is common (Cross and Prusak 2002; Cummings and Cross 2003). Further, the study indicated that the cognitive and the affective dimensions of trust followed rather different tracks. While the cognitive and task oriented type of trust was present among almost all the employees, the affective trust –relations was more sparsely distributed. Interestingly we found that individuals that were central in the cognitive trust

network were in some cases not included in the affective trust network. This suggests that we might have individuals that connect along affective or cognitive dimensions only, or along both dimensions.

To give a closer understanding of the relational dimensions of trust brokering, we will here focus on the activities of Kai and Martin, two Norwegian employees who appeared as central players having several connections to the distant units. Martin appeared as the most important trust broker in this group, as he also had affective bonds that crossed the organizational boundary. His close collaborator in Denmark, Ronny, expressed that the development of a strong relationship with Martin was something of a turning point for him:

“The fact that Martin now has joined the group with his high level of competence really makes me believe in this. He actually is the first Norwegian that I can say that I really trust ...” (Ronny, Danish employee).

The relations between these two employees had become an important tie that strengthened the relations not only between two employees, but between different geographical units within Omega. It is worth noting however, that Ronny emphasized Martin’s competence and abilities as main reasons for trusting him. For Martin, frequent visits to Denmark, together with frequent communication by electronic media, appeared to be part of a deliberate effort to create a better climate of collaboration within the group:

“I use much of my time on communication and on the establishment of a common understanding within the group. I must establish agreement, not by dictates but by communication. Our organization has not done enough to foster this type of understanding across the national boundaries...” (Martin, Norwegian employee)

Kai had a particular central role in the cognitive trust network. It turned out that he had a significant advantage by speaking both languages fluently. He had lived in Denmark for long periods of time, and he used his insights into culture and language actively to avoid conflicts and misunderstandings. He considered that he had a special responsibility to act as a mediator in the group, due to his ability to detect language-based misunderstandings:

“I speak Danish with my collaborators in Denmark, and Norwegian with the collaborators in Norway. In many situations I become a mediator between the environments, and frequently I must

change into a role of an “interpreter” in situations where I suspect that people misunderstand each other...” (Kai, Norwegian employee)

Thus, Kai's bilingualism helped him to detect misunderstandings, but perhaps also to strengthen his own integrity across the nationalities. The deliberate development of relations across the boundaries also involved active use of communication tools. Kai told us that he had made a routine of calling his colleagues regularly just to hear “how things were going”. One of these distant colleagues had recently experienced a critical conflict. He argued that the frequent telephone calls were important to better understand the colleagues' feelings:

” I call the other colleagues in my groups often to hear how things are going. I want them to feel that there is interest for what they are doing. When I do not sit beside them and see their faces, I need to call them up and hear how things are going. You must ‘read between the lines’ to know how they actually are doing in their work...Sometimes I also talk to others to get information about these issues.” (Kai, Norwegian employee)

Martin and Kai were not only developing relations, they were also actively surveying and following up on the others' work within the group. Interestingly, Kai in the citation above expressed that he actively used third parties to get a better understanding of other colleague's situation. The concern was, on the one hand, that of work-related control, since he was in the position of being the manager of a sub-unit. On the other hand, it was also related to concern about the well-being of his colleagues and an interest in “sorting out” problems in the group. Thus aspects of control seemed to be intertwined with establishment of trustful relation in this case.⁹¹ All in all, however, Kai and Martin had more interest for the group's activities and their colleagues work than most of the others in Omega. In addition to having an active attitude regarding the connection of ties across the local units, Kai and Martin also seemed to deliberately *make use of existing relations* on a broader scale. Both were employees who not only had longest records of working in the company, but also of working in different parts of the organization. This was important as Omega was highly dependent on collaboration with other groups within the larger NOMO system. Access to a wide network, then, was also clearly seen as an advantage by the others in the group:

⁹¹ This point is elaborated explicitly by O'Leary and his Colleagues in an historical analysis of trust and control in the Hudson Bay Company (O'Leary, Orlikowski and Yates 2002)

“Martin has experience from working in the market units ... This gives him access to very rich networks of contacts that is really useful to us now ...” (Erika, Norwegian employee)

Kai and Martin enjoyed high levels of trust, at least partly based on their experiences and wide network of contacts within the company. As far as we discovered, this was not used to keep the others at a distance, or to take credit of having exclusive access to central information and resources. Kai expressed that he tried to use help his Danish colleagues to develop their own network within the Norwegian part of the organization. In this way he, implicitly, saw himself as a stepping stone for Danish colleagues in order to develop relations in the Norwegian part of NOMO.

“...collaboration across the two countries is difficult. One of my colleagues is coming to me on Thursday, and he has not been here for 6 months. He needs to get help to develop his networks of contacts in the Norwegian part of the organization...” (Kai, Norwegian employee)

This indicates that mediation of relations, and potentially trustfulness, actually took place in the group.

Martin and Kai both reported being involved in trying to solve or moderate conflicts within the group as well as with partners outside the group. Kai emphasized that many conflicts seemed to be based on misunderstanding due to cultural and language differences. Martin, however, said that Norwegians in some situations had been complaining to him about others in the Danish part of the group, recognizing that he had stronger relations here than others. This situation also indicated that Martin operated as a “bridgehead” between the Danish and the Norwegian part of Omega, moderating conflicts.

It is noteworthy that Kai and Martin (as well as Torhild and Knut) developed *different types of relations* within the group. In a way they might be considered as a “team” of trust brokers, creating a common platform to develop trust across the group. The reorientation of Omega into smaller groups, probably also helped the brokers to develop trust within the group based on a common set of tasks and common professional ideas and norms.

3.4 Summing up

Our investigation of Omega found that some employees in the group were important for integrating the two former weakly connected sub-units, and build trust within the group. These employees did not only play roles as central connectors, but also acted as trust builders in a network

initially suffering from low trust relations. While there were several that figured as trust brokers along the cognitive dimension, affective trust brokers were more infrequent. In Omega only one employee had such a position.

Our qualitative enquiry provided evidence that these persons actually were supporting trustfulness within the group, and that their position as “trusting and trusted individuals” was vital for the development of trust within the group. This involved activities related to establishing and strengthening relations with colleagues at a distance, as well as exploitation of formerly established relations. Actions were also taken to moderate and solve conflicts within the group, and to deploy individual networks to help others to establish new relations: Even though most of the trust brokering was related to establishment of dyadic relations, indications of network building activities through third parties were evident.

4. The emergence of trust brokering in mediated environments

Trust brokering as such is not a new phenomenon. The existence of middlemen to enhance trust has been recognized as important and exploited actively for ages. In the beginning of the 20th century, the sociologist Georg Simmel wrote about the sociological significance of a “third element” in social relations. When a dyad was extended with a third person that acted as a neutral mediator, he argued that this tended to moderate conflicts and create a stronger focus on group based interest rather than individual needs (Wolff 1950). The importance of using third parties to foster trust is also increasingly being recognized as important for trust development on cooperation and negotiations between companies (McEvily and Zaheer 2004; Wall, Stark and Standifer 2001). Yet, this perspective is largely neglected in studies of trust in distributed groups.

As we have explained here, when such brokers succeed in lowering conflicts and establishing trust between two or more sub-groups we can see this as trust brokering. There are reasons to believe that in current and emerging distributed organizations – as well as in temporal and time-limited organizations – trust brokering will become much more important. One reason for this is simply that distributed collaboration becomes more common. Often, however, this emerges in settings that challenge trust and trustfulness. As in the case of NOMO, the merger, or company acquisitions, initial conflicts and discomfort due to power differences and insecurity regarding future work tasks were created. Such settings call for an active approach to the development of trust, rather than a passive one expecting trust to emerge and develop over time as a result of regular interactions.

Another, but equally important issue is that changing competitive environments requires the rapid establishment of groups and teams, often with a limited time-frame. Despite the fact that groups

may work over distance, collaboration – and trust – needs to be developed fast. Active trust brokering may here suggest a strategy for the development of trust in distributed groups and teams more efficiently than traditional approaches. Focusing on the network of relations opens for integration and trust building through a *limited number of central connections* rather than between all nodes in a network.

Finally, the issue of developing knowledge and common ideas in organizational environments is getting increasingly complex, as modern organizations tend to become more networked. In some cases this also represents a development of a “networked individualization” where the relations between individual employees are work tasks (Wellman 2002; Wellman, Quan-Haase, Boase et al. 2003). A high level of complexity makes it difficult for individuals to know or understand what others are doing. Trust brokers can in such organizations be central for connecting people with similar ideas and projects and make them work together. As such trust brokering can be a key factor for transmission of tacit knowledge, that usually depends on higher levels of trust (Hansen 1999).

4.1 Implications for further research

Several contributions have recognized the challenge of developing trust in distributed groups, and different solutions have been suggested for remedying the difficulties. Research in this area tends to emphasize different facets of research as decisive for the trust building in the distributed groups. At least three central factors have been much studied: the timing of the interaction, the quality of the communication, and the duration of interaction in the group. The timing argument holds that face-to-face interaction should be regular during the lifetime of the group, or more intense in the beginning of the collaboration (Jarvenpaa and Leidner 1999; Maznevski and Chudoba 2000; Zolin and Hinds 2002). The quality of interaction argument, on the other hand, emphasizes that changes in the communication content, in particular by the managers in the group, will support the trust development (Jarvenpaa and Leidner 1999; Panteli 2005). And finally, the duration argument argues that trust is enhanced by longer durations and time of interaction (Wilson, Straus and McEvily 2006). As an implication of these arguments, trust in distributed groups should develop in much the same way as in co-located groups, although it will take a longer time.

Within this chapter, distributed work groups are seen from a structural perspective. This approach helps us to see that trust development is largely established and sustained by a limited set of individual actors. The trust brokering argument holds that a closer focus on individual roles and their relations within a social network represents a supplementary and more detailed perspective on the development of trust in distributed groups. Rather than seeing the group as one closed unit, it provides a more fine-grained analysis of trust as a product of particular relational positions and patterns within a

network of distributed workers. This is a novel approach to studies of distributed work group, and we believe that it should be further explored.

Although the concept of trust brokering has been explored through an inductive, and small scale study, both the identified phenomenon and the concept seem to refer to generic organizational processes. Therefore, we believe that it has value as a description of mechanisms of developing trust, in particular for distributed settings where trust processes are challenged and contested. As a theoretical concept it is rooted in social network theory, as well as in general theories about development of relational trust in organizations. Yet it reflects a wider stream of research over the last decades focusing on the value of doing “boundary work” to connect individual groups to larger units.⁹²

Still, the concept needs to be further clarified and compared to other network related role descriptions such as “hubs”, “central connectors” and “boundary spanners”, as well as “gate-keepers.” More empirically oriented studies focusing on trust brokering activities, as well as on the impact of such activities on trust within the groups would be of interest. Our study of Omega suggests that trust brokering activities seems to be highly dependent on multiple communication channels, as well as a deliberate use of face-to face interaction. It would, however, be of interest to know more about the use of media for support trust brokering activities. Variations in the use of communication channels, suggested that different communication media were used for different purposes and to support different kinds of relations and ties. In this chapter we have also suggested that trust brokering based on affective and cognitive bonds follow rather different tracks. It would be interesting to explore further the similarities and dissimilarities between these two dimensions of trust brokering.

A further exploration of the role of trust brokers on distributed groups can also be developed in a more methodological direction, utilizing more sophisticated techniques for detecting and analyzing trust brokers and brokering mechanisms. Within the area of social network studies several paths are optional, including the use of positional role analysis and traditional broker indicators (Borgatti and Foster 2003; Breiger 2004; Fernandez and Gould 1994; Hanneman 2001). The nature of trust brokering as described here, however, may in particular be to call for a combination of quantitative and qualitative network studies, focusing on both structural aspects as well as the individuals work to establish and sustain social relations in distributed networks.

4.2 Implications for organizations

We have used this case study as a tool for developing the concept of trust brokering, based on the observation that individuals may facilitate collaboration and networking within a distributed

⁹² Related terms include boundary spanning agents in the field of intra organizational networks (Friedman and Podolny 1982; Marchington, Grimshaw, Rubery et al. 2005), Legitimate Peripheral Participation in the field of communities of practice (Lave and Wenger 1991; Wenger 1998), and boundary objects related to actor network theory (Star and Griesmer 1989).

organization, where trust is seen as something that – to a certain degree – can be actively addressed. The idea of trust in distributed groups as affected by brokerage allows for a more active approach to trust in organizations. This position is somewhat contrary to the view that trust is a by-product of other activities (Elster 1983); instead, trust brokering may be seen as a ‘functional equivalent’ to trust emerging over time. The concept of trust brokering also shows an affinity to the concept of *active trust*, trust that has to be energetically treated and sustained (Beck and Beck-Gernsheim 1994).

One practical implication is that organizations may actively assign individuals as trust brokers when setting up distributed work groups. This might include giving them particular and formal responsibilities and resources to develop relations, or one may take effort to enhance the development of social relations more indirectly through enhanced social interactions. Where the goal of traditional approaches would seek to develop trust on a broad scale, the trust-brokerage approach would emphasize the need for a few, but strong, relations across the boundaries. An alternative strategy is to develop the groups around existing relations where trust exists in advance. If there are pre-existing trusting relations spanning across the distant groups, this may kick-start the development of trust within the group.

A central issue for the development of trust in distributed networks is how to stimulate the development of trustful and stronger ties. For companies wanting to develop ties across boundaries and distances, the establishment of meeting places, communities, and fora where relations and networks can develop, becomes important strategy elements. Trust brokers can be central in the planning and development of such meeting places, and they can support them in the development of boundary-crossing relations and structures. Collaboration in projects might be one example of such fora, but more informal arrangements can also be introduced, such as professional interest groups.

Trust brokering should, however, not be seen as a highly fixed role description within a group. As emphasized by the definition suggested in this article, we see this as an ongoing activity. This implies that trust brokering activities may be performed by several persons in a group, shifting over time. Neither should this necessarily be seen as a formalized role; brokering activities will in most groups take place when there is a need to develop trust and someone feels obliged or called to support the development of a group.

Organizations should however be aware of the risks that may be ascribed to the trust brokers. Earlier studies of individuals located in boundary-crossing positions, suggest that this can be a vulnerable position, where there are risks of being targets of cross pressure and role conflicts (Friedman and Podolny 1982; Krackhardt 1999). A higher awareness of the actions and processes involved in trust brokering might help to avoid negative consequences, such as overwork, stress or burnout.

5. Concluding remarks

A trusting relationship is usually characterized by having positive expectations about other parties' actions and doings, with few options of controlling this directly. We have argued that in settings where options for interaction, observation and control diminish – like distributed work, and work in time-limited teams – trust becomes more vital. This is particularly critical for groups and organizations that are engaged in knowledge-based work, with high interdependencies in the tasks and high degrees of uncertainty. While regular interaction over time may enhance this, the particular setting of distributed work makes this difficult to achieve. This is what has been described as “the paradox of trust” in distributed work (Handy 1995).

This chapter has argued that the development of trust in distributed groups can be strengthened by trust brokers who work actively to connect employees and build (or thereby building) trust across distributed groups. By studying a case of distributed product developers as a network of relations, we found that both cognitive and affective relational trust was facilitated by trust brokers, centrally located between two national operations. Their active development of stronger relations within the group seemed to enhance the trust within the group, and helped to solve “the paradox of trust” in the distributed group of product developers. Thus the answer to the difficulties of enhancing trust is not necessarily to develop more trust on a general basis among all the involved employees. Another option is to enhance the development of trust through a limited number of centrally located trust brokers.

References

- Adler, Paul S, and Charles Heckscher. 2006. "Towards Collaborative Community." Pp. 11-105 in *The Firm as a Collaborative Community*, edited by C Heckscher and P Adler. New York: Oxford University Press.
- Beck, Ulrich, and E. Beck-Gernsheim. 1994. *Individualization*. London: Sage.
- Bernhardt, Russel H., Peter Killworth, and Lee Sailer. 1982. "Informant accuracy in social network data V." *Social Science Research*:30-66.
- Boissevain, Jeremy. 1974. *Friends of Friends. Networks, Manipulators and Coalitions*. Oxford: Basil Blackwell.
- Borgatti, Stephen, Martin Everett, and Linton Freeman. 2002. "Ucinet 6 for Windows." Harvard: Analytic Technologies.
- Borgatti, Stephen P., and Pacey C. Foster. 2003. "The Network Paradigm in Organizational Research: A Review and Typology." *Journal of management* 6:991-1013.
- Breiger, Ronald. 2004. "The Analysis of Social Networks." in *Handbook of Data analysis*, edited by Melissa Hardy and Alan Bryman. London: Sage.
- Brown, Houghton G., Marshall Scott Poole, and T.L Rogers. 2004. "Interpersonal Traits, Complementarity and Trust in Virtual Collaboration." *Journal of Management of Information Systems* 20:115-137.
- Burt, Ronald. 2005. *Brokerage and Closure. An Introduction to Social Capital*. New York: Oxford University Press.
- Burt, Ronald, and M. Knez. 1996. "Trust and Third-Party Gossip." Pp. 68-89 in *Trust in Organizations. Frontiers of Theory and research*, edited by R M kramer and T R Tyler. Thousand oaks: Sage.
- Cohen, and Prusak. 2001. *In good company. How social capital makes organizations works*. Boston, MA: Harvard Business School Press.
- Coleman, James. 1988. "Social capital in the creation of human capital." *American Journal of Sociology*:95-120.
- Cross, Rob, and Laurence Prusak. 2002. "The People Who Make Organizations Go -or Stop." *Harvard Business Review* 80:104-112.
- Cummings, Jonathon N. 2004. "Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization." *Management Science* 50:352-364.
- Cummings, Jonathon N., and Rob Cross. 2003. "Structural properties of work groups and their consequences for performance." *Social Networks*:197-210.
- Dirks, Kurt T., and Donald L. Ferrin. 2001. "The role of trust in organizational settings." *Organizational Science* 4:450-467.
- Eisenhardt, Kathleen M. 1989. "Building Theories from Case Study Research." *Academy of Management Review* 14:532-550.
- Elster, Jon. 1983. *Sour Grapes: Studies in the Subversion of Rationality*. Cambridge: Cambridge University Press.
- Fernandez, Roberto M, and Roger V Gould. 1994. "A dilemma of state power: Brokerage and influence in the national health policy domain." *American Journal of Sociology*:1455-91.

- Friedman, Raymond A., and Joel Podolny. 1982. "Differentiation of Boundary Spanning Roles: Labor Negotiations and implications for Role Conflict." *Administrative Science Quarterly* 1:28-47.
- Granovetter, Mark S. 1973. "The Strength of Weak Ties." *American Journal of Sociology*:1287-1303.
- Handy, Charles. 1995. "Trust and the Virtual Organization. How do you manage people whom you not see?" *Harvard Business Review* 73:40-50.
- Hanneman, Robert. 2001. "Introduction to Social Network Methods." Dep. Of Sociology. University of California, Riverside.
- Hansen, Morten. 1999. "The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits." *Administrative Science Quarterly*:82-111.
- Haragadon, Andrew B. 1998. "Firms as Knowledge brokers:Lessons in pursuing continuous innovation." *Management Review* 40:209-227.
- Hartley, Chris, M. Brecht, P. Pagerly, G. Weeks, A. Champanis, and D. Hoecker. 1977. "Subjective time estimates of work tasks by office workers." *Journal of occupational Psychology*:23-36.
- Hossain, L., and R Wigand. 2004. "ICT Enabled Virtual Collaboration through Trust." *Journal of Computer-Mediated Communication* 10.
- Jarvenpaa, Sirkka L., and Dorothy E. Leidner. 1999. "Communication and Trust in Global Virtual Teams." *Organization Science* 10:791-815.
- Julsrud, T, J. W. Bakke, E. Bjerrum, S. Gunnarsdottir, and T. Koskinen. 2004. "Status and strategies for the knowledge intensive Nordic workplace." Oslo: Nordic Innovation Center.
- Julsrud, T, P M Schiefloe, J Bakke, and. 2006. "Networks and Trust in Distributed Groups." University of Trondheim, NTNU.
- Kanawattanachai, Prasert, and Youngjin Yoo. 2002. "Dynamic nature of trust in virtual teams." *Strategic Information Systems*:187-213.
- Kilduff, Martin, and Kevin G. Corley. 2000. "Organizational Culture From a Network Perspective." Pp. 211-221 in *Handbook of Organizational Culture and Climate*, edited by N Ashkanasy, C P M Wilderom, and M F Peterson. New york: Sage.
- Kilduff, Martin, and Wendip Tsai. 2003. *Social Networks and Organizations*. London: Sage.
- Krackhardt, David. 1992. "The strength of strong ties: The importance of philos in organizations." Pp. 216-239 in *Network and Organizations; Structure, Form and Action*, edited by N Nohria and R Eccles. Boston: Harvard University Press.
- . 1999. "The ties that torture: simmelian tie analysis in organizations." *Research in the Sociology of Organizations* 16:183-210.
- Krackhardt, David, and D. Brass. 1994. "Intraorganizational Networks. The Micro Side." Pp. 207-229 in *Advances in Social Network Analysis*, edited by S Wasserman and J Galaskiewicz. Thousand Oaks: Sage.
- Krackhardt, David, and Martin Kilduff. 2002. "Structure, Culture and Simmelian ties in entrepreneurial firms." *Social Networks* 3:279-290.
- Kramer, Roderick M., and Karen S. Cook. 2004. "Trust and Distrust in organizations: Dilemmas and Approaches." Pp. 1-17 in *Trust and Distrust in organizations. Dilemmas and Approaches*, edited by R.M. Kramer and K. S Cook. New York: Russel Sage Foundation.
- Kramer, Roderick M., and Tom R. Tyler. 1996. "Whither Trust." Pp. 1-15 in *Trust in Organizations: Frontiers of Theory and Research*, edited by R.M Kramer and T.R Tyler. Thousand Oaks: Sage Publications.
- Lave, Jean, and Etienne Wenger. 1991. *Situated learning. Legitimate peripheral participation*. Cambridge: Cambridge University Press.

- Lewicki, Roy L., and Barbara B. Bunker. 1996. "Developing and Maintaining Trust in Work Relationships." Pp. 114-139 in *Trust in Organizations. Frontiers of Theory and research*, edited by R. Kramer and T. Tyler. Thousand Oaks: Sage.
- Marchington, Mick, D Grimshaw, J Rubery, and H Willmott (Eds.). 2005. *Fragmenting Work. Blurring Organizational Boundaries and Disordering Hierarchies*. Oxford: Oxford University Press.
- Mayer, Roger C., J.H Davis, and F.D Schoorman. 1995. "An integrated model of organizational trust." *Academy of Management Review* 3:709-734.
- Maznevski, Martha L., and Katherine M. Chudoba. 2000. "Bridging Space Over Time: Global Virtual Team Dynamics and Effectiveness." *Organizational Science* 11:473-492.
- McEvily, Bill, and A. Zaheer. 2004. "Architects of Trust: The Role of Network Facilitators in Geographical Clusters." Pp. 189-213 in *Trust and Distrust in Organizations. Dilemmas and Approaches*, edited by R.M. Kramer and K. S Cook. New York: Russell Sage Foundation.
- McKnight, D H, L L Cummings, and N L Chervany. 1995. "Trust formations in new organizational relationships." in *Information and Decision Sciences Workshop*. University of Minnesota.
- Meyerson, Debra, Karl Weick, and Roderick Kramer. 1996. "Swift Trust and Temporary Groups." Pp. 166-195 in *Trust in Organizations. Frontiers of Research and Theory*, edited by R Kramer and R Tyler. Thousand Oaks, CA: Sage.
- Mishra, A. K. 1996. "Organizational Response to Crisis: The Centrality of Trust." Pp. 261-87 in *Trust in Organizations: Frontiers of Theory and Research*, edited by R.M Kramer and T.R. Tyler. Thousand Oaks, CA: Sage.
- Nissenbaum, Helen. 2004. "Will Security Enhance Trust Online, Or Supplant It?" Pp. 155-185 in *Trust and distrust in organizations. Dilemmas and approaches*, edited by R. M. Kramer and K. S. Cook. New York: Russell Sage Foundation.
- O'Leary, Michael, Wanda Orlikowski, and JoAnne Yates. 2002. "Distributed work over the Centuries. Trust and Control in the Hudson Bay Company." Pp. 27-54 in *Distributed Work*, edited by P Hinds and S Kiesler. Cambridge, Mass.: MIT Press.
- Panteli, Niki. 2005. "Trust in Global Virtual Teams." in *Ariadne*. www.ariadne.ac.uk/issue43/panteli/: University of Bath, UK.
- Piccoli, Gabriele, and Blake Ives. 2003. "Trust and the Unintended Effects of Behavior Control in Virtual Teams." *MIS Quarterly* 27:365-395.
- Podolny, Joel, and J Baron. 1997. "Resources and relationships, social networks and mobility in the workplace." *American Sociological Review*:673-693.
- Ragin, Charles A. 1994. *Constructing Social Research*. Thousand Oaks, CA: Sage.
- Star, Susan Leigh, and J Griesemer. 1989. "Institutional Ecology, "translation" and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology." *Social Studies of Science*:387-420.
- Wall, J.A., J.B. Stark, and R.L Standifer. 2001. "Mediation: A current review and theory development." *Journal of Conflict Resolution* 45:370-391.
- Wasserman, Stanley, and Katherine Faust. 1994. *Social Network Analysis. Methods and Applications*. New York: Cambridge University Press.
- Wellman, Barry. 2002. "Little Boxes, Globalization, and Networked Individualism?" Pp. 10-25 in *Digital Cities II: Computational and Sociological Approaches*, edited by Makoto Tanabe, Peter van den Besselaar, and Toru Ishida. Berlin: Springer.
- Wellman, Barry, Anabel Quan-Haase, Jeffrey Boase, Whenhong Chen, Keith Hampton, Isabel Isla de Diaz, and Kakuko Miyata. 2003. "The Social Affordances of the Internet for Networked

Individualism." *Journal of Computer Mediated Communication*
8:<http://jcmc.indiana.edu/vol8/issue3/wellman.html>.

- Wenger, Etienne. 1998. *Communities of Praxis. Learning, Meaning and Identity*. Cambridge: Cambridge University Press.
- Wilson, Jeanne M., Susan G. Straus, and Bill McEvily. 2006. "All in due time: The development of trust in computer-mediated and face-toface teams." *Organizational Behavior and Human Decision Processes*:16-33.
- Wolff, Kurt H. (Ed.). 1950. *The Sociology of Georg Simmel*. New York: The Free Press.
- Zolin, Roxanne, and Pamela Hinds. 2002. "Trust in Context: The Development of Interpesonal Trust in Geographically Distributed Wok Teams." in *CIFE working paper*, edited by Stanford University. Stanford: Center for integrated facility engineering.

Third paper (C)

Flow, bridges and brokers: Exploring the development of trust relations in a distributed work group

Tom Erik Julsrud^{ab}

^a Telenor Research & Innovation, N-1331 Fornebu, Norway

^b Norwegian University of Science Technology, N-7491 Trondheim, Norway

Abstract: During the last decades several important empirical studies has documented that trust is important for the efficiency of distributed groups (Piccoli and Ives 2003; Wilson, Straus and McEvily 2006). It has also been documented that more task oriented forms of trust (i.e. swift trust) more easily develops in such teams, than affective trust forms (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002; Meyerson, Weick and Kramer 1996). Much poorer understood is the underlying mechanisms that generate different types of trust within distributed groups in the first place. In this article findings from a study of affective and cognitive trust relations in a group of distributed engineers is presented, and it is demonstrated how these trust forms followed slightly different patterns. The findings indicate that "trust brokering" occurred along both dimensions and that these activities were crucial for the development of trust in the group.

Key words: interpersonal trust, active trust, distributed work, trust brokers, social networks.

Reference: Julsrud, Tom E. 2008. "Flow, bridges and brokers: exploring the development of trust relations in a distributed work group." *International Journal of Networking and Virtual Organisations* 5:83-102.

1. Introduction

The phenomenon of distributed work⁹³ has received significant attention during the last decades (Duarte and Snyder 2006; Hinds and Kiesler 2002; Jackson and derWilen 1998; Jones, Oyung and Pace 2005; Lipnack and Stamps 2000). Spurred by organizational macro-trends like internationalization, sub-contracting, collaboration in business networks and more flexible work practices by individuals, distributed work seems to be increasingly common in knowledge based companies (Castells 1996; Knoke 2001). The increased use of communication technologies, infrastructures and tools support distributed work practices by giving new opportunities for interaction and communication across distance.

Whereas collaborating in distributed groups is emerging as a common way of working – perhaps also the most common way of working in the near future – the ability to monitor or control the other party is drastically reduced in such groups. This is one central issue that has evoked an increased need for trust in virtual teams. Even if interaction on web-based infrastructures and software applications like e-mail, instant messaging (IM) and mobile communication provides rich opportunities for instant communication, it often lacks the differentiating cues that influences judgments about trustfulness (Nissenbaum 2004).

Several important empirical studies have documented that trust is important for the efficiency of distributed groups (Piccoli and Ives 2003; Wilson, Straus and McEvily 2006). It has also been documented that more task oriented forms of trust (i.e. swift trust) are more easily developed in such teams than more affective trust forms (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002; Meyerson, Weick and Kramer 1996). Much poorer understood is the underlying mechanisms that generate the different types of trust within distributed groups in the first place. Why do some groups manage to establish trust while others never succeed? And what kinds of social mechanisms are involved when trust is established and sustained in dispersed groups?

Based on a study of social relations within a distributed group, this article investigates these issues further. The article first maps out one crucial dimension in discussions about development of trust, emphasizing different ways of understanding trust: as embedded in everyday routines and institutions, or as related to active trust-building. I will then move on to describe the development of trust relations in one group of distributed workers in a Nordic engineering company. This case involved a group of professionals that were challenged by working together across national and

⁹³ There is no single definition available for the term “distributed work”. In line with most current studies (Hinds and Kiesler 2002) we will define this as “collaboration across geographical distance assisted by various information and communication technologies”.

cultural boundaries over a period of 15 months. The study suggests that relying on institutional norms or routines might not be enough to create trust in such groups, but need to depend on individual employees' active efforts to "connect" with others across boundaries of culture and distance to avoid fragmentation.

2. Building trusting relations across distance

During the last decades trust has increasingly been discussed as a core term important for understanding various organizational processes, including the running of successful distributed work groups (Jarvenpaa and Leidner 1999; Panteli 2003; Piccoli and Ives 2003; Wilson, Straus and McEvily 2006; Zolin, Hinds, Fruchter et al. 2004). Turning to the broader field of organizational trust theories, however, different aspects is accentuated to explain why trust emerges in the first place. Even though there are multiple answers to this it is possible to draw out some important "points of departure" that pervade much of the writings and empirical enquiries in the field.

3.1 Active and passive trust

One such dimension is concerned with the role of individual actors. In ethno-methodological and phenomenological inspired understandings, trust is usually seen as embedded in every day actions, role-taking and routines (Garfinkel 1967; Goffman 1959; Schütz 1967). From this point of view trust is often envisioned almost as a passive state of mind that regulates much of people's way of acting and relating to each other. Trust is produced and reproduced when individuals take part in everyday actions and situations and perform their roles as expected. This point of view has later been re-developed in institutional perspectives on trust, in particular through the work of Zucker (1986). According to Zucker institutions are essential as a guarantee for trust in society, although it is a guarantee that we usually take for granted. Institution-based trust is developed based on a shared expectation derived from membership of a profession, association or by intermediate mechanisms such as bureaucracy, banking or legal regulation. Theories of trust as embedded in economically and technically based systems also emphasize how particular settings and institutions evoke trustfulness (Luhmann 1979; Luhmann 1988).

On the other hand there is a stream of theories that see trust as a more *active process*, related to individuals' intentional interaction and communication. This view, firstly, has roots in game-

theoretical and economic approaches, understanding trust as a rational choice (Axelrod 1984; Dasgupta 1988; Elster 1983)). Axelrod (1984), for instance, approaches trust from the perspective of game theory, and he systematically investigates advantages or disadvantages of various trust-strategies. In his famous prisoner-dilemma type of game, he found that the “tit-for-tat strategy” was the one that was beneficial in most cases; involving cooperation in the first round and then do whatever the other has done in the previous round. Second, there is a more recent stream of theories seeing trust not as a strategic game, but still more based on individuals’ deliberate actions. Going beyond the mechanistic predictions of the game theoretical approach, these approaches emphasize the necessity of seeing trust as an active process that individuals cannot take for granted (McEvily and Zaheer 2004; Möllering 2006). Most notably Giddens has proposed the term *active trust* to denote how many individuals in modern society need to work on trust relationships through active interaction and communication (1991, 1994). Active trust implies a reflexive process, which requires that it is constantly reproduced in order to result in a stable or at least continuous relationship. According to this way of approaching trust this does not “only happen” to the participants as they enter a particular situation, but it is something that has to be “energetically treated and sustained” (Giddens 1994, 186). Based on the work of Giddens, Möllering has more recently elaborated on the active approach focussing on the importance of a particular “leap of fait” (or suspension as he prefers to call it) to build up trust (Möllering 2006).

In the field of distributed work and virtual teams the role of active trust may be particularly important, in particular in cases of mergers where the institutional “frames” are lacking or are weak. They may often represent “weaker situations” as they provide little guidance or incentives to behave in a particular way, and do not provide powerful cues that lead individuals to interpret events in a similar way (Dirks and Ferrin 2001). The situation itself may be new and unfamiliar to the participants, and the norms and routines different in formerly unrelated organizational units. Current studies of distributed work have noted that it is advantageous that someone in the group take particular responsibility to facilitate interaction between distributed units or partners (Duarte and Snyder 2006; Pauleen 2003). Yet, the idea of seeing trust as actively built up by trust facilitators has not been much discussed in studies of distributed work. In this paper the duality between passive and active trust will be used as a backdrop to an empirical analysis of how trust slowly developed within a distributed group of engineers working across strong cultural boundaries. I will do this by applying some central emerging analytical ideas embedded within social network approaches.

3.2 Trust networks

In general trust can be defined as “a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of others” (Rousseau, Sitkin, Burt et al. 1998) (p. 395). This widely used definition emphasizes that trust is a subjective perception of others’ intentions and potential future actions. Even though it demarks trust as a psychological state, it does not necessarily follow that trust is unrelated to the social settings or environments. On the contrary, the perceived vulnerability and the expectations of others will to a high degree depend on actors’ positions in a social system, the risks and dangers they experience, and the possibilities of observing or controlling the actions of others. Therefore, trust is at the same time an individual state of mind, but also strongly constrained, created or supported by social factors.

Trust may have a general form, as in the form of dispositional trust (Mayer, Davis and Schoorman 1995). Yet in many situations this is a positive attitude towards particular others at the workplace, neighbourhood or in the family. This dimension of trust is often denoted interpersonal or *relational trust*. Recognizing the relational aspects of trust, several scholars have suggested that a social network approach is a fruitful way to approach trust empirically and theoretically (McEvily, Perrone and Zaheer 2003; Möllering 2006; Tilly 2005). A network approach to trust in distributed groups draws attention to how this is built up through a set of dyadic ties, and as such it can give a more detailed picture of the “flow of trust” within a group than traditional approaches.

Accentuating trust as a network phenomenon has several important implications. First, it draws attention to the particular structural aspects of trust and how trustfulness follows particular paths within a group. As demonstrated in several case studies, trusting ties is useful as input for conducting structural relational network analysis. As such trust relations can be studied as a particular kind of structural property of a particular group or an organization. Trust networks are usually directed binary networks based on a limited number of indicative questions to find whom individuals tends to trust in a particular social group. Trust is perceived as a resource that *flows* within a social network, constrained or supported by the kind of ties and bonds that exist. Relations that manage to connect otherwise disconnected network constellations can be described as *bridges*. Trust networks can also be compared to other relational networks, and regular structural measures can be applied to get a clearer picture of their constellations and how they relate to other types of ties.

Second, a relational view on trust opens for a dedicated analysis of the role that individuals display in trust networks (Boissevain 1974; Krackhardt and Brass 1994; Rogers and Kincaid 1981). Turning the attention to trust as a flow within a web of relations opens for a deeper understanding of the position individual’s display in the trust flows. In network structures typical positions are connectors, hangers-on, isolates, bridges and brokers. As argued above, I will here in particular look

for nodes in trust networks that are central in connecting de-centralized units of a group together. Individuals displaying such a position can be described as *trust brokers* (Julsrud and Bakke 2007). Trust brokers are particularly important for distributed groups because they tend to “reach out” and create bridges between formerly disconnected units. As such trust brokers are closely related to the concept of active trust in distributed work groups.

3.3 Affective and cognitive dimensions

Interpersonal trust is a multidimensional construct with both cognitive and affective foundations (Boon and Holmes 1991; Lewis and Weigert 1985; McAllister 1995). The *cognitive dimension* refers to the calculative and rational characteristics demonstrated by trustees, such as reliability, integrity, competence and responsibility. *Affect-based trust*, on the other hand, involves emotional elements and social skills of trustees. Care and concern for the welfare of partners form the basis for this type of interpersonal trust. The affective aspects of trust have in particular been studied in close relationships, but they have also been found to be important in work-related relationships

It has also been argued that in temporary and distributed groups the cognitive aspects are dominating, because there are fewer opportunities to develop affective ties (Meyerson et al. 1996, Jarvenpaa and Leidner 1999). Yet recent studies of trust in organizations tend to emphasize the importance of also capturing the affective side of the concept (Kramer and Tyler 1996). Kanawattanachai and Yoo found in a study of virtual student teams that high performing teams were more likely to maintain high levels of affect-based trust than low-performing teams (Kanawattanachai and Yoo 2002). Hence, the studies of trust flows within groups should strive to capture both cognitive and affective dimensions, and I will in this article include both dimensions.

A central idea in interpersonal trust theories has been that cognitive forms of trust precede affective forms. Affective trust may grow out of more professionally based relations over time, it is argued (Lewicki and Bunker 1996). Former studies have found empirical evidence that cognitive trust affects positively on affective trust, even though they appear as unique types of trust, with distinct patterns of association to antecedent and consequent variables (McAllister 1995).

3 Methodology and research questions

Although there has been a renewed interest for applying a network approach on small organizational groups, this is so far mostly done on larger samples, and mainly by analyzing interaction based ties (Sparrowe, Liden et al. 2001; Cummings and Cross 2003). The design of the current study is a combination of different methodological strategies, including qualitative interviews with individuals as well as quantitative studies of group-based social networks. The data gathering included an explorative qualitative study, followed up by a quantitative enquiry, targeted at issues evolving out of the explorative phase. Yet, in the initial phase a general questionnaire was distributed to get baseline information about satisfaction, performance and interaction patterns. Together with other distributed work groups, Delta was followed over approximately 15 months. The result presented in this article is based on the group-based network data as well as data from the qualitative interviews. The qualitative results will, however, be combined with findings from the network study. Note that all names of individuals and groups used in this article are pseudonyms, as well as the nationality of the units.

3.1 Research questions

The interest in this study is to look for network related mechanisms involved in the development of affective and cognitive trust in the group. The focal interest is the role individuals play in forging new ties between distant individuals and units, along the lines of cognitive and affective trust. Two research questions have guided the study:

1. Does the affective trust network follow the same flows as the cognitive trust network?
2. Are there nodes in trust networks that “transmit” trust across the boundaries more than others?

Even though the attention towards the two dimensions of interpersonal trust discussed here has been caught by earlier studies of distributed work, the structural dimensions of these have not been much in focus. The network design gives unique opportunities to study the flow of cognitive and affective trust in detail. Second, the transmission of trust across remote individuals and units is particularly important in distributed groups. If we find that certain individuals actively forge such ties it might give empirical evidence for the idea of active trust building in distributed groups.

3.2 Qualitative interviews

Prior to the main quantitative network study, semi-structured interviews were conducted with employees and managers to get a better picture of their work situation. The interviews followed an interview guide focusing on the respondents' main work tasks, social relations, and identity in group/organization and trust issues, and lasted 30-40 minutes. 11 of the 13 employees in Delta were interviewed. (Two of the employees in the group were not available for interviews due to a shift in job assignments and sickness.) In addition, interviews were constructed with individuals outside the group, including the leader's superior executive and other managers in the company. The rationale for this was to get a better understanding of the group's tasks and position in the company by including "outside perspectives".

During the qualitative study intermediate reports and preliminary analyses were made. The interviews were coded as text files (using NUD*IST software) and the main issues and topics from the interviews were classified. I used this coding as input for the subsequent social network module and for integrated analyses.

3.3 Social network study

In the social network part of the study, interactions were registered through a web-based questionnaire and coded in a case-by-case social network matrix. All network data was gathered through retrospective reports of the frequency of communication during a week. The data was gathered after a period of 19 months working as a distributed group. Before the distributed work was established no ties existed across the national units.

The group members were asked to indicate interaction-based as well as trust-based relations. A traditional "roster" design was used to the network study, whereby each group member received a list of the other members in the group (Wasserman and Faust 1994a). The response to the survey was good, and after two reminders, all the employees in the groups save one had completed their questionnaire. The data was coded as regular 1-mode social network data in sociomatrices for valued data, and analysed by UCINET and NetDraw software packages⁹⁴.

⁹⁴ Closer description of social network measures and techniques can be found in Wassemann and Faust (Wasserman and Faust 1994b) and in the UCINET software manuals (Borgatti, Everett and Freeman 2002).

Table 1. Questions used to track trust flows and interaction in Delta

Cognitive trust	Whom in your group would you talk to if you needed a professional advice in your daily work?
Affective trust	If you were planning to apply for a job similar to the one you have today, but in another company; whom would you prefer to discuss this with?
Interaction based ties	Whom in your group have you contacted during the last seven days, and how often? (daily, weekly, monthly)

As described above the study intended to include both cognitive and affective aspects of trust⁹⁵. Table 1 shows the questions were used to capture these dimensions.

The idea behind the affective trust formulation is that this type of discussion would imply trustfulness as disclosure of such plans would be negative for the reputation of the individual in question⁹⁶. Indirect questions are the most usual way to analyze trust based relations in organizations (Burt and Knez 1996; Krackhardt and Hanson 1993). It should be noted, however, that such questions always involve a risk of neglecting individuals that have a more introvert nature, or simply prefer not to talk to anybody about such plans (even if they have trustful ties within the group). The cognitive trust question tried to capture the knowledge based ties in the group, based on professionalism.

As a general question capturing the general interaction patterns in the group the informants were asked to describe whom they had been in contact with the last seven days, involving both mediated and non-mediated channels, and intensity of interaction (daily, weekly, monthly). In this article the daily interaction frequency will be used as an indicator on general interaction frequency. The network study will rely on some general concepts and terms including density, degree of centrality, E-I index, and brokerage, which will be further explained in the next chapter.

⁹⁵ In his extensive study of trust among 194 managers, McAllister used 12 items to capture affective and cognitive dimensions of trust (see McAllister 1995, p.37). I have here chosen to use two indicative questions that try to capture the essence of the terms.

⁹⁶ This strategy is similar to the one used by earlier network studies on trust in organizations (Burt and Knez 1996; Krackhardt and Brass 1994; Krackhardt and Hanson 1993).

4. Empirical study

4.1 About Delta

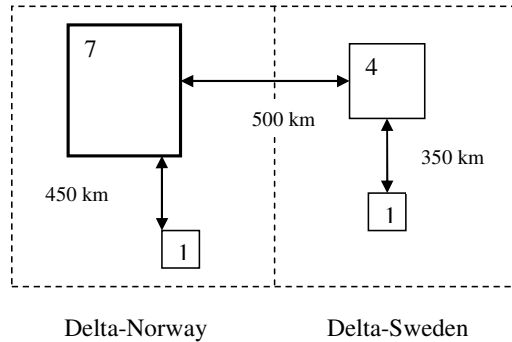
Delta is a group of 13 technical experts working across the boundaries of two Nordic companies, situated in Norway and Sweden. The group was established after a Norwegian engineering company bought a smaller Swedish company. In the new and more international company, the Delta group got an important role in building up a common technical product line that could be used in two different markets. As such the group was central in the work involving integration of former technical products into a new set of technical products developed for the business consumer market. The group had monthly face-to-face meetings when we investigated them, and their regular interaction took part by the use of e-mails, audio-meetings, telephone calls and occasionally video conferences.

Our early study of the communication and interaction in the group revealed that they had experienced problems in the collaboration in the group the first year. The qualitative interviews indicated that many employees found the collaboration in the group inadequate and that there was a sense of “local orientation” in the group. Some of the employees in Norway blamed their group manager for not being active enough to foster collaboration across the national (and organizational) boundaries. The Swedish employees were worried that their Norwegian colleagues were taking over all the attractive tasks and assignments, as they appeared as the stronger part after the acquisition. Thus, the distributed group of experts faced several problems in the first period.

“As I see it, Delta has not functioned as one group across the two countries. We see each other too seldom, and few of us are actually working together. We are a highly divided group, from my point of view....”
(Eva, Female Delta employee)

The Norwegian employees expressed significant dissatisfaction with the Swedish manager who, according to several employees, spent too little time at their location. However, the organizational structure also made the interaction across the boundaries demanding: Delta was a group where all participants were experts working in the same technical field. Yet, in their daily work, much of the employees’ tasks were related to technology oriented projects, that often had a long duration and involved employees outside the group. According to the manager in the group (and also some of the employees), the projects was the prime focus for most employees. This made the group vulnerable to activities and constraints put on the employees from projects.

Figure 1. Number of employees at main locations in Delta



Moreover, their work was challenged by different types of boundaries. On the one hand the national boundary that also reflected a difference in organizational cultures. While the Swedish group had been part of a smaller and fast-changing company, the Norwegian group came from the opposite: a big and hierarchical company with a high degree of formalism and clear work routines. This cultural difference was blended with national differences and identities that in some cases seemed to enhance the cultural gap between the two units. The other boundary was a pure distance boundary that was present not only between the two countries, but also inside the two countries. In both countries one employee was located in a different city, due to personal and organizational circumstances. In this article, however, we will mainly pay attention to the boundary constituted by national and organizational boundaries.

4.2 Network concepts and measures

Applying a network approach to a small group means that the individuals are seen as nodes in a network, integrated through a web of stronger and weaker relations (Kadushin 2005; Katz, Lazer, Arrow et al. 2005). To capture the relations and networks in Delta, a limited number of measures are used, and these will be briefly described in the following.

Indegree centrality indicates the number of incoming lines for each node in a directional node-by-node network (Wasserman and Faust 1994a). The indegree of a node n_i in an ordered set of nodes is then the number of arcs that terminate at n_i . The *density* of a network is measured as the number of actual connections as a proportion of the maximal possible connection, going from 0 to 1.

For a directed graph the density is calculated as the number of arcs (L) divided by the possible number of arcs. For relations describing a distributed work group there is usually a particular need to describe relations that cross boundaries between two places. For this purpose the *E-I Index*, as developed by Krackhardt and Stern will be used (Krackhardt and Stern 1988). This indicator compares the external ties with the internal ties for groups within a network, ranging from -1 to +1. Given a partition of a network into a number of mutually exclusive groups, the E-I index is the number of ties external to the group minus the number of ties that are internal to the group divided by the total number of ties. Maximum collaboration across the boundaries is then +1 (all links are external), while equally divided links will give an index equal to zero.⁹⁷

To measure boundary-crossing relations I will, however, also look at the proportion of *boundary-crossing cliques*. This is based on the traditional concept of *cliques*, indicating a maximally complete sub-graph within a larger network. In directed networks, cliques are usually found by focussing on those ties that are reciprocated, and the Bron and Kerbosch (1973) algorithm is used to find all Luce and Perry (1949) cliques larger than three (as is the default option in UCINET). The proportion of boundary-crossing cliques, i.e. cliques involving employees from both groups, is then sorted out. This indicated important areas for establishment of trust and stability across boundaries.

Table 2. General network indicators for cognitive trust (C-Trust), affective trust (A-Trust), and daily interaction through all communication channels (Interaction).

	Arcs	Density	Network Centralization (In-degree)	Boundary Crossing Cliques (prop.)	Local Density	E-I Index
Interaction	36	0.158	20.83	0.33 (1/3)	0.286 (No) 0.800 (Sw)	- 0.778
C-trust	62	0.429	45.83	0.5 (5/10)	0.429 (No) 0.275 (Sw)	- 0.290
A-trust	16	0.064	20.14	0 (0/1)	0.179 (No) 0.100 (Sw)	- 0.500

⁹⁷ Note that due to the differences in numbers, the Swedish employees are in this analysis described as “external” and the Norwegians as “internal”.

4.3 Structural aspects of trust

The *interaction network* in the group indicated firstly that most interactions were taking place in the local (national) units. There were more interactions going on within the local units than across the units, and in particular the Swedish group was interacting more frequently with their local unit than across the boundary. The density for the interaction network was here as high as 0.8. The high negative E-I index also suggests that most ties are local, and daily interaction is highly place-dependent. Yet, there is one boundary crossing clique, and as can be seen from figure 2, this clique involves Kristoffer, Stein and David. Note that one Norwegian employee, Vidar, did not have daily contact with the others in the group. This is the one Norwegian employee that had his office in another city than the main office.

Turning to the *cognitive* trust dimensions, a striking feature of the group is that this type of trust is much more widespread than the affective type. The high density (compared to the other networks), suggests that the participants in Delta were confident that the others in the group could help them solve difficult work-related issues. As indicated by the low E-I index; this network is much more boundary-crossing, suggesting that there is a certain recognition of the remote individuals' knowledge and competence. The centralization index, however, is also higher for cognitive trust than the interaction network, indicating that the competencies are not equally distributed in the network (which would be unlikely in this type of knowledge based community). Yet, the local ties, based on cognitive trust, are higher among the Norwegian groups, indicating that they tend to turn to each other for advice while the Swedes also turn to the Norwegians.

The *affective trust network*, based on personal dimensions of trust and personal oriented risks, are more sparsely distributed. This type of trust is more difficult to develop, as it is based on a more personal relationship, rather than knowledge and competence. Yet, as discussed in the earlier sections of this article, there are reasons to believe that this form of trust is particularly useful for groups that are distributed (Kanawattanachai and Yoo 2002). As one would expect, this trust is more locally oriented than cognitive trust, even though (as indicated by the I-E index) there is one boundary crossing relation. Interestingly, however, the local density of the affective trust was much lower for the Swedish employees than for the Norwegian group. Even though the interaction networks were denser among the Swedish employees, there appears to be lower levels of affective trust in this part of Delta. Actually, there was only one affective trust relation within the Swedish group, from Kristoffer to Carl. Figures 2 and 3 illustrate the structure of the cognitive and affective trust networks in Delta.

Figure 2. Daily interaction (Blue = Swedish, Red = Norwegian)

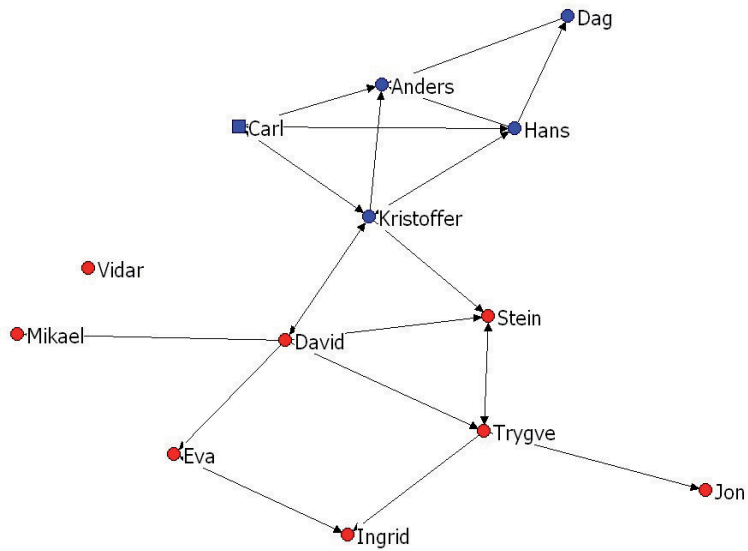


Figure 3. Cognitive trust (Blue = Swedish, Red = Norwegian)

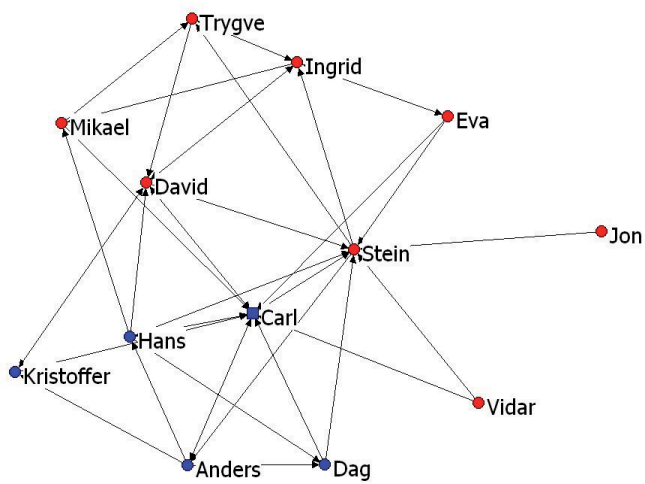
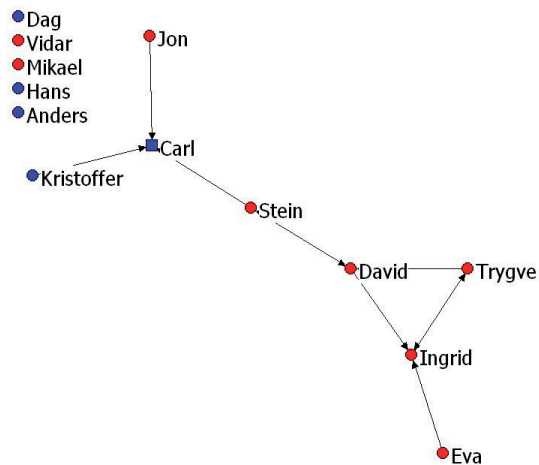


Figure 4. Affective trust (Blue = Swedish, Red = Norwegian)



The two trust flows were highly similar, although not isomorphic. A simple QAP correlation⁹⁸ based on permutations found that there was a significant correlation between the two trust forms ($r = 0.278$, $P < 0.01$). Affective and cognitive trust does then go rather close together in this case. The same do interaction-based relations and cognitive trust ($r = 0.255$, $P < 0.01$) but not the affective trust and interaction networks ($r = 0.179$). Thus, the interaction patterns in the group tended to be more similar to the flow of cognitive trust than the affective.

4.4 Brokers in the trust networks

A role-oriented analysis of trust networks can help illuminate who in the distributed group that is central in connecting affective and cognitive trust-networks. The general Indegree centralization scores for the two trust networks in Delta indicate that the manager; Carl, as well as Stein and David are most trusted when it comes to solving professional problems (see table 2). When it comes to the

⁹⁸ UCINETs QAP correlation procedure is based on permutation of rows and columns together with one of the input matrixes, and then correlating the permuted matrix with the other matrix. This is repeated hundreds of times to build up a distribution of correlations under the null hypothesis of no relationships between the matrixes. A low p-value ($< .05$) suggests a strong relationship unlikely to have occurred by chance.

affective dimension, however, Carl and Ingrid are most trusted. Two employees, Jon and Vidar are only weakly connected to the trust networks.

Of particular interest in trust networks are individuals that can transmit trust between the boundaries of distance. Individuals that have ties that cross this boundary may be described as brokers if they also connect to others in the network. In social network terms *information brokerage* occurs when, in a triad of nodes A, B and C, A has a tie to B, and B has a tie to C, but A has no tie to C. That is, A needs B to reach C, and B is therefore a broker (Fernandez and Gould 1994). When A, B, and C may belong to two different groups, different kinds of brokerage across boundaries are possible including gatekeepers, representatives and consultants.⁹⁹ For trust brokerage, however, the central issue is not dealing with information but being in the position of developing affective or cognitive trust ties across boundaries. As such the process of developing trust is not primarily dedicated to exploitation of the “structural holes” between disconnected nodes, but rather to connect distant nodes into denser constellations (Burt 1992; Julsrud and Bakke 2007). Therefore, the labels gatekeepers, representatives and consultants take on a slightly different content in trust networks; “Gatekeepers” are nodes that are being trusted from a distant node, while also trusting others in the group; “Representatives” are trusting a distant node, while being trusted themselves by a local node; and “Consultants” are being trusted by a distant node and also trusting a distant node themselves (see figure 5).

Calculating the number of brokerages relations for each individual in the trust networks indicate, first, that Carl, Stein, David, Anders, Ingrid and Mikael are the ones receiving cognitive trust across boundaries in Delta, acting as “gatekeepers” (see table 3). Most important among these were Carl, Stein and David, and they were also the ones that tended to trust others more frequently across the boundary. Carl, Stein and David were also the members that displayed “consultant” types of cognitive trust ties in Delta. These three group members then may be said to be the most salient trust brokers within the cognitive trust network.

⁹⁹ For information brokerage between three groups, five types of brokerage may occur, including coordinator, consultant, gatekeeper, representative and liaison. See Fernandez and Gould (1994).

Figure 5. Central broker positions in trust networks (Dark node = broker)

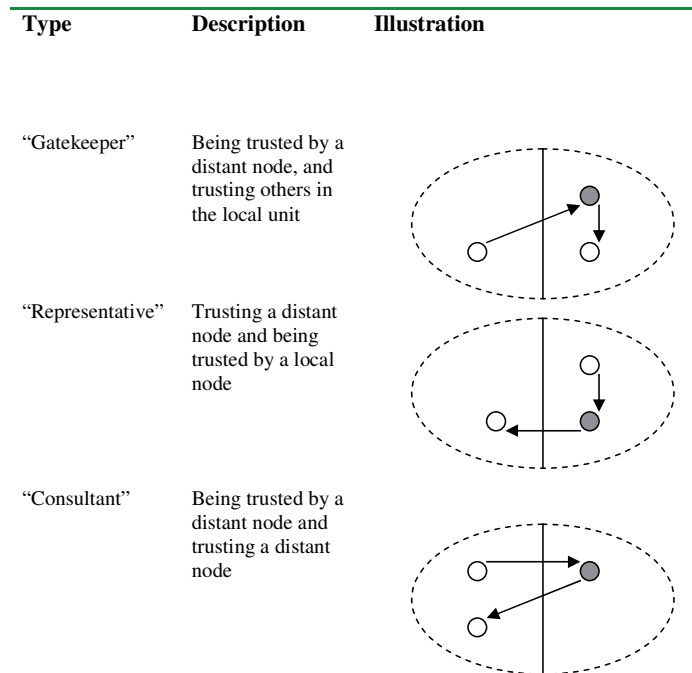


Table 3. Normalized Indegree Centralisation for Delta. Affective trust, cognitive trust and daily interaction

	A-trust	C-trust	Interact
Ingrid	25	33,33	16,67
David	16,67	41,67	8,33
Trygve	8,33	25	16,67
Jon	0	0	8,33
Stein	8,33	58,33	25
Dag	0	16,67	8,33
Eva	0	8,33	16,67
Kristoffer	0	16,67	25
Vidar	0	0	0
Mikael	0	16,67	8,33
Hans	0	16,67	16,67
Anders	0	16,67	33,33
Carl	25	66,67	16,67
Indegree Network Centralization	20,14	45,83	19,44

Table 4. Position trust-networks measures in Delta

	Gatekeeper (Receive trust across distance)		Represent (trusting ties to distant others)		Consultant (receive and give trust across distance)		Sum
	A-trust	C-trust	A-trust	C-trust	A-trust	C-trust	
Ingrid		3		1			4
David		4		4		2	10
Trygve							0
Jon							0
Stein		6	1	4		2	12 (1)
Dag				1			1
Eva				1			1
Kristoffer				1			1
Vidar							0
Mikael		1		1			2
Hans				4			4
Anders		4					4
Carl		8		4		4	16

In addition there was a group of employees who trusted one or more distant employee (Hans, Kristoffer, Eva, Dag) and a group who did not trust distant employees at all (Trygve, Jon, Vidar). Along the affective dimension, there was only one employee who had trusting ties across the boundary; going from Stein to Carl. As the latter did not trust any one along this dimension he does not figure as a receiving broker in the table. Even though this trust-tie is not reciprocal (Stein would go to Carl to discuss a potential change of job, but not the other way round) it indicates that Stein might be in a central position in the group, related to the development of trust across the boundaries. He is positioned in the affective trust-network as a trust-based cut-point in between the two units.¹⁰⁰ In this

¹⁰⁰ A cut point is one whose removal would increase the number of components by dividing the sub-graph into two or more separate sub-sets between which there is no connection (Scott 2000).

group of distributed workers, Stein is also the only one who had both affective and cognitive trust ties across the boundary.

5. Discussion

At the beginning of this article two central ways of understanding trust were presented; one approach seeing trust as embedded in rituals, roles or institutions; another seeing trust as individually created and developed. These two approaches are not antagonistic; in most corners of society institutional forms of trust interact with individual forms. Yet, in some situations the possibilities for institutional trust is low, and there is uncertainty about how to interact and collaborate. In the literature these are sometime called “weak situations” as they provide little guidance or incentives to behave in a particular way, and do not provide powerful cues that lead individuals to interpret events in a similar way (Dirks and Ferrin 2001). Distributed work groups probably often have a weak situational strength, and this was certainly the case of Delta. The employees trusted each other reasonably well in professional matters, but had weakly developed affective trusting ties across the two central national units. In this section I will discuss this further, taking up the central research questions raised earlier in this article regarding the interrelatedness of cognitive and affective trust, as well as the development of boundary-crossing relations within the trust networks.

4.1 Structures of affective and cognitive trust

Earlier work has found that cognitive trust is more easily built up and sustained in distributed groups than affective trust (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002). Further, it has been assumed that cognitive types over time affects positively on affective trust (Lewicki and Bunker 1996; McAllister 1995).

This study provides additional evidence that the cognitive trust ties are easier and faster to establish in distributed work groups. The affective trust relations tended to be more bound up with co-located employees, although we found that in one of the local units there was a general lack of affective trust ties. In this case study we found that the affective and cognitive trust types had a high

degree of structural similarity, indicating that the differences are not random. Much in line with earlier studies this case found that cognitive and affective trust ties were closely inter-related.

However, we also found interesting differences in how people were positioned in the trust and interaction based networks. Kristoffer, for instance, was in a cut-point position in the interaction based network, he was not central in the trust networks. This person seems to be important as a node for much of the interaction in the group, yet he was not important for the affective trust within the group. In the affective network Kristoffer had a position similar to Eva and Jon, as “hangers-on” connected to the network through a one-directional arc. Ingrid, on the other hand, was not particularly central in the cognitive trust network, but she was the most trusted Norwegian employee along the affective dimension. This indicates that even though the two dimensions follow similar structures, there might be important individual differences.

4.2 Building trust across distance

An interesting issue for trust studies in distributed groups is how trust is built over time. Earlier studies of trust in distributed groups have on the one hand argued that trust needs time to develop in distributed groups (Wilson, Straus and McEvily 2006), as well as regularity and timing of their face-to-face meetings (Maznevski and Chudoba 2000; Zolin and Hinds 2004). On the other hand studies have emphasized that trust development also depends on clear goals and objectives (Jarvenpaa and Leidner 1999; Panteli 2005) as well as a managerial style that is not too rigid and control oriented (Piccoli and Ives 2003). In general trust is assumed to develop over time as groups interact more frequently, although it may be spurred by certain kinds of active leadership. Thus, both the active and the more passive approaches to trust building have been reflected in the research so far.

This study adds to this research by pointing at how trust builds up through certain trust-nodes in the cognitive and affective networks. Interpersonal trust did not evolve equally within the group, but followed certain patterns. In Delta there were three cognitive trust brokers, involving the manager (Carl) as well as two other employees (Stein and David). These three were more often trusted by others across the boundary, and they also had more trusting ties to their distant colleagues. In addition there was one affective, boundary-crossing tie from Stein to Carl, representing an important bridge between the two local units. Actually, Stein appeared as a “double trust broker” in this group since he had built both cognitive and affective ties across the boundary. Even though there was a relatively high degree of dissatisfaction with the managers and the way the group was run, Stein was the only one in the interviews that emphasized the importance of building internal relations in Delta:

“...this group needs to develop relations between the participants over time [...]. We cannot move the Swedish employees over here, so we have to develop the relations little by little. When we build these relations we also build the group stronger....” (Stein, Norwegian employee)

In sum the case of Delta gave strong evidence that trust in distributed work groups needs to be generated actively by individual employees to avoid fragmentation. These are individuals that intentionally try to build up trust in a group, as they see that this is necessary to get the distributed group to work together. It is interesting to note that in the case of Delta, the most important trust-broker was not the manager, but a regular employee with high competence and trustfulness among his co-located and distributed peers. The attitude displayed by Stein in the citation above seems to resemble the idea of active trust proposed by Giddens (Giddens 1994). In contemporary life, and perhaps in particular in highly flexible organizations, trust needs to be worked on, as much of the traditional institutional frames are lacking or changing or “reconstructed”. (It also seems to match the theory of Krackhardt and Stern.)

4.3 Implications of the study

It should be noted that the data presented here has certain limitations. Mapping trust relations based on single item questions involves the risk of missing important nuances in relationships, or overstating the meaning of a registered tie. The use of self-reporting interaction frequencies is also relatively low on reliability, compared to data generated through observations or data-assisted registration (Bernhardt, Killworth and Sailer 1982). Also, the case discussed here might be a relatively “difficult” case since it involved a group that was established in the wake of a company acquisition. This setting might have resulted in particular difficulties in establishing affective trust ties.

However, there are reasons to believe that the trust networks reported here reflect reasonably well the way the individuals in the group trusted each other at the time of the study. An advantageous aspect of these data, however, is that it is based on “real” distributed workers within a knowledge based organization, and not groups of students (as most of the former contributions dealing with trust in distributed groups).

By focussing on interpersonal trust as flows within a network, the study represents a novel and supplementing approach to existing studies in the field. This approach may be followed up in subsequent studies using more elaborated techniques, new cases and also larger data sets. One interesting area for further research is to follow the development of social structures in distributed groups over time. A time study of network development could, for instance help reveal the steps

involved in the development of denser trust networks in distributed groups over time. Another area that deserves closer examination is the way trust interacts with the regular use of communication media such as e-mail, Instant Messages (IM), mobile phone applications, web-based applications, and more. It would be of interest to know more about how such tools are used actively by trust brokers in distributed groups to build up affective and cognitive trust.

6. Conclusions

Trust networks are based on networks of individuals that have cognitive or affective interpersonal trustful relations to one another. These relations are anchored in subjective perceptions, and they are not necessarily overviewed or reflected upon by the participants themselves. Even so – or perhaps just for this reason – they are important as indicators of the “flow of trust” in a group. This approach to trust is unique in the way that it helps visualise the relational patterns involved in the establishment and construction of trust within a group.

This article has used this approach to discuss further how trust is developed in a group of distributed workers. The case investigated here provided relatively strong empirical evidence that trust was generated through a few nodes in the distributed groups, acting as trust brokers in the network of more or less distributed nodes. Trust brokers were found in cognitive as well as affective trust networks, although the first type was more common. Given that the case of Delta bears similarities with other distributed work groups and teams, such trust-connectors might be important for the development of trust on a more general level. For organizations and researchers interested in trust building in distributed work groups, understanding the flow of trust, and the role of trust brokers, appears as one promising way ahead.

Literature

- Axelrod, Robert. 1984. *The Evolution of Cooperation*. New York: Basic Books.
- Bernhardt, Russel H., Peter Killworth, and Lee Sailer. 1982. "Informant accuracy in social network data V." *Social Science Research*:30-66.
- Boissevain, Jeremy. 1974. *Friends of Friends. Networks, Manipulators and Coalitions*. Oxford: Basil Blackwell.
- Boon, S.D., and J.G. Holmes. 1991. "The dynamics of interpersonal trust: resolving uncertainty in the face of risk." Pp. 190-211 in *Cooperation and Prosocial Behavior*, edited by R.A. Hinde and J. Groebel. Cambridge: Cambridge University Press.
- Borgatti, Stephen, Martin Everett, and Linton Freeman. 2002. "Ucinet 6 for Windows." Harvard: Analytic Technologies.
- Burt, Ronald. 1992. *Structural holes*. Cambridge: Harvard University Press.
- Burt, Ronald, and M. Knez. 1996. "Trust and Third-Party Gossip." Pp. 68-89 in *Trust in Organizations. Frontiers of Theory and research*, edited by R M Kramer and T R Tyler. Thousand oaks: Sage.
- Castells, Manuel. 1996. *The rise of the network society; the information age: Economy, society and culture*. Malden MA: Blackwell.
- Dasgupta, P. 1988. "Trust as a commodity." Pp. 49-72 in *Trust, Making and Breaking Cooperation*, edited by D Gambetta. Oxford: Blackwell.
- Dirks, Kurt T., and Donald L. Ferrin. 2001. "The role of trust in organizational settings." *Organizational Science* 4:450-467.
- Duarte, Deborah L., and Nancy Tennant Snyder. 2006. "Mastering Virtual Teams." Josey-Bass.
- Elster, Jon. 1983. *Sour Grapes: Studies in the Subversion of Rationality*. Cambridge: Cambridge University Press.
- Fernandez, Roberto M, and Roger V Gould. 1994. "A dilemma of state power: Brokerage and influence in the national health policy domain." *American Journal of Sociology*:1455-91.
- Garfinkel, Harold. 1967. *Studies in Ethnomethodology*. Englewood Cliffs: Prentice Halls.
- Giddens, Anthony. 1994. "Risk, trust, reflexivity." Pp. 184-197 in *Reflexive Modernization*, edited by U. Beck, A. Giddens, and S. Lash. Cambridge UK: Polity Press.
- Goffman, Erving. 1959. *The Presentation of Self in Everyday Life*. Garden City, NY: Doubleday, Anchor books.
- Hinds, Pamela, and Sara Kiesler. 2002. *Distributed Work*. Cambridge, Massachusetts: MIT press.
- Jackson, Paul, and J.M Van derWilen. 1998. *Teleworking: International Perspectives. From Telecommuting to the Virtual Organisation*. London: Routledge.
- Jarvenpaa, Sirkka L., and Dorothy E. Leidner. 1999. "Communication and Trust in Global Virtual Teams." *Organization Science* 10:791-815.
- Jones, R., R. Oyung, and L. Pace. 2005. *Working Virtually. Challenges of Virtual Teams*. London: Cybertech Publishing.
- Julsrud, Tom E., and John W. Bakke. 2007. "Building Trust in Networked Environments: Understanding the Importance of Trust Brokers." Pp. 117-138 in *Computer-mediated Relationships and Trust: Organizational and Managerial Effects*, edited by Linda Brennan and Victoria Johnson. Hershey PA: Idea Group Publ.

- Kadushin, C. 2005. "Networks and Small Groups." *Structure and Dynamics: eJournal of Anthropology and Related Science* 1.
- Kanawattanachai, Prasert, and Youngjin Yoo. 2002. "Dynamic nature of trust in virtual teams." *Strategic Information Systems*:187-213.
- Katz, Nanct, David Lazer, Holly Arrow, and Noshir Contractor. 2005. "The Network Perspective on Small Groups." Pp. 277-312 in *Theories of Small Groups*, edited by M. Scott Poole and A B. Hollingshead. Thousand Oaks, California: Sage.
- Knoke, David. 2001. *Changing Organizations. Business Networks in the New political Economy*: Westview Press.
- Krackhardt, David, and D. Brass. 1994. "Intraorganizational Networks. The Micro Side." Pp. 207-229 in *Advances in Social Network Analysis*, edited by S Wasserman and J Galaskiewicz. Thousand Oaks: Sage.
- Krackhardt, David, and J R Hanson. 1993. "Informal Networks: The Company behind the Chart." *Harvard Business Review* 71:104-111.
- Krackhardt, David, and R N Stern. 1988. "Informal Networks and Organizational Crises: An Experimental Simulation." *Social Psychology Quarterly* 51:123-140.
- Kramer, Roderick M., and Tom R. Tyler. 1996. "Whither Trust." Pp. 1-15 in *Trust in Organizations: Frontiers of Theory and Research*, edited by R.M Kramer and T.R Tyler. Thousand Oaks: Sage Publications.
- Lewicki, Roy L., and Barbara B. Bunker. 1996. "Developing and Maintaining Trust in Work Relationships." Pp. 114-139 in *Trust in Organizations. Frontiers of Theory and research*, edited by R. Kramer and T. Tyler. Thousand Oaks: Sage.
- Lewis, J.D., and A. Weigert. 1985. "Trust as a social reality." *Social Forces* 63:967-985.
- Lipnack, Jessica, and Jeffrey Stamps. 2000. *Virtual Teams. People Working Across Boundaries with Technology*. New York: John Wiley.
- Luhmann, Niklas. 1979. *Trust and Power*. New York: Wiley.
- . 1988. "Familiarity, confidence, trust: Problems and alternatives." Pp. 94-107 in *Trust: Making and Breaking Co-operative Relations*, edited by D. Gambetta. Oxford: Basil Blackwell.
- Mayer, Roger C., J.H Davis, and F.D Schoorman. 1995. "An integrated model of organizational trust." *Academy of Management Review* 3:709-734.
- Maznevski, Martha L., and Katherine M. Chudoba. 2000. "Bridging Space Over Time: Global Virtual Team Dynamics and Effectiveness." *Organizational Science* 11:473-492.
- McAllister, Daniel J. 1995. "Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations." *Academy of Management Journal* 1:24-59.
- McEvily, Bill, V. Perrone, and A. Zaheer. 2003. "Trust as an organizing Principle." *Organization Science* 1:91-103.
- McEvily, Bill, and A. Zaheer. 2004. "Architects of Trust: The Role of Network Facilitators in Geographical Clusters." Pp. 189-213 in *Trust and Distrust in Organizations. Dilemmas and Approaches*, edited by R.M. Kramer and K. S Cook. New york: Russel Sage Foundation.
- Meyerson, Debra, Karl Weick, and Roderick Kramer. 1996. "Swift Trust and Temporary Groups." Pp. 166-195 in *Trust in Organizations. Frontiers of Research and Theory*, edited by R kramer and R Tyler. Thousand Oaks, CA: Sage.
- Möllering, Guido. 2006. *Trust: Reason, Routine, Reflexivity*. Amsterdam: Elsevier.

- Nissenbaum, Helen. 2004. "Will Security Enhance Trust Online, Or Supplant It?" Pp. 155-185 in *Trust and distrust in organizations. Dilemmas and approaches*, edited by R. M. Kramer and K. S. Cook. New York: Russel Sage Foundation.
- Panteli, Niki. 2003. "Situating Trust within Virtual Teams." edited by University of Bath School of Management.
- . 2005. "Trust in Global Virtual Teams." in *Ariadne*. www.ariadne.ac.uk/issue43/panteli/: University of Bath, UK.
- Pauleen, David J. 2003. "Lessons learned crossing boundaries in an ICT-supported distributed team." *Journal of Global Information Management* 11:1-19.
- Piccoli, Gabriele, and Blake Ives. 2003. "Trust and the Unintended Effects of Behavior Control in Virtual Teams." *MIS Quarterly* 27:365-395.
- Rogers, Everett M., and D. Lawrence Kincaid. 1981. *Communication Networks. Toward a new paradigm for research*. New York: The Free Press.
- Rousseau, Denise M., S.B. Sitkin, R.S. Burt, and C. Camerer. 1998. "Not So Different After All: A Cross-Disipline View of Trust." *Academy of Management Journal* 3:393-404.
- Schütz, Alfred. 1967. *The Phenomenology of the Social World*. Evanston: North-Western University Press.
- Scott, John. 2000. *Social Network Analysis: A handbook*. Thousand Oaks CA.: Sage.
- Tilly, Charles. 2005. *Trust and Rule*. Cambridge: Cambridge University Press.
- Wasserman, Stanley, and Katherine Faust. 1994a. *Social Network Analysis. Methods and Applications*. Cambridge: Cambridge University Press.
- . 1994b. *Social Network Analysis. Methods and Applications*. New York: Cambridge University Press.
- Wilson, Jeanne M., Susan G. Straus, and Bill McEvily. 2006. "All in due time: The development of trust in computer-mediated and face-toface teams." *Organizational Behavior and Human Decision Processes*:16-33.
- Zolin, Roxanne, P. J. Hinds, R. Fruchter, and R.E. Levitt. 2004. "Interpersonal Trust in Cross-Functional Global Teams. A longitudinal Study." *Information and Organization* 1:1-26.
- Zolin, Roxanne, and Pamela Hinds. 2004. "Trust in Context: The Development of Interpersonal Trust in Geographically Dispersed Work." Pp. 214-238 in *Trust and Distrust in Organizations. Dilemmas and Approaches*, edited by Roderick M. Kramer and Karen S. Cook. New York: Russel Sage Foundation.

Trust, friendship and expertise: The use of email, mobile dialogues and SMS to develop and sustain social relations in a distributed work group

Tom Erik Julsrud^{ab} and John Willy Bakke^a

^a Telenor Research & Innovation, N -1331 Fornebu,

^b Norway, and Norwegian University of Science Technology, N-7491 Trondheim, Norway

Abstract: In this article, we explore how mobile dialogues and mobile text messages (SMS) were used in a communication environment together with email to maintain and develop different social relations among professionals. We apply a cognitive social network approach to see how one-to-one dialogues and SMS were related to different types of social relations within a unit of highly distributed knowledge workers in a Nordic ICT company. Our interest here is particularly directed towards differences between long-term relations of trust and friendship, and intermittent relations, based on professional expertise. Based on a case study of a group of distributed knowledge workers, we found that relations of friendship and trust were less intensively sustained by communication media, than the expertise relations. Trust relations were primarily sustained by written communication (SMS and email), while work relations were supported by all media and in particular mobile dialogues and emails.

Key words: Mobile communication, trust, friendship, social networks, email, SMS, text messages

Citation: Julsrud, Tom E., and John W. Bakke. 2008. "Trust, friendship and expertise: The use of email, mobile dialogues and SMS to develop and sustain social relations in a distributed work group." in *The mobile communications research annual: The reconstruction of space and time through mobile communication practices*, edited by R. Ling and S. Campbell. New Brunswick, NJ: Transaction.

1. Introduction

A central issue in writings about modern and flexible organizations is how new information and communication technologies (ICT) affect organizations and intra-organizational communication. Related to the rapid increase of mobile communication technologies, concepts like “mobile workplaces” and “virtual teams” have been common among organizational developers and within organizational research (Castells 1996; Castells, Fernández-Ardévol, Qiu et al. 2007; Kristoffersen 2000; Lipnack and Stamps 2000; Quan-Haase and Wellman 2006; Urry 2000). Workplaces are becoming less place-bound and increasingly dependent on collaboration across distance assisted by mobile communication tools as well as computer based collaboration tools.

On a very general level, it is acknowledged that information and communication technologies alter the geography of communication, where relations easily can be established between individuals who are situated in different locations. ICTs connect different locations, and their use imply that the boundaries of the respective locations become (re)negotiated: “Instead then, of thinking of places as areas with boundaries around, they can be imagined as articulated moments in networks of social relations and understandings” (Massey 1994) p, 154).

Collaboration can take place through multiple mediated channels despite geographical distance. Such virtual and distributed groups provide opportunities for knowledge building based on expertise located at multiple sites, and to the extent that these different participants represent different perspectives, knowledge types or cultures, it opens for knowledge sharing and innovations in more heterogeneous environments (Cummins 2004; Hollingshead, Fulk and Monge 2002). Portable and individual technologies may ensure instant interaction and feedback ensuring high efficiency and closeness to customer and clients (Julsrud 2005). The challenge, however, is to make sure that different groups and teams are working together without leading to organizational “balkanization”, where groups interact densely without sufficient intermediate contact, or where the internal relations within the group are eroding altogether.

Mobile communication tools and services are important devices that can help share information and knowledge within distributed groups. Yet, mobile technologies are rarely introduced as the only available means for communication. In virtually all cases, the mobile device is part of a larger menu of available technologies, such as face- to-face interaction, emails and others. Nevertheless, studies in this area tend to look for particular qualities of single technologies that determine their use in organizations¹⁰¹. We will in this paper go beyond this single-technology bias and explore how new mobile technologies find their form within a particular social context, and within an existing environment of communication tools. Rather than focusing solely on individual

¹⁰¹ For critiques of single technology studies, see (Krotz 2005; Meyrowitz 1994; Postman 1993).

technologies and their technical properties, we will look at the way three important media technologies worked in concert within a particular group of physically distributed mobile knowledge workers: Two mobile services; telephone conversations and mobile text messages (SMS), and PC-based email messages.

Within the study, we adopt a *social network perspective* to explore how these communication tools were used to establish, support or sustain various types of social and spatial relations. This perspective draws attention away from the technical qualities, towards an understanding of how the communication technology is used in the process of supporting a network of different social relations (Contractor and Eisenberg 1990; Licoppe and Smoreda 2004; Wellman 2001; Wellman, Salaff, Dimitrova et al. 1996). One of the benefits of this approach is that it opens for analyses of the *multiplexity*¹⁰² of relations within a group, and recent studies have used this approach to capture the larger ecology of media used to support collaboration in distributed groups (Haythornthwaite 2001; Haythornthwaite and Wellman 1998).

The social network approach to media and ICT use has received increased attention during the last decade, and research on how new media affects social relations is starting to accumulate (Bryant, Sanders-Jackson and Smallwood 2006; Haythornthwaite and Wellman 1998; Ishii 2006; Yuan and Gay 2006). Yet, there are few empirical studies investigating the role that mobile technologies play in supporting relations among professional users.¹⁰³ A central objective of this study is to contribute towards filling this gap in the literature, and investigate how mobile technologies are applied in a group of professional knowledge workers, collaborating across geographical distance. We will in this article look at various social relations within a distributed group of knowledge workers, and analyze how these relations were related to the daily use of SMS, emails and mobile phone. As such, we will both explore the geographical distance involved in distributed work, and the psychological distance between the distant workers, and their mediated interaction patterns. This article is also anchored in the tradition called *domestication of technologies*, where it is acknowledged that technologies do not determine their use; technologies are malleable, and there is a degree of adaptation and interpretation needed to make technologies “one’s own” and to incorporate them into work practices after they have been acquired (Silverstone and Haddon 1996).

We start the article by describing more closely how a distributed work group can be studied as a social network, constituted by a range of formal and informal social relations. Following this approach a group of distributed workers can be described as inter-connected by a multitude of social relations. These relations constitute a structural social space that will often be of importance to the

¹⁰² Multiplexity is in social network analysis used to describe the number of relations that connects two nodes in a network. The more relations in a tie, the more multiplex is the tie (Garton, Haythornwhite and Wellman 1997). The term “media multiplexity” is usually applied to describe the number of media that is used to support a social tie, e.g. (Haythornthwaite 2005).

¹⁰³ For some notable exceptions, see the work of Koku and Wellman, Quan-Haase and Wellman (Ahuja and Carley 1999; Erickson 1988; Koku and Wellman 2002; Quan-Haase and Wellman 2006).

well-being of the individuals as well as the efficiency of the group. Next, we will propose a rough analytical framework drawing a distinction between subjectively perceived relations and interaction-based relations in groups. It is suggested that observed interactions in organizations can be seen as manifestations of perceived relations, where trust and expertise are central dimensions, but that these relations might operate in different ways. We will then go on to present findings from a case study of a group of distributed workers within a computer company, exploring how the relations were supported by SMS, emails and mobile phone dialogues.

2. Distributed work groups as networks of relations

2.1 The social network approach

Distributed groups and teams have been in the centre of attention for researchers for several years, involving scholars from work sociology, organization studies, communication studies and computer-supported collaborative work (CSCW). Studies in this area address the ways individuals work together despite geographical dispersions, and how they are making use of various communication technologies to support their collaboration (Duarte and Snyder 2006; Hinds and Kiesler 2002; Lipnack and Stamps 2000).

The social network approach offers a novel way to understand such groups and how ICTs are adopted and used (Garton, Haythornwhite and Wellman 1997). Compared to approaches studying groups through characteristic traits of individuals, a social network approach focuses on the various *relations* within the group and the way technologies at hand are applied to support or sustain those relations. Instead of developing an aggregated index of workplace communication based e.g. on usage of e-mails and mobile phone dialogues, a network approach will try to survey the particular relations and structures that are supported by these tools and the different roles individuals display in such networks. Similarly, where traditional perspectives tend to categorize and analyze distributed groups by aggregated scores for trust, identification and efficiency, the network approach would try to look for the relational structures that transmit trustfulness, identification or efficient information-flows. Thereby, the network approach shows greater sensibility for the internal working of the group.

Within the rapidly evolving field of network analysis a number of concepts and techniques have been developed to capture important features and structures of networks and nodes within such networks. This includes network centrality, density, tie-strength, core/periphery structures, cohesive sub units, role analysis and much more (Brehm and Scott 2004; Breiger 2004; Scott 2000; Wasserman and Faust 1994). For researchers interested in studying distributed work groups, social network methodologies offer important analytical tools. Yet, the network approach is more than just a way of

analyzing the data; in a wider context it is a theoretical perspective that draws attention to the relations and structures of relations in a group, not solely on characteristics at the level of the individual or the group (Kilduff and Tsai 2003; Scott 2000; Wasserman and Faust 1994; Wellman 1988).

During the last two decades social network studies of distributed work groups have developed along different paths: One path has been the study of the efficiency of information flow-structures in groups. These studies have focused on a limited number of relations over a large sample of cases in order to find significant differences between high and low performing groups, and they have concluded that groups that perform well tend to have a more hierarchical information structure¹⁰⁴ (Ahuja and Carley 1999; Cummings and Cross 2003; Hinds and McGrath 2006). A second path has focused more on the detailed patterns of interaction within distributed groups and teams and the way ICT supports different ties and tasks. These studies have been analyzing individual cases in depth, usually also using more elaborated qualitative analyses. A central finding here has been that collaborators with stronger ties – such as friends and close colleagues – are communicating more frequently than those with weaker ties, and they also tend to use more media channels to support the ties (Haythornthwaite 2005; Koku and Wellman 2002). Analyses of students working in virtual teams have also shown that different media were used for supporting weak and strong ties (Haythornthwaite 2005).

This article will follow up on the latter path of research, focusing on the various network structures constituted by selected communication media. However, rather than using the traditional distinction between strong and weak ties, we will make a distinction between *perceived* and *interaction-based* ties. In line with cognitive oriented network theories (Corman and Scott 1994; Krackhardt 1987), we argue that relations based on trust and expertise may be seen as a different type of relations, compared to interaction-based ties.

2.2 *Perceived and interaction-based relations*

The distinction between strong and weak ties has been much applied in social network analysis, and the distinction has been path-breaking for much of the innovative theoretical and empirical work coming out of the field in the last decades (Burt 2005; Granovetter 1983; Granovetter 1973; Wellman and Wortley 1990). Yet, researchers have for a long period noted that the terms are often difficult to apply in empirical organizational network studies (Krackhardt 1999; Nardi,

¹⁰⁴ There are, however, also findings that suggest that denser and more interconnected groups perform better than highly centralized ones. Cummings and Cross studied 182 work groups in a large telecommunication firm and compared internal network structures with performance measures. Structures of hierarchy, degree of centrality, and managers' degree of structural holes were measured for each group and used as input in a subsequent regression analysis (Cummings and Cross 2003). In contrast to the earlier work of Ahuja and Carley (Ahuja and Carley 1999), this study found that hierarchal structures as well as a dominant core-periphery structures were negatively associated with performance measured by members and managers (Cummings and Cross 2003).

Whittaker and Schwarz 2000; Wenger 1991). First, because the definition of strong ties is at the same time very broad and very specific: It points to characteristics such as time spent together, emotional intensity, intimacy and reciprocity (Granovetter 1973). This seems to point directly at ties within, for example, nuclear families, and groups of close friends. Yet for practical enquiries these key words are difficult to operationalize, and divergent strategies have been applied to estimate the strength of the ties between individuals. Second, in organizations many relations seem to fall somewhere in-between strong and weak ties. In particular intra-organizational ties tend to be stronger than “weak ties”, yet weaker than “strong ties” (Nardi, Whittaker and Schwarz 2000; Wenger 1991). And thirdly, although the terms are well known for network scholars, they are not widely applied in general organization studies or within the fields of CSCW and media studies. General terms like trustfulness, identification or friendship are more commonly used to describe work-relations (Gersick, Bartunek and Dutton 2000). Thus, the strong/weak tie dichotomy appears as an association-rich metaphor that may be difficult to use in detailed analyses of relations in organizations¹⁰⁵.

Instead of relying on this dichotomy, we will apply the more generic terms *trust*, *friendship* and *expertise*. Thereby, it is possible to circumvent some of the difficulties embedded in using the dichotomy based on tie-strength. Still, a central question remains about how relations like trust, friendship and expertise should be seen in relation to interaction. Are friendship and trust results of frequent interaction or is it the other way round? Researchers working in the field tend to give divergent answers to these questions. For instance, some researchers emphasize that interaction is important to build trust (Shapiro, Sheppard and Cheraskin 1992); others argue, on the contrary, that a high degree of interaction should be seen as an indicator of *distrust*, because it may reflect high levels of surveillance and control (Buskens 1998).

To clarify these issues, we propose to establish an analytical distinction between interaction-based patterns (based on face-to-face or mediated interaction) and subjective relations based on subjective feelings towards other persons. This perspective finds support in cognitive network theories, focusing on individuals’ or groups’ subjectively perceived relations in contrast to objective and interaction-based relations (Corman and Scott 1994; Krackhardt 1987). Corman and Scott have applied elements from Giddens’ structuration theory to clarify the connections between observable communication networks and the latent networks of perceived relationships (Giddens 1984). They argue that different modalities explain the recursive relationships between cognitive social structure and interaction. Much in line with Giddens they explain: “... we define a communication system as a set of continually reproduced communicative interactions between individuals and collectives situated in time and space. The network is an abstract structure of rules and resources of communicative actors

¹⁰⁵ To avoid the term “strong tie” Krackhardt has applied the term *Philos* to designate particular strong relations within organizations. Philos-relations are characterized by frequent interaction, strong affections and a long history of interactions. See (Krackhardt 1992)

in a given social collective, instantiated in communication systems, but having only a “virtual existence” ” (Ibid, p 174).

The social network is here described as a cognitive resource embedded within a particular social community or culture, where spatial and temporal aspects are included in the analysis. Further, Corman and Scott propose that the cognitive network structures are activated through taking part in common activities (foci) or enacted through various triggering events. The advantage of this perspective is that it helps to establish a clear distinction between a (cognitive) network structure, and a system of observable communicative actions. These structures are clearly related, but they are not isomorphic. Instead, we argue that studies of the ways these structures are interrelated constitute an interesting and fertile area for empirical studies. In the empirical analysis in this paper we will study interaction-based relations and subjective closeness as separate relational ties, not assuming in advance that they are related. The interesting question of how ICTs are used to support different relational structures (or not) can then be investigated in more detail, compared to studies primarily based on the strong tie/weak tie dichotomy.

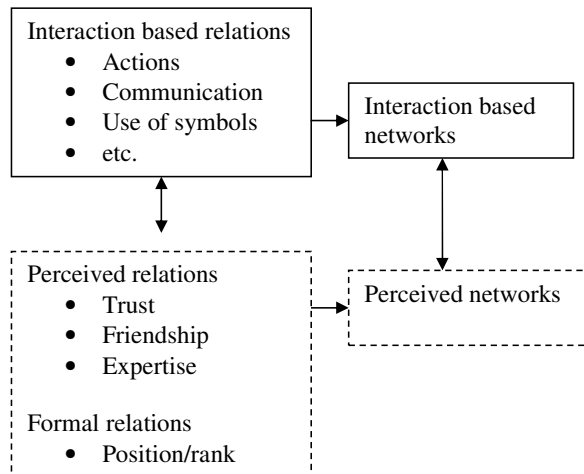
2.3 Prescribed relations

According to the cognitive approach to social networks, all social relations are basically abstract structures existing mainly as memories or expectations in the minds of individuals. Yet, in organizations there is an important set of relations that is based on formal agreements and contracts, such as relations to sub-ordinates. Informal relations in organizations and work places can be seen as embedded within and partly constrained by a formal system involving a manager and sub-ordinates (Kadushin 2005). Such formal relations in a distributed work group will usually be made explicit in job descriptions and in organizational charts. These relations are more formalized than trust, friendship and expertise ties, even if they involve expectations that probably affect the interaction and communication patterns. For the purpose of this article we label them “prescribed relations”.

2.4 Trust, friendship and expertise

In addition to interaction-based relations and formal or prescribed relations, we will in this article look at three different relational qualities: trust, friendship and expertise. These are selected because they refer to important but different dimensions of working relationships: Trust is an aspect of a social relation that can be seen as a “resource” that an individual has access to and may exploit in particular situations.

Figure 2.1 Interaction and latent relations. Figure based on the work of Corman and Scott (1994)



In the last few years, trust has received increased recognition as a phenomenon worthy of closer examination in organizational studies, and several volumes provide reviews of theoretical positions and broad theoretical frameworks (Elsbach and Kramer; Kramer and Cook 2004; Kramer and Tyler 1996; Mayer, Davis and Schoorman 1995; McKnight, Cummings and Chervany 1995; Rousseau, Sitkin, Burt et al. 1998). Trust may be defined as: “A willingness of a party to be vulnerable to actions of another party based on the expectations that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” (Mayer et al. 1995: 2).

This definition emphasizes that trust is built on basically positive expectations regarding individuals’ future behaviour¹⁰⁶. As a concept that is directly concerned with a relation between two individuals, it is a particularly relevant topic for social network approach. From a social network point of view, trust is not primarily the property of an individual; rather it is part of the relations between two or more individuals (McEvily, Perrone and Zaheer 2003). Paying attention not only to dyadic ties but to larger networks of indirect ties (i.e. between the egos’ alters), may give an added value to the analysis of trust.

¹⁰⁶ This definition is much in line with later contributions where interpersonal trust is seen as a particular psychological mindset or attitude involving a deliberate willingness to be vulnerable. See for instance; (Rousseau, Sitkin et al. 1998)

Friendship has mainly been studied in the context of individual personal social networks and among students (Haythornthwaite and Wellman 1998; McPherson, Smith-Lovin and Cook 2001; Wellman and Potter 1999; Wellman and Wortley 1990). In network terms a friendship relation is usually described as reciprocal and durable (thereby incorporating temporal aspects) and it is closely related to trusting relations. Yet in a work setting close friends may be indicating a relationship that is closer than regular workmates, indicating informal contact also in private settings.

Expertise refers to relations that are important for the conduct of everyday work tasks. This type of relations has been widely used to detect flows of information and knowledge in organizations and groups (Cross, Parker, Prusak et al. 2001; Cross and Prusak 2002; Hollingshead, Fulk and Monge 2002). However, we should note that it can also be seen as a more rational form of trustfulness; i.e. cognitive trust (Lewis and Weigert 1985). To avoid confusion between the affective form of trust and the cognitive one, we will here stick to the term expertise. Although these qualities obviously also may be developed and maintained over distance – aided by ICTs – they are primarily explored in collocated settings.

3. Method and case

3.1 *NOMO and Omega*

The results presented here are based on a study of several work groups in a Nordic company, here called *NOMO*¹⁰⁷. *NOMO* is a Norwegian ICT-provider with a fairly strong position in the Nordic markets. Approximately one year prior to our study, the company acquired and merged with a smaller Danish company to get an even stronger position in the Scandinavian market. This process was experienced as stressful for the employees in both companies. A major objective for the company after the acquisition was to integrate its operations across the national markets to create market synergies. This led to the setting up of a number of permanent work groups encompassing employees in different locations in Norway and Denmark. Since different functions now had to be coordinated across distances and national boundaries, distributed work was initiated and formalized in several different areas. The analysis in this paper will focus on one such group; *Omega*. The core task of the *Omega* group was to manage and develop products for a particular segment of *NOMO*'s customers. The group consisted of 16 product managers; 12 in Norway and four in Denmark, with the manager located at the headquarters in Norway.¹⁰⁸ Virtually all respondents had previous employment within the respective

¹⁰⁷ Please note that the names of the organization and the groups, as well as the individuals' names are all pseudonyms

¹⁰⁸ Danish and Norwegian were working languages within the groups. The languages are fairly similar, whereas there are certain differences that potentially can lead to misunderstandings.

organizations, and most of them made deliberate efforts to maintain relations with previous colleagues.

The work was divided between two main workplaces; one at the NOMO-headquarters in Norway and one at the Danish department. At both sites, the employees had a mobile work style, where open offices were used in combination with portable PCs as well as mobile phones as their primary work-phone. The company deployed a hot-desking strategy without fixed work-places, ensuring a certain degree of internal physical mobility. Two of the Norwegian employees and one of the Danes were located outside the national hubs, making the group even more dispersed. Much of the work in the group also required travelling outside the city area, so the physical mobility was in general high. The work form implied that some of the employees had relatively frequent interaction face-to-face, while others met only when the group had their meetings.

The frequency of their meetings fluctuated in accordance with tasks and happenings in the organization. Yet, based on the estimates of the group members, we found that telephone conferences and regular (face-to-face) meetings were usually arranged bi-monthly (see table 3.1). Videoconferences and PC-based conferences were however relatively little used in this group. When our investigation started the group had worked together for 12 months. According to the interviews, the group had been involved in several critical discussions related to the consolidation of the former national product development groups. Now, most of the employees expressed that the group now moved in a positive direction, were they were working together as a unified group.

3.1 General methodological design

The investigations followed the group from spring 2004 to the end of 2006. The design of the study was based on a triangulation of different methodological strategies, including qualitative interviews with individuals as well as quantitative studies of individual (ego-networks) and group-based social networks.

The study started with an explorative qualitative study and was followed up with a quantitative study targeted at more specific issues evolving out of the explorative phase. Yet, in the initial phase a general questionnaire was distributed to get baseline information about satisfaction, performance and interaction patterns. In this article we will mainly deploy the group-based network data and the data from the qualitative interviews.

Table 3.1 Frequency of group-based communication in Omega, based on averages of individual estimates (mean values)

	Estimated frequency (n = 15)	Mean st. error
Telephone conferences	Bi-monthly	.291
Video conferences	Less than monthly	.215
PC-conferences	Less than monthly	.215
Physical meetings	Bi-monthly	.284

3.2 The qualitative study

Before the main quantitative network study, semi-structured interviews were conducted with employees and managers to get a better picture of their work situation. The interviews followed an interview guide focusing on the respondents' main work tasks, social relations, identity in group/organization and trust issues, and lasted 30-40 minutes. Fourteen of the 16 employees in Omega were interviewed. Two of the employees in the group were not available for interviews due to shift in job assignments and sickness. In addition, we conducted interviews with individuals outside the group, including the leader's superior executive and other managers in the company. The rationale for this was to get a better understanding of the group's tasks and position in the company by including supplementary perspectives.

During the qualitative study intermediate reports and preliminary analyses were made. The interviews were coded as text files (using QSR NUD*IST software) and the main issues and topics from the interviews were classified. We used this coding as input for the subsequent social network module and for integrated analyses.

3.3 The social network module

In the social network part of the study, interactions were registered through a web-based questionnaire and coded in a case-by-case social network matrix. We asked the persons to indicate interaction-based relations as well as perceived relations. A traditional "roster" design was used to the network study, where each group member received a list of the other members in the group (Wasserman and Faust 1994). The informants were then asked to report the frequency of interaction with other members in the group as well as the type of media used in the interaction and the three perceived ties.

A critical issue of self-reported designs is that they often have poor reliability, as people are often bad at remembering and reporting their actual behaviour (Bernhardt, Killworth and Sailer 1982). Nevertheless, self-reported data have been found to be fairly reliable when it comes to the individual ranking of different activities, and to compare interaction across different media (Hartley, Brecht, Pagerly et al. 1977). Thus, we treat them as indicative of the interaction within the group. The response to the survey was good, and after two reminders, all the employees in the groups save one had completed their questionnaire. The data were coded and analyzed through standard social network software (UCINET 6 and NetMinerII 2.5).

We used a single question to map the trust-based relationships: “If you decided to search for another job similar to the one you have today, but in another company; whom on the list would you most likely talk to about this?” The idea behind this formulation is that this type of discussion would imply trustfulness, as disclosure of such plans would be negative for the reputation of the individual in question¹⁰⁹. Indirect questions are the most usual way to analyze trust-based relations in organizations. It should be noted, however, that such questions involve a risk for neglecting individuals that have a more introvert nature or simply prefer not to talk to anybody about such plans (even if they have trustful ties within the group).

The expertise relations were based on a question asking whom the informant preferred to speak to when facing problems in his/her work. Starting with the list of group members, we asked them to indicate whom on the list they would most likely turn to if they needed advice in their daily work. This expertise network does not address the affective aspect (like the trust ties), but the network with the most central professionals in the group.

Table 3.2 Relations investigated in Omega

Interaction based relations	Face-to-face meetings
	Mobile phone dialogues
	Email
	SMS
	Overall daily interaction
Prescribed relations	Formal work relations
Perceived relations	Trust
	Friendship
	Expertise

¹⁰⁹ This strategy is similar to the one used by earlier network studies on trust in organizations (Burt and Knez 1996; Krackhardt and Brass 1994; Krackhardt and Hanson 1993).

The friendship relations were derived from our question whether there was someone on the list they considered as close friends in their group. Thus, we asked her specifically for close friends, not regular work mates.

4. Networks and positions in Omega

In this section, we will present findings from the study, emphasizing results from the network analysis. We will start with a presentation of the formal structure of the group and the network structures indicating perceived and interaction-based relations. Next, we will discuss differences in general structures between these networks and variations in individuals' centrality within these networks.

4.1 Formal structure

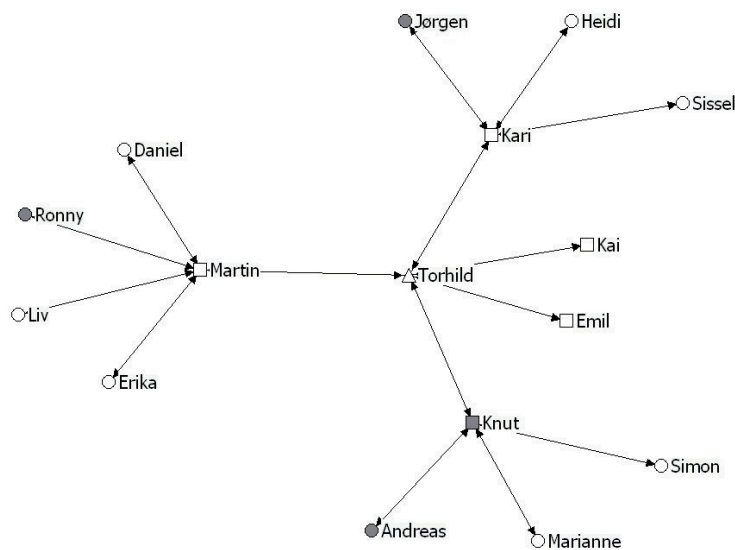
The formal structure of the group is presented in figure 4.1. Torhild is the manager of the group. She started in this position just after the research project started, yet she is experienced and in general highly respected by the employees. One of her first decisions was to divide the group into three smaller sub-units, and she appointed Martin, Kari and Knut as leaders of these units. In addition, she pointed out two other persons to be responsible for individual areas of product development in NOMO -- Kai and Emil. It is worth noting that the four employees from the Danish unit (indicated by squares) were directed to different sub-units, and one was also appointed a sub-unit manager.

Yet, as noted above, the members did not work only within their units; much interaction and work took place in projects involving employees from groups other than Omega. This activity is however not included in the results displayed here.

4.2 Description of relations and networks in Omega

As it turns out, the Omega group was handling the long-distance collaboration relatively well when measured along traditional network indicators for integration and coherence. For example, when looking at interaction via email and mobile voice, none of the members were isolated from the others. All employees in the group were in contact with at least one other person during a regular week.

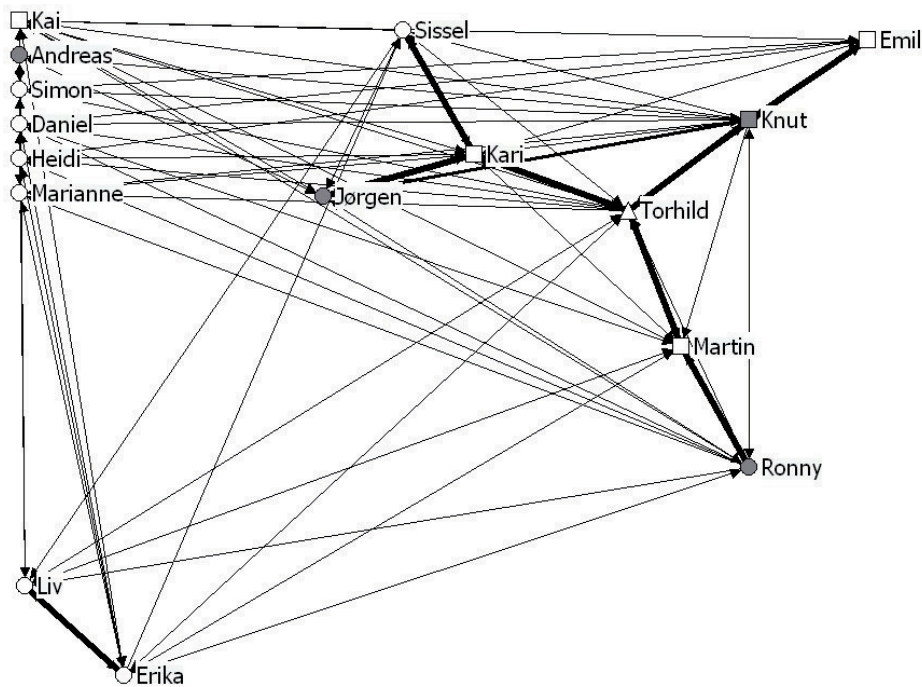
Figure 4.1 Omega's formal structure. Danish employees grey, Norwegian white (triangle = manager, square = sub-unit manager, circle = employee).



In addition, the dialogues connected the employees through a network that crossed the geographical boundaries of the sub-units. It is easy to see, however, that email interaction followed rather closely the formal interaction lines, in particular for the group managed by Martin. It is also evident that much interaction seems to go through Martin, Kai and Emil.

The manager Torhild was fairly central in the information flow. The mediated relations suggested that much of the information circulated between the sub-unit managers Martin, Kari, Knut as well as Emil (see figures 4.2 and 4.3). It is also evident that most of the Danish employees were well integrated in the group, despite their geographical distance from the majority of employees in Omega. Table 4.1 gives more precise details for the networks based on interactions and on the perceived relations. Among the *interaction-based relations*, the e-mail network was the most active, followed by mobile phone dialogues and SMS. The email networks were denser and they also had higher reciprocity, indicating that they were not simply used to distribute information, but for two-way interaction. The lower level of reciprocity for SMS may suggest that this was a less formal channel, but also that the traffic here is less intense and task-related than in the email network.

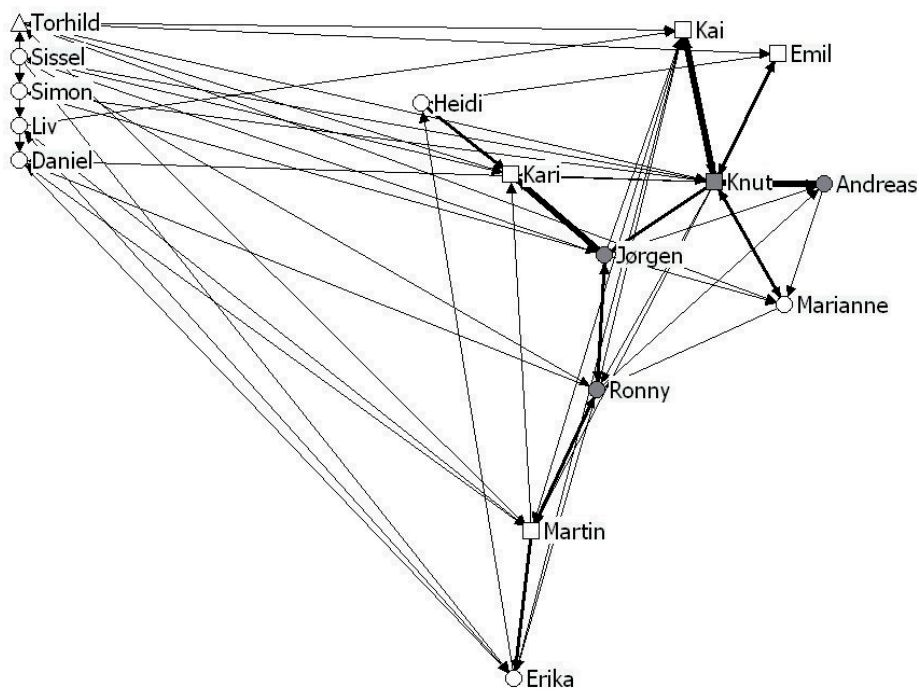
Figure 4.2 E-mail interaction network for Omega last 7 days. Danish employees grey, Norwegian white (triangle = manager, square = sub-unit manager, circle = employee). Tie strength indicates intensity of interaction (1 = 1-4, 2= 5-10 and 3 = 11-20 messages).



The average degree score is a ratio of the number of incoming and outgoing ties for a network of relations (Freeman 1979). An average degree score reaching above six for email relations, then indicates that the average member had been in email contact with approximately six other persons in the group during the last week. The corresponding numbers for mobile and SMS were 4.1 and 2.6.

The score for emails was, interestingly, also higher than the face-to-face interaction (4), illustrating how email connected far more people in the group than physical interaction. The core/periphery score indicates how well the registered values approximate to an ideal core/periphery structure (Borgatti and Everett 1999). This value was relatively high for the face-to-face networks due to the fact that there is a clear co-located core situated at the Norwegian headquarters, and that face-to-face follows close to this structure.

Figure 4.3 Mobile dialogue network for Omega last 7 days. Danish employees grey, Norwegian white (triangle = manager, square = sub-unit manager, circle = employee). Tie strength indicates intensity of interaction (1 = 1-4, 2 = 5-10 or 3 = 11-20 dialogues)



This structure is softened in the mediated networks. However, while there was a relatively clear core/periphery structure reflected in the mobile network; this was less spelled out in the SMS network.

For distributed work groups it is of particular interest to see the extent to which the relations cross physical distance or not.¹¹⁰ To compare the number of ties within and across the two involved countries, we applied the E-I Index, as developed by Krackhardt and Stern (Krackhardt and Stern 1988). This indicator compares the external ties with the internal ties for groups within a network, ranging from -1 to +1. Given a partition of a network into a number of mutually exclusive groups, the E-I index is the number of ties external to the groups minus the number of ties that are internal to the

¹¹⁰ In the case of mobile work, this can of course be difficult, as these boundaries are often blurred. Yet, in this group there was one important difference between individuals situated in Denmark and those in Norway.

group divided by the total number of ties. Maximum collaboration across the boundaries is then +1 (all links are external), while equally divided links will give an index equal to zero. We categorized the employees in Denmark as “external” and the Norwegian group as “internal”. None of the interaction-based relations were equally divided, but email messages were the form of interaction that was most boundary-crossing (considering the national boundaries) in this group. Interestingly, SMS was more frequently used within each of the national sub-units, with mobile phone dialogues in a position in-between. This shows that – at least within this organization – the geography-bridging qualities of ICTs are selectively deployed; some are primarily used across larger distances, others are more commonly used within local regions. It is also interesting to observe that these technologies are important *within* collocated settings: While it is common to address the capacity of ICTs for bridging space and time, they are also used for communication with neighbouring colleagues. This may be seen as an extension and generalization of norms and technical skills for communication with distant parties, or as an indication of conscious choices for media behaviour, acknowledging that even in a collocated setting, face-to-face communication is not always the preferred form.

Turning to *the perceived relations* of trust, friendship and expertise, these were less cohesive in Omega than the interaction-based relations: only 10 friendship links (relations) and 13 trust links were reported. The expertise network, however, was about the same density level as for mobile communication (0.275). Reciprocity is often related to trust in organizations, as trust is often seen as stronger when relations are symmetrical (Kilduff and Tsai 2003). Interestingly, the trust relations have low levels of reciprocity, indicating that this is not a strongly interconnected network, but more open and “fluid”. This indicates the “cognitive” nature of trust, since the existence of a trust-tie is not always perceived equally by two individuals in a network. As displayed in the figure below (figure 4.4), the trust network actually formed a chain-like structure, with a more cohesive constellation in the Norwegian group. The trust network was also strongly embedded in the national units within the group, indicated by the high negative E/I index, while the expertise relations had a much more boundary-crossing nature.

4.3 Network similarities

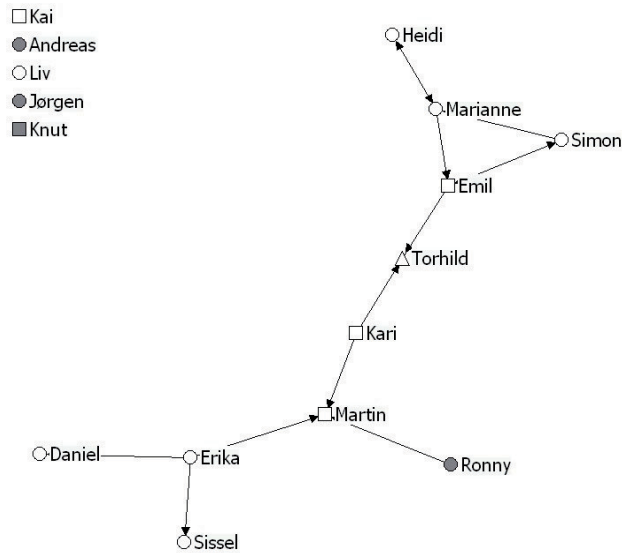
Comparing networks through general indicators gives important information regarding the general use of interaction media and the general level of trust, friendship and expertise relations. Yet, to explore the similarities between the latent networks and the four different interaction networks further, we conducted a QAP-correlation¹¹¹. This procedure is often used to see to what extent there are similarities between two social networks containing the same actors (Hanneman 2001).

¹¹¹ UCINETs QAP correlation procedure is based on permutation of rows and columns together of one of the input matrixes, and then correlating the permuted matrix with the other matrix. This is repeated hundreds of times to build up a distribution

Table 4.1 Selected network characteristics of interaction-based and perceived relations

	Relation	Scale	Links	Density	Average degree	Reciprocity	Core-Periphery	E/I index
Interaction based rel.	Interaction	Daily (weekly)	45	0.188 (0.546)	2.812	0.356	0.519	-0.301
	Mobile	1-4/5-10/ 11-20/>21	66	0.275	4.125	0.515	0.518	-0.208
	Email	1-4/5-10/ 11-20/>21	106	0.442	6.625	0.736	0.485	-0.083
	SMS	1-4/5-10/ 11-20/>21	43	0.179	2.688	0.512	0.370	-0.5
	Face-to face	Daily (weekly)	64	0.267 (0.733)	4	0.688	0.829	-0.375
Perceived rel.	Trust	Yes/no	13	0.054	0.812	0.308	0.433	-0.818
	Friendship	Yes/no	10	0.042	0.625	0.4	0.466	-0.5
	Expertise	Yes/no	66	0.275	4.125	0.515	0.377	-0.250

Figure 4.4 Trust network in Omega. Danish employees grey, Norwegian white (triangle = manager, square = sub-unit manager, circle = employee)



of correlations under the null hypothesis of no relationships between the matrixes. A low p-value (< .05) suggests a strong relationship unlikely to have occurred by chance.

As indicated in table 4.2 the expertise network, as well as the formal network, were closely related in all the media channels.¹¹² In particular, the relation between expertise, email and mobile was strong ($r = 0.522$ and 0.435 , respectively). The mediated networks of mobile phones, SMS and email were all highly correlated, and in particular email and mobile dialogues ($r = 0.564$) (all significant on a 0.01 level). This indicates that the media in Omega to a large extent followed the task related patterns of interaction, and that the media followed highly similar patterns, in particular in the case of mobile dialogues and SMS. The trust network, however, had no significant relation to the formal network, the face-to-face network or the mobile communication network. It was however weakly (but significantly) related to the expertise network, the email network and the SMS network. Trust relations were most strongly correlated to friendship relations ($r = 0.278$) but not at all with the formal relations (0.068). This indicates on the one hand that the perceived expertise relations were most closely related to the observable interaction that took place in Omega. This pattern also followed fairly close to the formal structure of the organization. On the other hand, the less intensive trust network diverged from the formal structure and was less similar to the mediated networks based on mobile dialogues. Yet it had high similarity to the friendship network, and also to the expertise network.

This then might suggest that trust relations are more strongly supported by text-based media like SMS and email, while the more intensive work-related communication uses all media, and in particular email and mobile dialogue. As such, it indicates that the instant problem-solving relations have other needs for communication than the more low-frequent trust and friendship ties. It is clear, however, that these relations do not operate as isolated structures, but have significant overlaps.

Table 4.2 QAP correlations for different networks (Jaccard coefficients)

	Formal	Expertise	Mobile	Email	SMS	Trust	Face-to face
Expertise	0.316**						
Mobile	0.389**	0.435**					
Email	0.296**	0.522**	0.564*				
SMS	0.375**	0.38**	0.514*	0.393**			
Trust	0.068	0.113*	0.053	0.092*	0.12*		
Face-to-face	0.207*	0.236*	0.236*	0.295*	0.227**	0.054	
Friendship	0.1	0.086*	0.086*	0.074*	0.128**	0.278**	0.05

Note: * $p < 0.05$ ** $p < 0.01$

¹¹² The table below presents Jaccard coefficients since some relations (trust, friendship, face-to-face) are binary (Hanneman 2001).

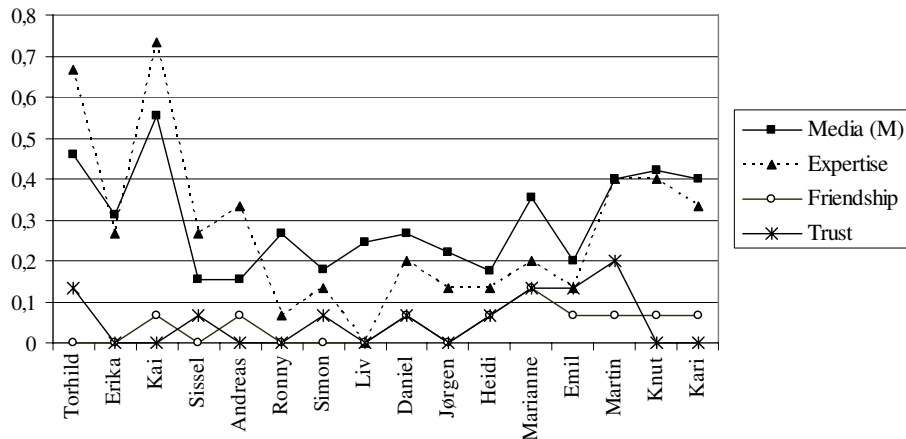
It should also be noted that physical closeness (i.e. face-to-face interaction) was positively correlated to the use of all media, and in particular the SMS network, indicating that mediated interaction is more intense among co-located workers.

4.4 Network positions in trust, friendship and expertise networks

As argued earlier in this article, relations of trust, friendship and expertise are based on a subjective perception of others. Within an organization or a group, however, this information might be used to indicate those that more often are the object of the others' "positive expectations". The indegree centrality score is a much used indicator for measuring popularity or prestige in complete networks, based on mental concepts such as trust and friendship (Freeman 1979; Knoke and Kuklinksi 1982). As indicated above, the expertise network was in particular strongly related to the formal structure of the group, and much of the mediated interaction followed this pattern. Trust and friendship, on the other hand, were more weakly related to the expertise network as well as to the formal structure. This suggests that the informal networks of trust and friendship were different from the formal networks, although they had similarities with the advice network.

An interesting question is to what extent the same people are central in the expertise network and in the trust network. As could be seen directly from the mediated interaction network above, the manager and the sub-unit managers were highly central in the interaction networks. Only some of these were however included in the trust network. Comparing indegree centrality, i.e. number of incoming connections, indicates that one of the "independent" sub-unit managers (Kai) is the most attractive node in the interaction network. He was the one who received most emails and mobile phone calls, and also (together with Kari) the one who had most face-to-face interaction with the others. He is also the one with the highest indegree centrality in the expertise network. Figure 4.5 illustrates the strong connection between being central in advice networks and being central in the mediated networks. Kai is however not included in the trust network. In this network Martin, Marianne, Emil and Torhild are the only ones with "indegrees" higher than 2. Most central was Martin, who also had a trust-relation across the national boundaries (see figure 4.4). As such, he is the only person who acted like a "trust-broker" in this distributed network (Julsrud and Bakke 2007a). Thus, it seems like there are different roles and relations involved in the group, but that it is the expertise-role that most strongly generates interaction through the available media.

Figure 4.5 Normalized indegree centrality scores for position in media network (mean value for indegree of email, mobile phone talks and SMS), expertise, trust and friendship networks



5. Supporting relations by e-mail, mobile dialogue and SMS

By exploring the social relations and networks embedded within a group of distributed workers in a computer company, we have seen how a set of available communication technologies was used in slightly different manners to support and sustain both work-tasks and more informal social relations in a group of professionals. The results from the network study suggest firstly, that the trust relations in this group followed a different pattern than the work-related and intensive expertise network. Individuals that were central in the expertise network were not always central in the trust network. Secondly, the mediated interaction networks were in general strongly related to the expertise relations, although the trust relations had a structure that related to the SMS and the email networks. Thus, this might indicate that the trust network evokes another type of “narrowband” (text-based) interaction.

In this chapter we will elaborate these issues further, based on evidence from the qualitative part of the study. In particular, we will present some tentative explanations for why the trust network tended to follow other structures than the professional network, and why mobile talk and e-mail relations seemed to be more closely related to the professional and expertise based ties.

5.1 Origins of trust and expertise networks

The trust network in Omega was less dense and more locally embedded than the professional expertise network. The interviews with the members with trusting ties revealed that these relations in several instances had roots in older projects and collaborating groups. *Daniel and Erika* for instance, one dyad in Omega connected by trusting ties (see figure 4.4), had both worked together in NOMO for a long time. They were both located at the same building at the Norwegian headquarters. Daniel explains that their relationship has origins from “the old NOMO company”:

“... at that time we were only four to five persons in this group. There were activities where family members joined, and the group was actually real close. It is not like that nowadays [with the current group] (...) we still eat lunch together with the old group” (Daniel).

Daniel and Erika and others from the trust dyads identified in Omega, had a record of work-related collaboration that ran several years back in time. Such relationships outside their current project organization were, however, hardly visible in organizational charts, or in surveys of interaction in the present organization. Another source for developing trusting ties was found in the relationship between *Marianne and Heidi*. These two co-located employees belonged to different sub-groups in Omega but had a strong trustful relation as well as a friendship tie. The reason appeared to be that they shared a workspace in a satellite office that was at a significant distance from the others. Their shared destiny as co-located distant workers, and their time spent together, was important for the development of solidarity and stronger ties.

A third interesting trust-tie in the network was found between *Martin and Ronny*. In this case, the relationship actually crossed the national boundaries and the significant distance between their regular workplaces. Martin was highly trusted by Ronny, who had known him for only about 1.5 year. This was also seen as a friendship relation by one of the parties. In the interviews Ronny emphasized Martin’s high level of knowledge and that they shared many of the same goals and ideas for future developments. Ronny expressed that the development of a strong relation with Martin was something of a turning point for him:

“The fact that Martin now has joined the group with his high level of competence really makes me believe in this. He actually is the first Norwegian I can say that I really trust ...” (Ronny).

For Martin, frequent visits to Denmark together with frequent communication via electronic media appeared to be part of a deliberate effort within the group to create a better climate for collaboration. It is worth noting however, that Ronny emphasized Martin’s competence and abilities as the main reasons for trusting him. Martin’s and Ronny’s trusting ties are thus perhaps an example of

how a relation based on rational trust and collaboration over time may transform to a stronger knowledge-based trust (Lewicki and Bunker 1996).

These trust dyads illustrate that trust relations might have roots in collaboration and activities that took part several years previous to the study. The activities that had generated the trusting relations were in some cases participation in several former projects. Thus, they often had a longer history and duration than the patterns of the expertise network.

5.2 Media choice, risk and relations

Much of the daily interaction in the group was, as indicated above, related to formal tasks and had a professional character. For work-related tasks, email was the most obvious choice for the members of Omega in their daily routine. All formal information about meetings, change of work assignments, and relevant information about the company, was distributed by email. Written email messages also allowed for a level of precision that was essential when describing technical components, specifications and so on. In most cases, the informants did not make sharp distinctions between email and voice mobile interaction. Both were actively used in various combinations, i.e. following up emails with mobile phone calls, but also the other way round. Kai, one of the most active users of ICT, explained that he used to combine email and mobile to get a rich understanding of how the distant colleagues were managing their tasks:

” Often I call the other colleagues in my groups just to hear how things are going. I want them to feel that there is interest for what they are doing. When you do not sit next to them and see their faces, I need to call them up and hear how things are going. You must ‘read between the lines’ to know how they’re actually doing in their work ... Email can be misinterpreted and read in the worst meaning. That’s why I prefer telephone; it is easier to make adjustments and make sure that a meaning is correctly understood. To me, that is an important tool in a virtual organization like ours ...” (Kai)

This citation draws attention to the risk of misunderstanding email messages, when the group members do not know each other well. Kai argued that mobile dialogues were important because they allowed for immediate correction of potential misinterpretations. In this newly merged group there might have been a particular need for this, since they were speaking different languages and were working with complex technical issues. Yet, Kai had particular advantages here, since he spoke both languages fluently. He used this capability to translate and negotiate when there were misunderstandings due to language barriers – thus he can be seen as a “trust-broker” between the subgroups (for the concept of trust brokerage, see Julsrud and Bakke 2007b). The others in the group, however, found the mobile more difficult to use across the national boundaries because sometimes they found it difficult to understand the other language. This was mentioned as a problem, not only for

phone dialogues, but also for audio-conferences. All in all, the language differences seemed to spur the use of email rather than mobile dialogues, and this was probably one reason why, in this organization, email had a more boundary-crossing usage in Omega than mobile phone dialogues (as noted in section 4.2).

The central advantage of the mobile phone dialogue was the *immediacy* involved. Employees in Omega stressed that they often needed to get instant feedback and clarification on issues and that mobile phones were particularly well suited for this.

“When it is necessary with fast decisions I prefer to use a mobile phone. It doesn’t matter if people are located in Denmark or elsewhere.” (Dan)

This indicates that the combination of dialogues and e-mail represented a powerful combination that operated in a complementary way to support the expertise based relations.

The trusting ties seemed, however, to be particularly strongly related to the use of SMS, and – to a somewhat lesser degree – email. One reason for this might be, as discussed above, that these relations often were based on former collaboration. Thus, there was not the immediate need for interacting to solve problems or immediate difficulties. The trust network was more of a “latent” network structure that was inactive in much of the daily work in the group. Another reason could be that the strong trust relations did not need the immediacy that mobile dialogues offered. It has been recognized that trusting relations may not need the same kind of immediacy as low-trust relations (McEvily et al 2004). Periods of silence or absence of replies could be tolerated in the case of trusting ties, but more easily perceived as hostile in relations with low trust (Licoppe and Smoreda 2004). As such, media with high level of immediacy might be preferred where trustfulness is low, either as a deliberate choice or unconscious preference.

Thus, it might be that services like SMS were seen as little suited in relations where there are lower levels of trust. Several of the informants told us that their SMS messages were primarily used to contact friends and family, and usually not for professional acquaintances. However, this also suggested that SMS in this group of workers had another *symbolic meaning* for the users than email (Trevino, Lengel and Daft 1987). Sending SMS messages rather than an email messages symbolized and manifested a relation that was less informal and more private.

6. Concluding remarks

In this article we have argued that the perceived relational structures of trust, friendship and expertise are supported in different ways by available technologies in their communication environment. In the distributed group of product developers that was analyzed in this paper, we found that the expertise network was mostly supported by email messages and mobile phone dialogues. The networks based on trust and friendship relations were particularly supported by SMS and email. The qualitative study suggested that, compared to the expertise network, the trust network operated on a “lower frequency” where the relations were of a longer duration, but had less frequent interaction. We also found that the email network was more boundary-crossing, connecting employees from both countries, while the SMS network was more used among employees meeting face-to-face. This study adds to a growing body of research applying network analysis in investigations of media use in organizations, groups and teams. The study also demonstrates the fruitfulness of studying technologies within a communication environment, as the study shows that technologies are important for establishing and maintaining relations within a group, and that technologies are deployed as available elements from a menu, not as singular technologies. Thereby, the article contributes to the rich literature on domestication of technologies – with an emphasis of the multiplicity of technologies.

The article also shows that the geography-bridging qualities of ICTs are selectively deployed; some are primarily used across larger distances, others are more commonly used within local regions. It is also interesting to note that these technologies are frequently used *within* collocated settings, indicating that face-to-face communication is not always the preferred form.

In accordance with some earlier studies we found that the use of mobile media, and in particular SMS, was more frequent among those who met face-to face in their work (Ishii 2006; Julsrud and Bakke 2007b). Thus it seems like work tasks and social closeness are more important in spurring mediated interaction than geographical distance alone. Yet, this study also paints a slightly different picture than some earlier studies that have found that stronger relations tend to communicate more intensively and also use more numerous media (Haythornthwaite 2002). One reason for this, we believe, is that our case involved a group of technical professionals working in permanent work groups – and although the group was newly established, the members had a history within the organization. In contrast, former studies of relations and media-use in distributed environments have used empirical data from *ad hoc* teams of students collaborating in temporal, virtual teams (Haythornthwaite 2001; Haythornthwaite 2005) or in a community of scholars at a university (Koku and Wellman 2002). In our group of professionals, the task-related ties were very much in focus, whereas the trust and friendship relations were less explicit. Also, this group was relatively recently established, connecting experts located in different geographical units due to a company merger. This might have made the

friendship relations within the group less dense and more weakly supported by media, as compared to networks of students or university scholars. Another reason for the differences may be that we applied the term trust in addition to friendship; a term that is rarely studied in relation to mediated ties in organizations. We believe, however, that this actually unveils a relational dimension that is different from close friendship in organizations, but still important. In modern organizations it might be that it is more important – or more achievable – to have someone that you trust to discuss difficult personal matters with, than someone you consider as close friends. Detecting these “low frequency” relations in organizational networks, and how they are supported by communication media, appear to be a task that is worth pursuing in future research.

References

- Ahuja, Maju, and Kathleen M. Carley. 1999. "Network Structure in Virtual Organizations." *Organization Science* 10:741-57.
- Bernhardt, Russel H., Peter Killworth, and Lee Sailer. 1982. "Informant accuracy in social network data V." *Social Science Research*:30-66.
- Borgatti, Stephen, and Martin Everett. 1999. "Models of core/periphery structures." *Social Networks*:375-395.
- Brehm, John, and Geoffrey Gates Scott. 2004. "Supervisors as trust brokers in social-work bureaucracies." Pp. 41-64. in *Trust and distrust in organizations. Dilemmas and approaches*, edited by R. M. Kramer and K. S. Cook. New York: Russel Sage.
- Breiger, Ronald. 2004. "The Analysis of Social Networks." in *Handbook of Data analysis*, edited by Melissa Hardy and Alan Bryman. London: Sage.
- Bryant, J. Alison, A. Sanders-Jackson, and A. M. K. Smallwood. 2006. "IMing, Text Messaging, and Adolescents Social Networks." *Journal of Computer-Mediated Communication* 11.
- Burt, Ronald. 2005. *Brokerage and Closure. An Introduction to Social Capital*. New York: Oxford University Press.
- Burt, Ronald, and M. Knez. 1996. "Trust and Third-Party Gossip." Pp. 68-89 in *Trust in Organizations. Frontiers of Theory and research*, edited by R M kramer and T R Tyler. Thousand oaks: Sage.
- Buskens, Vincent. 1998. "The social structure of trust." *Social Networks*:265-289.
- Castells, Manuel. 1996. *The rise of the network society; the information age: Economy, society and culture*. Malden MA: Blackwell.
- Castells, Manuel, M Fernández-Ardévol, J.L Qiu, and A. Sey. 2007. *Mobile Communication and Society. A Global Perspective*. Cambridge MA: The MIT press.
- Contractor, Noshir S., and Eric M. Eisenberg. 1990. "Communication Networks and New Media in Organizations." Pp. 143-172 in *Organizations and communication Technology*, edited by Fulk & C.W. Steinfield. Newbury Park CA: Sage.
- Corman, S.R., and C.R. Scott. 1994. "Perceived networks, activity, foci and observable communication in social collectives." *Communication theory*:171-190.
- Cross, Rob, Andrew Parker, Laurence Prusak, and Stephen Borgatti. 2001. "Knowing What We Know: Supporting Knowledge Creation and Sharing in Social Networks." *Organizational Dynamics* 30:100-120.
- Cross, Rob, and Laurence Prusak. 2002. "The People Who Make Organizations Go -or Stop." *Harvard Business Review* 80:104-112.
- Cummings, Jonathon N. 2004. "Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization." *Management Science* 50:352-364.
- Cummings, Jonathon N., and Rob Cross. 2003. "Structural properties of work groups and their consequences for performance." *Social Networks*:197-210.
- Duarte, Deborah L., and Nancy Tennant Snyder. 2006. "Mastering Virtual Teams." Josey-Bass.
- Elsbach, Kimberley, and Roderick Kramer. "Members Responses to Organizational Identity Threats: Encountering and Countering the Business Weeks Rankings." *Administrative Science Quarterly* 41:442-76.

- Erickson, Bonnie. 1988. "The relational basis of attitudes." Pp. 99-121 in *Social Structures. A Network Approach*, edited by B. Wellman and S D. Berkowitz. Cambridge: Cambridge University Press.
- Freeman, Linton C. 1979. "Centrality in social networks: Conceptual clarification." *Social Networks*:215-39.
- Garton, Laura, Caroline Haythornwhite, and Barry Wellman. 1997. "Studying Online Social Networks." in *JCMC*.
- Gersick, C. J. G., J. M Bartunek, and J. Dutton. 2000. "Learning form Academia. The Importance of Relations in Proffessional Life." *Academy of Management Journal* 43:1026-1044.
- Giddens, Anthony. 1984. *The Constitution of Society*. Berkley / Los Angeles: University of California Press.
- Granovetter, Mark. 1983. "The strength of weak ties: a network theory revisted." Pp. 2001-233 in *Sociological Theory*.
- Granovetter, Mark S. 1973. "The Strength of Weak Ties." *American Journal of Sociology*:1287-1303.
- Hanneman, Robert. 2001. "Introduction to Social Network Methods." Dep. Of Sociology. University of California, Riverside.
- Hartley, Chris, M. Brecht, P. Pagerly, G. Weeks, A. Champanis, and D. Hoecker. 1977. "Subjective time estimates of work tasks by office workers." *Journal of occupational Psychology*:23-36.
- Haythornthwaite, Caroline. 2001. "Exploring Multiplexity: Social Network Structures in a Computer-Supported Distance learning Class." *The Information Society*:211-226.
- . 2002. "Strong, Weak, and Latent Ties and the Impact of New Media." *The Information Society* 18:385-401.
- . 2005. "Social Networks and Internet Connectivity Effects." *Information Communication and Society* 8:125-147.
- Haythornthwaite, Caroline, and Barry Wellman. 1998. "Work, Friendship, and Media Use for Information Exchange in a Networked Organization." *Journal of the American Society for Information Science* 12:1101-1114.
- Hinds, Pamela, and Sara Kiesler. 2002. *Distributed Work*. Cambridge, Massachuset: MIT press.
- Hinds, Pamela, and Cathleen McGrath. 2006. "Structures that Work: Social Structure, Work Structure and Coordination Ease in Geographically Distributed Teams." in *CSCW'06*. Banff, Alberta, Canada.
- Hollingshead, Andrea B., Janet Fulk, and Peter Monge. 2002. "Fostering Intranet knowledge Sharing: An integrated Transactive Memory and Public Goods Approaches." Pp. 335-355 in *Distributed Work*, edited by P. Hinds and S. Kiesler. Cambridge MA: MIT press.
- Ishii, K. 2006. "Implications of mobility: The uses of Personal Communication Media in Everyday Life." *Journal of Communication*:346-365.
- Julsrud, Tom E., and John W. Bakke. 2007a. "Building Trust in Networked Environments: Understanding the Importance of Trust Brokers." Pp. 117-138 in *Computer-mediated Relationships and Trust: Organizational and Managerial Effects*, edited by Linda Brennan and Victoria Johnson. Hershey PA: Idea Group Publ.
- Julsrud, Tom Erik. 2005. "Behavioral changes at the mobile workplace; a symbolic interactionistic approach (eds.)." in *Mobile Communications: Re-negotiation of the Social Sphere*, edited by R Ling and P Pedersen. Berlin: Springer.
- Julsrud, Tom Erik, and John Willy Bakke. 2007b. "Boundary spanners, close collaborators and old friends: An exploatory analysis of distributed knowledge workers personal networks." *Forthcoming*.

- Kadushin, C. 2005. "Networks and Small Groups." *Structure and Dynamics:eJournal of Anthropology and Related Science* 1.
- Kilduff, Martin, and Wendip Tsai. 2003. *Social Networks and Organizations*. London: Sage.
- Knoke, David, and James H Kuklinksi. 1982. *Network Analysis*. London: Sage.
- Koku, Emmanuel F., and Barry Wellman. 2002. "Scholarly Networks as Learning Communities: The Case of TechNet." Pp. 299-338 in *Designing Virtual Communities in the Service of Learning*, edited by Sasha Barab and Rob Kling. Cambridge: Cambridge University Press.
- Krackhardt, D. 1987. "Cognitive Social Structures." *Social Networks*:109-134.
- Krackhardt, David. 1992. "The strength of strong ties: The importance of philos in organizations." Pp. 216-239 in *Network and Organizations; Structure, Form and Action*, edited by N Nohria and R Eccles. Boston: Harvard University Press.
- . 1999. "The ties that torture: simmelian tie analysis in organizations." *Research in the Sociology of Organizations* 16:183-210.
- Krackhardt, David, and D. Brass. 1994. "Intraorganizational Networks. The Micro Side." Pp. 207-229 in *Advances in Social Network Analysis*, edited by S Wasserman and J Galaskiewicz. Thousand Oaks: Sage.
- Krackhardt, David, and J R Hanson. 1993. "Informal Networks: The Company behind the Chart." *Harvard Business Review* 71:104-111.
- Krackhardt, David, and R N Stern. 1988. "Informal Networks and Organizational Crises: An Experimental Simulation." *Social Psychology Quarterly* 51:123-140.
- Kramer, Roderick M., and Karen S. Cook (Eds.). 2004. *Trust and Distrust in Organizations. Dilemmas and Approaches*. New York: Russel Sage Foundation.
- Kramer, Roderick M., and Tom R. Tyler. 1996. "Whither Trust." Pp. 1-15 in *Trust in Organizations: Frontiers of Theory and Research*, edited by R.M Kramer and T.R Tyler. Thousand Oaks: Sage Publications.
- Kristoffersen, Steinar, and Fredrik Ljungberg. 2000. "Mobility: From stationary to mobile work." Pp. 137-156 in *Planet Internet*, edited by Carsten Sørensen and Bo Dahlbom Kristin Braa. Lund: Studentlitteratur.
- Krotz, Friedrich. 2005. "Mobile Communication, the Internet and the Net of Social Relations." Pp. 447-458 in *A Sense of Place*, edited by K. Nyiri. Vienna: Passagen.
- Lewicki, Roy L., and Barbara B. Bunker. 1996. "Developing and Maintaining Trust in Work Relationships." Pp. 114-139 in *Trust in Organizations. Frontiers of Theory and research*, edited by R. Kramer and T. Tyler. Thousand Oaks: Sage.
- Lewis, J.D., and A. Weigert. 1985. "Trust as a social reality." *Social Forces* 63:967-985.
- Licoppe, Christian, and Zbigniew Smoreda. 2004. "Are social networks technologically embedded? How networks are changing today with changes in communication technology." *Social Networks*:317-335.
- Lipnack, Jessica, and Jeffrey Stamps. 2000. *Virtual Teams. People Working Across Boundaries with Technology*. New York: John Wiley.
- Massey, D. 1994. *Space, Place and Gender*. Minneapolis: University of Minnesota Press.
- Mayer, Roger C., J.H Davis, and F.D Schoorman. 1995. "An integrated model of organizational trust." *Academy of Management Review* 3:709-734.
- McEvily, Bill, V. Perrone, and A. Zaheer. 2003. "Trust as an organizing Principle." *Organization Science* 1:91-103.

- McKnight, D H, L L Cummings, and N L Chervany. 1995. "Trust formations in new organizational relationships." in *Information and Decision Sciences Workshop*. University of Minnesota.
- McPherson, M, L Smith-Lovin, and J M Cook. 2001. "Birds of a Feather. Homophily in social networks." *Annual Review of Sociology*:415-444.
- Meyrowitz, Joshua. 1994. "Medium Theory." Pp. 50-77 in *Communication Theory Today*, edited by E Crowley and D Mitchell. London: Polity Press.
- Nardi, Bonnie, S Whittaker, and H Schwarz. 2000. "It's Not What You Know, It's Who You Know: Work in the Information Age." *First Monday*
5:http://firstmonday.org/issues/issue5_5/nardi/index.html.
- Postman, Neil. 1993. *Technopoly: The Surrender of Culture to Technology*. New York: Vintage Books.
- Quan-Haase, Anabel, and Barry Wellman. 2006. "Hyperconnected Net Work: Computer-Mediated Community in a High-Tech Organization." Pp. 281-333 in *The Firm as a Collaborative Community. Reconstructing Trust in the Knowledge Economy*, edited by C Hekscher and P Adler. New York: Oxford University Press.
- Rousseau, Denise M., S.B. Sitkin, R.S. Burt, and C. Camerer. 1998. "Not So Different After All: A Cross-Disipline View of Trust." *Academy of Management Journal* 3:393-404.
- Scott, John. 2000. *Social Network Analysis: A handbook*. Thousand Oaks CA.: Sage.
- Shapiro, Debra, Blair H. Sheppard, and Lisa Cheraskin. 1992. "Business on a handshake." *Negotiation Journal* 8:365-377.
- Silverstone, Roger, and Leslie Haddon. 1996. "Design and domestication of information and communication technologies: Technical change and everyday life." in *Communication by Design: The Politics of Information and Communication Technologies*, edited by R. Silverstone and R. Mansell. Oxford: Oxford University Press.
- Trevino, L.K., R. H. Lengel, and R.L. Daft. 1987. "Media symbolism, media richness, and media choice in organizations." *Communication Research*:553-574.
- Urry, John. 2000. "Mobile sociology." *British Journal of Sociology* 51:185-203.
- Wasserman, Stanley, and Katherine Faust. 1994. *Social Network Analysis. Methods and Applications*. Cambridge: Cambridge University Press.
- Wellman, B, and S Potter. 1999. "The Elements of Personal Communities." Pp. 49-82 in *Networks in the Globale Village. Life in Contemporary Communities.*, edited by B Wellman. Oxford: Westview Press.
- Wellman, Barry. 1988. "Structural analysis: from method and metaphor to theory and substance." Pp. 19-61 in *Social Structures: a network approach*, edited by B Wellman and S.D. Berkowitz. New York: Cambridge University Press.
- . 2001. "Computer Networks As Social Networks." *Science* 293:2031-34.
- Wellman, Barry, Janet Salaff, Dimitrina Dimitrova, Laura Garton, Milena Gulia, and Caroline Haythornthwaite. 1996. "Computer Networks as Social Networks: Virtual Community, Computer Supported Cooperative Work and Telework." *Annual Review of Sociology*:213-38.
- Wellman, Barry, and S. Wortley. 1990. "Different Strokes from Different Folks: Community Ties and Social Support." *American Journal of Sociology*:558-88.
- Wenger, Clare. 1991. "A Network Typology: From Theory to Practice." *Journal of Aging Studies* 5:147-162.
- Yuan, Y. Connie, and Geri Gay. 2006. "Homophily of Network Ties and Bonding and Bridging Social Capital in Computer-mediated Distributed Teams." *Journal of Computer-Mediated Communication* 11.

Fifth paper (E)

Interpersonal trust and mobile communication: A social network approach

Tom Erik Julsrud^{ab} and John Willy Bakke^a

^a *Telenor Research & Innovation, N-1331 Fornebu, Norway*

^b *Norwegian University of Science Technology, N-7491 Trondheim, Norway*

Abstract: Mobile communication technologies, such as mobile phones, PDAs and handheld computers, have during the last decade been widely adopted among private users as well as business professionals. The high availability of basic mobile communication technologies and services has created a new situation for regular users, where fast and almost immediate access to friends, families and colleagues is possible whenever needed. The norms for how social relations should be supported by mediated communication has changed, and among early adopters there are indicators of new ways of using communication technologies to support individual and group based social networks (Katz and Aakhus 2002; Katz and Rice 2002; Ling 2004). This new situation implies that there are changing criteria's for how social relations are established, sustained and terminated. This article raises the question of how mobile phone services, such as dialogues and text messages (SMS) is used to support and sustain relations of interpersonal trust, and how trust affects the use of these communication channels. Based on empirical studies of professional users in a telecommunication company, the article argues that trust can be seen as a "cognitive network resource" existing on various levels within a social group, and supported in different ways by available communication media. The article present findings that shows how different mobile channels are used to support different types of trust, with a special emphasis of the difference between SMS and mobile dialogues. The findings are then used to discuss further the way trust affects the adoption and use of mobile services, and the difference between "broadband" and "narrowband" applications.

Key words: Trust, mobile communication, social networks, SMS, email, cognitive networks.

Citation: Julsrud, Tom E., and John W. Bakke. 2008. "Interpersonal trust and mobile communication: a social network approach." in *Trust and New Technologies: Marketing and Management on the Internet and Mobile Media*, edited by Teemu Kautonen and Heikki Karjaluoto. London: Edward Elgar

1. Introduction

Mobile communication technologies, such as mobile phones, PDAs and handheld computers, have during the last decade been widely adopted among private users as well as business professionals. For many European countries the average penetration rate for mobile phones has reached and even surpassed 100 per cent, indicating that the large majority of inhabitants has access to mobile speech communication, as well as exchange of text messages (SMS) (ITU 2006). For the increasing number of people that have access to broadband mobile networks, more advanced services are accessible, such as multimedia messages, e-mail services and mobile videoconferences.

The high availability of basic mobile communication technologies and services has created a new situation for regular users, with almost immediate access to friends, families and colleagues whenever needed. The norms for how social relations should be supported by mediated communication have changed, and there are several indicators of new and innovative ways of using communication technologies to support individual and group based social networks (Katz and Aakhus 2002; Katz and Rice 2002; Ling 2004). Some researchers have called the emerging situation a 'connected presence' (Licoppe and Smoreda 2004), or a situation of 'perpetual contact' (Katz and Aakhus 2002), indicating how mobile technology has created an opportunity to always be in touch with the important relations in your private life or at work. This motivates the emergence of new criteria for how social relations are established, sustained and terminated: New norms and rules for how trust is expressed and enhanced are emerging, not determined by any technological logic, but intertwined with the opportunities provided by the affordances of the technologies (Gaver 1991; Norman 1998; Wellman, Quan-Haase, Boase et al. 2003). As a vital element in many relations, *interpersonal trust* is strongly involved in these changes.

Within workplace settings, the proliferation of knowledge work makes considerations of interpersonal trust ever more important, since knowledge sharing to a large extent depends on trust. Distributed work settings may challenge the development of trust relations, whereas information and communication technologies both facilitate and change the potentials for the development and maintenance of interpersonal trust.

The objective of this article is twofold: Firstly we will propose a framework for discussing trust as embedded in social relations and networks within a workgroup, closely related to (but not constituted by) the flow of mediated interaction. Based on a cognitive network approach we argue that trust can be seen as a 'perceived network' existing on various levels within a social group, and supported in different ways by available communication media. Secondly, we will use this framework to explore how cognitive and affective trust networks were interrelated to the use of SMS and mobile phone dialogues as well as e-mail interaction. Based on a quantitative and qualitative study of

distributed workers in a Nordic engineering company, we present findings that explore and explain interrelationships between interpersonal trust and mobile phone dialogues, SMS and e-mail messages. The case presented here involves a group of technical experts working together across national as well as institutional boundaries in the wake of a company acquisition.

2. Interpersonal trust and the use of ICT in work situations

Trust can be defined as ‘a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of others’ (Rousseau, Sitkin, Burt et al. 1998 p. 395). This widely used definition emphasizes that trust is a subjective perception of others’ intentions and potential future actions. Even though it demarks trust as a psychological state, it does by no means follow that trust is unrelated to the social settings – such as work environments. On the contrary, the perceived vulnerability and the expectations of others will to a high degree depend on actors’ position in a social system, the risks and danger they experience, and the possibilities of observing or controlling the actions of others. Therefore, trust is at the same time an individual state of mind, but also strongly constrained, created or supported by social factors.

In organization studies trust is believed to have a positive effect by enabling cooperative behaviour (Gambetta 1988), promote adaptive organizational forms (Miles and Snow 1992), reduce conflicts and decrease transaction costs (Bradach and Eccles 1989). According to Dirks and Ferrin, however, the most important impact of trust is that it seems to *moderate* the effects of primary determinants on outcomes by affecting how one interprets other individuals’ intentions and actions (Dirks and Ferrin 2001). It affects how individuals interpret and assess other parties’ past behaviour, and shapes expectations of future behaviour.

Trust may have a general form, as in the form of dispositional trust (Mayer, Davis and Schoorman 1995) or as embedded in norms and values within a particular society. Yet in many situations this is a positive attitude directed towards particular others at the workplace, neighbourhood or in the family. This is often denoted interpersonal trust, and this article draws particular attention to this type of trust within a group of professionals. Empirical investigations of interpersonal trust usually make a distinction between cognitive and affective dimensions of interpersonal trust (Boon and Holmes 1991; Lewis and Weigert 1985; McAllister 1995). The cognitive dimension refers to the calculative and rational characteristics demonstrated by trustees, such as reliability, integrity, competence and responsibility. The affective dimension, on the other hand, involves emotional elements and social skills of trustees. The affective aspects of trust have in particular been studied in close relationships, but they have also been found to be important in work-related relationships

(McAllister 1995). Later in this paper we will use this distinction in the study of interpersonal trust and the use of mediated communication in a small, distributed work group.

2.1 Trust, interaction and time

A crucial issue in any discussion about the use of communication media and interpersonal trust is how the latter is related to interaction. This is a point where divergent answers are given by trust researchers, emphasizing either interaction or trust as the crucial 'driving factor'. On the one hand, there is a widely held belief that regular interaction over time leads to relational trust, at least in most cases (Ring and Van de Ven 1992). In analyses of development of trust in political movements, for instance, Tilly sees trust as developing through interaction over time (Tilly 2005). On the other hand, there is a strand of researchers who argue that trust is a mental motive that *generates* interaction and cohesiveness (Bradach and Eccles 1989; Johansen and Selart 2006; McEvily, Perrone and Zaheer 2003).

The trust/interaction relation may seem to be a typical chicken and egg problem, where it is difficult to account for the causal direction in a good way. What is clear, however, is that trusting someone depends on some form of information about the potential trustee. This information does not necessarily come out of personal experiences; reputations and rumours are also important, along with cultural stereotypes or 'images' (Burt and Knez 1996; McKnight, Cummings and Chervany 1995). Also, a high level of trust in others' role or professionalism can help to establish cognitive trust quickly, with little or no former interaction (Meyerson, Weick and Kramer 1996). For the more affective forms of trust, however, in-depth knowledge about the trustor through face-to-face communication seems to be a precondition. Such ties will also need some sort of recurring communication not to fade away. In general, one may say that affective trust takes a longer time to build up than cognitive trust, while it is also more durable and robust (Boon and Holmes 1991; Lewicki and Bunker 1996). As captured in the concept of *social capital*, trusting relations can be seen as a resource, available only after sufficient 'investments' in the relations over time (Burt 2005; Fukuyama 2001; Lin 2001; Monge and Eisenberg 1987; Nahapiet and Ghoshal 1998).

Emerging transformations in post-bureaucratic organizations may be challenging for the development of interpersonal trust (Grey and Garsten 2001). Lack of routines and procedures may create uncertainty in what is proper behaviour, and fast organizational changes may prevent the establishment of long and 'deeper' relations (Sennett 1998). Simultaneously, new sets of personal media have been widely adapted in organizations and workplaces in the last decades, including e-mail, instant messaging, and mobile communication services. These tools offer new ways to conduct work tasks but also new ways to handle social relations across time and space. The different media have,

however, different qualities as well as symbolic values for users. The choice of a particular medium over another to sustain relations is thus hardly random, but must be seen in relation to the user's and receiver's experience of the particular relation.

2.2 Trust as networks: A conceptual framework

Within sociology, social psychology and anthropology a central paradigm for studies of relational structures is *social network analysis* (Erickson 1988; Scott 2000; Wasserman and Faust 1994; Wellman 1988). A central idea underlying this paradigm is that structural aspects of social relations have impacts on individuals, on groups and on organizations. While acknowledging the importance of the attributes of the individuals, social network studies direct their attention to relations and social structures in explaining social phenomena, rather than focussing on the individual. According to this perspective, trust can be seen as a quality of a social relation, and there will be structured patterns of trust within a group, together with other forms of relations (Julsrud and Bakke 2007).

But what kind of network is a trust network? As evident from the definition above, the essential feature of trust is that it is based on 'positive expectations of the intentions or behaviour of others'. Like relations based on friendship, trusting ties represent *perceived relationships* that exist largely as a mental attitude towards others in a network. Analytically, trust relations can be distinguished from *interaction-based relations*, that is, relations based on observed communication patterns – the number of phone calls or frequency of face-to-face interaction. This is not to say that trust and interaction are non-related, but that the relationship is difficult to anticipate a priori. Social networks are usually snapshots of interaction on a given time and the trust relations might, or might not, be evident in a network structure.

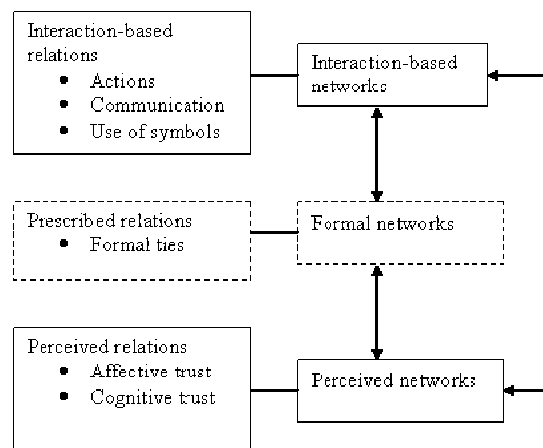
Second, both trust networks and interaction networks should be distinguished from *formal organizational networks*. In most workplaces, for individuals there is a considerable degree of choice for selecting communication partners, and for deciding whom to trust in work settings (Kadushin 2005). Whereas formal roles and job descriptions prescribe certain types of interaction and communication in organizations, actual interaction is usually shaped by these other constraints. This is important to remember when analysing relational trust in organizations, where taking frequent interaction between two individuals as an indicator of high interpersonal trust may be problematic.

In the field of social network studies, the connections between networks as observed interactions and networks as mental constructs touch on important ontological questions, regarding what should be seen to constitute the 'real' manifestations of social networks; observable interactions

and/or psychological attractions. We will here rely on a framework outlined by Corman and Scott to clarify this issue (Corman and Scott 1994). These authors apply elements from structuration theory developed by Anthony Giddens and argue that different modalities explain the recursive relationships between cognitive social structure and interaction (Giddens 1984). From their perspective, social networks are basically mental constructs that are continually reproduced through interaction. In line with the basic ideas of structuration theory, they argue that: ‘... the network is an abstract structure of rules and resources of communicative actors in a given social collective, instantiated in communication systems, but having only a “virtual existence”’ (Corman and Scott 1994, p. 174).

Social networks, then, may be seen as a *cognitive resource* embedded in a particular social community or culture, not an observable social reality. Trust relations are cognitive resources that are activated or enacted by communication face-to-face or through communication media. As such they are distinguished from interaction-based relations (such as mediated communication) and prescribed relations (such as formal relations). The relationship between these relations is indicated in the figure below (see figure 1). This model does not intend to capture all kinds of social relations or networks, but to sketch out some central types of relations and networks in organizations and groups.

Figure 1. A conceptual model of central types of relations and networks in professional groups and teams



The model is useful because it draws a clear distinction between interaction-based relations and perceived relations, and as such it opens for the option of systematically analysing and comparing these networks in groups. In this article we are in particular interested in how the perceived relations of trust are linked to the use of mobile communication. The case in this study is a group of distributed workers working across distance, although in a non-hierarchical setting. As the difference between work-related and informal interaction was highly blurred in this group, we will in the following focus on the relationship between perceived and interaction-based ties.

3. Methodology

Although there has been a renewed interest for applying a network approach on small organizational groups, this is so far mostly done on larger samples, and mainly by analysing interaction-based ties (Ahuja and Carley 1999; Cummings and Cross 2003; Hinds and McGrath 2006; Sparrowe, Liden, Waynes et al. 2001). The design of the current study is a combination of different methodological strategies, including qualitative interviews with individuals and quantitative studies of group-based social networks. The data gathering included an explorative qualitative study, followed up by a quantitative enquiry, targeted at issues evolving out of the explorative phase. Together with other distributed work groups (not reported here), Delta was observed during a period of approximately 15 months. The qualitative results will in this paper be used to supplement and explain central findings from the network study. (Note that all names of individuals and groups used in this article are pseudonyms, whereas information about gender and nationality is correct).

The case investigated is a group of technical experts working in a Nordic engineering company. As part of the implementation of a new and mobile workplace design, mobile phones had replaced traditional fixed-line telephones for all employees in Delta (fixed-line phones were only installed in some smaller rooms at the headquarters, mainly intended for telephone conferences). Therefore, we focused in this study on two of the mobile applications that we assumed to be the most important ones; SMS and mobile phone dialogues. In addition we included what we believed was the other most important communication medium in the group; e-mail interaction through PCs.

3.1 Qualitative interviews

Prior to the main quantitative network study, semi-structured interviews were conducted with employees and managers in order to get a better understanding of their work situation. The interviews followed an interview guide focusing on the respondents' main work tasks, social relations, identity in group/organization, and trust issues, and lasted 30-40 minutes. Eleven of the thirteen employees in Delta were interviewed (two of the employees in the group were unavailable for interviews due to a shift in job assignments and absence due to sickness). In addition, interviews were conducted with individuals outside the group, including the leader's superior executive and other managers in the company. The rationale was to get a better understanding of the group's tasks and position in the company by including 'outside perspectives'.

During the qualitative study intermediate reports and preliminary analyses were made. The interviews were coded as text files (using NUD*IST software) and the main issues and topics from the interviews were classified.

3.2 Social network study

In the social network part of the study, interactions were registered through a web-based questionnaire and coded in a case-by-case social network matrix. All network data were gathered through retrospective reports of the frequency of communication during a week, together with assessments of trustworthiness. The data were gathered after the group had existed for a period of 19 months as a distributed group. Before the distributed work was established, no ties existed between the two national units.

The group members were asked to indicate interaction-based as well as trust-based relations. A traditional 'roster' design was used for the network study, whereby each group member received a list of the other members of the group (Wasserman and Faust 1994). The response to the survey was good, and after two reminders, all the employees in the groups save one had completed their questionnaires. The data were coded as regular 1-mode social network data in socio-matrices for valued data, and analysed by UCINET and NetDraw software packages. As described above the study intended to include both cognitive and affective aspects of trust. Table 1 shows the questions that were used to capture these dimensions.

Table 1. Questions used to track trust flows and interaction in Delta

Type	Relation/network	Indicator
Perceived	Cognitive trust	Whom in your group would you talk to if you needed professional advice in your daily work?
	Affective trust	If you were planning to apply for a job similar to the one you have today, but in another company; whom in your group would you prefer to discuss this with?
Interaction based	Mobile phone dialogues	Whom in your group have you talked to on the mobile phone during the last seven days?
	SMS	Whom in your group have you sent SMS messages to during the last seven days?
	E-mail	Whom in your group have you sent e-mail messages to during the last seven days?
	FTF	Whom in your group have you talked to face-to-face during the last seven days?

The idea behind the affective trust formulation is that a discussion of a potential job shift would imply trustfulness, as disclosure of such plans would be negative for the reputation of the individual in question. These types of indirect questions are the most usual way to analyse trust-based relations in organizations within the network research tradition (Burt and Knez 1996; Krackhardt and Hanson 1993). The cognitive trust question tried to capture the knowledge-based ties in the group, based on professionalism and expertise. In more extensive organizational studies of affective and cognitive dimensions of trust, several items may be deployed in order to construct multi-dimensional indicators (see McAllister 1995, p.37). Our rationale for choosing two single item indicators in this study are twofold: Firstly it is much more complex to use multiple indicators when applying a network study, because the recipient must indicate his/hers perceived relationship to every other person in the group for each item. Secondly, our main goal for this study is not to measure trustfulness in the group per se, but to get some indicators that could reflect central different trust-dimensions within the group. A more extended design would therefore go beyond the scope of the study.

A measure of mediated interaction was established, based on questions asking for interaction between the respondents in the group in the last seven days, using mobile phone dialogues, SMS, and e-mail messages. In addition we asked for frequency of physical meetings between individuals and the group in general (formal and informal). The network study relied on certain general concepts and

terms including density, degree of centralization, core-periphery measures and E-I index, which will be further explained in the next chapter.

4. Empirical study

4.1 Delta - a group of experts working across boundaries

Delta was a group of 13 technical experts working as a team across the boundaries of two units, situated in Norway and Denmark, respectively. The group was established after a Norwegian engineering company bought a smaller Danish company within the same business sector. In the new company, Delta got an important role in building up a united line of technical products that could be used in both markets. As such the group was central in the work involving the integration of former technical products into a new set of technical products developed for the business consumer market. The group was having monthly face-to-face meetings when we investigated them, and their regular interaction took place by the use of e-mails, audio-meetings, telephone calls and occasional video conferences.

Our early qualitative study of the communication and interaction in the group revealed that they had experienced significant problems in the group during the first year. Many employees found the collaboration in the group inadequate and that there was a sense of 'local orientation' in the group. In particular there were often problems agreeing on the right technical products and applications. One Norwegian Delta employee told us that:

'There has been several conflicts here. Discussions go on and on and never end. Decisions that you think are made, keep coming back again and again. In the end, the result is a lack of trust between the employees in Denmark and here ...' (Female Delta employee)

These problems had brought issues of 'cultural differences', 'organizational identities' and 'trust' to the surface. Still, most participants felt that the group had taken important steps forward over the last months in creating a better understanding of their work ahead.

4.2 Network structures

Applying a network approach to a small group means that the individuals are seen as nodes in a network, integrated through a web of stronger and weaker relations (Kadushin 2005; Katz, Lazer,

Arrow et al. 2005). To capture the relations and networks in Delta, a limited number of measures were used, briefly described in the following.

The *density* of a network is measured as the number of actual connections as a proportion of the maximum possible connections, going from 0 to 1. For a directed graph the density is calculated as the number of arcs (L) divided by the possible number of arcs. *Freeman's centralization* measure describes how centralized a network is based on their incoming and outgoing ties (arcs). More precisely; it indicates the extent to which the network resembles the shape of a 'star', the most centralized structure, of either ingoing or outgoing ties (Freeman 1979). (Note that for valued graphs, as used here, the percentage may be larger than 100 per cent). A high *core-periphery structure* of a network indicates that there is a dense cohesive core with a sparse unconnected periphery (Borgatti and Everett 1999). The coreness measure indicates the extent to which the network correlates to an ideal core-periphery model. For relations describing a distributed work group there is usually a particular need to describe relations that cross boundaries between two places. For this purpose the *E-I index*, as developed by Krackhardt and Stern, will be used (Krackhardt and Stern 1988). This indicator compares the external ties with the internal ties for groups within a network, ranging from -1 to +1. Given a partition of a network into a number of mutually exclusive groups, the E-I index is the number of ties external to the group, minus the number of ties that are internal to the group, divided by the total number of ties. Maximum collaboration across the boundaries is then +1 (all links are external), while equally divided links will give an index equal to zero. For the purpose of this part of the study, the Danish employees are described as 'external' and the Norwegians as 'internal'.

Table 2. General network indicators for cognitive trust (C-Trust), affective trust (A-Trust), mobile phone dialogues, SMS, e-mails and face-to-face interaction

	Ties	Density	Network Centralization (In-degree) %	Network Centralization (Out-degree) %	Coreness (continuous)	E-I Index
C-trust	62	0.429	45.833	18.750	0.353	-0.290
A-trust	16	0.064	20.139	11.111	0.437	-0.500
Mobile phone dialogues	68	0.403	28.472	127.778	0.523	-0.118
SMS	30	0.109	42.361	24.306	0.462	-0.467
E-mails	80	0.570	64.583	154.861	0.624	-0.263
FTF	106	0.645	29.861	93.056	0.596	-0.520

As can be seen in table 2, the *cognitive trust network* is much more widespread than the affective one. The high density of the cognitive network – compared to the affective trust network – suggests that the participants in Delta were confident that the others in the group could help them solve difficult work-related issues. As indicated by the low E-I index, this network is much more boundary-crossing than the affective trust network, suggesting that there is an acknowledgment of the remote individuals' knowledge and competence. The in-degree centralization index is, however, also relatively high for cognitive trust, indicating that the competencies are not equally distributed in the network, which would be unlikely in this type of knowledge-based community. The structure of the cognitive network is presented in figure 3. The *affective trust networks*, based on personal dimensions of trust and personal oriented risks are more sparsely distributed. As one would expect, this trust is more locally oriented than cognitive trust (as indicated by the high negative E-I index); there is only one boundary-crossing tie. The affective network is displayed in figure 2.

The *mediated networks* had different qualities according to the network indicators in table 2. First, the e-mail network had highest density, indicating that this was the most frequently used medium in the group, followed by mobile phone dialogues. Both these networks had high out-degree centralization indexes, indicating that they were widely used to distribute information in the group. The e-mail network also had high in-degree centralization and a high coreness value, indicating that it was used to connect a central core in the group. The mobile network on the other hand had the most boundary-crossing structure (indicated by the low E-I index) and a lower in-degree centralization. Second, the SMS network was much more sparsely connected than the e-mail and mobile phone dialogue networks, and the high E-I index indicates a local orientation. As such it had a structure that was very similar to the face-to-face interaction patterns, although less dense.

4.3 Trust relations and mobile communication networks

In our conceptual model we argued that trust relations in general could be seen as cognitive structures based on positive expectations toward others in a group. An interesting question is whether these structures are related to the mediated interaction in the group. A regular QAP correlation procedure displayed interesting differences between the two trust networks and the three mediated networks (see table 3). This is a technique that investigates whether one or more network values may predict a dependent network structure. More precisely it uses an algorithm that analyses the matrix data in two steps: In the first step, it computes Pearson's correlation coefficient (as well as simple matching coefficient) between corresponding cells of the two data matrices. In the second step, it randomly permutes rows and columns of one matrix and re-computes the correlation. (Borgatti, Everett and Freeman 2002)

Table 3. QAP correlations of perceived and interaction based relations in Delta

Relations	C-trust	A-trust	Mobile phone dialogues	SMS	E-mails
Perceived					
C-trust	-				
A-trust	0.278*	-			
Interaction based					
Mobile phone dialogues	0.396*	0.165	-		
SMS	0.281*	0.328*	0.397*	-	
E-mails	0.504*	0.170	0.681*	0.363*	-
Face-to-face	0.312*	0.342*	0.121	0.282*	0.165

Note: * $p < .05$: A low p-value (< 0.05) suggests a strong relationship between the matrices that is unlikely to have occurred by chance.

Firstly, we found that the two trust networks displayed high structural similarities, and the high correlation score indicated that the relation between them was not random ($r = 0.278$). Secondly, the cognitive trust network bears strong similarities to all the mediated interaction, indicating that the much of this communication was related to conducting of work tasks. All the three media channels is closely interrelated and in particular the e-mail and the mobile phone dialogue networks ($r = 0.681$). Thirdly, and perhaps most interestingly, the correlation analysis indicates that the affective network is strongly related to the SMS and the face- to face-network, although not to e-mail and mobile phone dialogue networks. Thus, in Delta the available media seemed to be used differently in the work of establishing, sustaining and activating the two trust dimensions: Affective trust networks were following similar patterns as the narrowband SMS interaction, while the more task oriented cognitive trust network seemed to follow the same patterns as (in particular) e-mail interaction and mobile phone dialogues.

5. Discussion

The integrated network analysis of Delta indicated that the affective and the cognitive trust networks were related to different media. Having affective relations correlated positively with the

likelihood of using SMS, while cognitive trust relations correlated positively with the likelihood of using the e-mail messages and mobile phone dialogues. Moreover, media usage showed different patterns of proximity, where affective ties and SMS were more locally oriented. In the following, we will discuss further some potential explanations for these differences, coming out of the qualitative interviews.

5.1 The risk of 'narrow-band' communication

Our interviews with Delta employees left little doubt that e-mail and mobile phone were by far the most important communication tools, together with speech communication via mobile phones. The use of e-mail messages was the main channel for job-related formal communication, and for the distribution of official information within the company, as there were few other options for longer written communication. The central role of e-mail as a channel for work-related communication was probably an important reason why this channel was so much used among partners with high cognitive, or task oriented trust. The language differences within Delta may have strengthened the use of e-mail communication, since the two languages spoken in the group (Norwegian and Danish) are quite similar in their vocabulary (although with some differences in spelling), whereas pronunciation is quite different. Employees in both countries found that in particular telephone-dialogues were challenging, and that written language often was easier to comprehend.

'I prefer to use e-mail in my work. It can be difficult to understand what they are saying, and when I use e-mail I avoid misunderstandings' (Female employee in Delta)

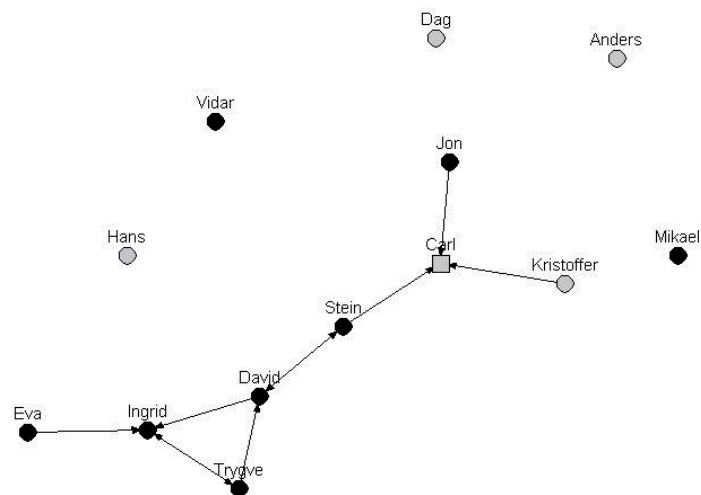
To ensure that messages were correctly understood many employees said that they used to follow up phone conversations and audio meetings with e-mail messages. This might have been one reason for the close connection that we found between mobile phone dialogues and e-mails. There was, however, an important aspect of *risk* and uncertainty related to the telephone-mediated communication, as addressed by several Delta employees. The newly established group had, as mentioned earlier in this paper, experienced significant difficulties in their first phase of collaboration. This might have been an important reason for their awareness of potential sources of conflict:

'You cannot avoid sending e-mails, but it is important also to talk together and listen to the tone in the voice. The optimal is to meet each other face-to-face every now and then. When you don't know the other well

enough it is often difficult to interpret the e-mail message correctly. To avoid misunderstandings due to irony, mood and so on, I believe it is crucial to have regular group meetings ...' (Female employee, Delta)

Several of the informants argued that group-internal communication should involve more face-to-face meetings to avoid further misunderstandings. In this perspective, text messages appear as a 'risky' communication channel as they usually contain short and context-specific messages with a relatively high degree of ambiguity. SMS were mainly used for last minute coordination, ad-hoc information, and more private messages. The less developed use of SMS suggests that the norms for using this technology were weaker than for e-mail and mobile phone dialogues, and this could have made it difficult to interpret, for instance, a lack of immediate response. A receiver with high affective trust might be a safeguard against such misunderstandings, as they would probably interpret the message in a positive way. Thus, the risk surrounding the use of SMS might call for another level of trust in this group. In addition, short messages on the mobile phone seemed to have a slightly stronger symbolic meaning than e-mail and dialogues. In Scandinavian culture SMS has always been most frequently used by adolescents and students, and as such it may symbolize a more private relationship than the other channels (Ling 2004).

Figure 2. Affective trust relations in Delta



Several earlier studies of trust in distributed groups have found that cognitive trust is more easily established than affective trust (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002; Meyerson, Weick and Kramer 1996). The current study corroborates these findings, suggesting that the affective trust is mainly situated within local ties, although occasionally also crossing organizational boundaries and distances. In Delta this was the case for the affective trust tie between Stein and Carl (see figure 2). The local core of affective trust in the Norwegian sub-unit illustrates how the pattern of affective trust in Delta was embedded in cohesive sub-units of employees, often based on long-term relations. Many of the Norwegian Delta employees had been working together for several years and had therefore developed a richer network of affective ties.

Interestingly, the local trust zone was closely associated with face-to-face communication and with SMS. The remote, and more task oriented relations within the group were dominated by e-mail in combination with mobile phone dialogues. This suggests that narrow-band technologies, such as SMS, fulfil a dual role in distributed groups: On the one hand to conduct micro-coordination of ad-hoc tasks; on the other hand to sustain and activate the affective trusting ties.

One would perhaps expect closer and more affective ties to use *all* available communication media more intensively than more task-oriented ties. A finding coming out of earlier studies of media use in distributed networks has been that stronger ties usually is supported by the use of multiple media channels (Haythornthwaite 2002; Haythornthwaite and Wellman 1998). Yet, the physical proximity among the group with high affective trust, as well as the long history of collaboration between many of these employees seemed to have moderated the need for instant mobile phone dialogues and e-mail interaction.

6. Concluding remarks

A network approach to interpersonal trust approaches trust as a 'flow' following particular relations and nodes within an organization or a group. This represents a distinct and novel way to understanding trustfulness in organizations and groups, in business and private life. It also opens for a closer analysis of how trust dimensions are interrelated to the use of available communication technologies. The results from this study suggest that affective and cognitive 'trust flows' was related to the use of mobile ICT in different ways: While e-mail appeared as a channel for work related communication and cognitive trust, SMS was more closely related to the flow of affective trust. Mobile phone dialogues, on the other hand, appeared to be closely affected by both e-mail and SMS interaction, but most closely to the cognitive trust dimension.

This study has explored two aspects of trust, affective and cognitive 'trust flows'. This extended scope has been achieved by making certain delimitations: Being based on a single case study and with the mapping of the trust relations based on single indicators, the study can be seen as an exploratory study of how aspects of trust relate to multidimensional ICT usage. The findings that central dimensions of interpersonal trust showed different patterns within a distributed group, and that different communication technologies affect trust in different ways, are two strong arguments for this kind of detailed and disaggregated studies of trust and ICT.

A promising implication for managers of distributed work is that the cognitive trust network – which is important for solving work-related issues – proved to be widespread, in spite of a presumably difficult constellation of geographical distances and cultural differences related to the acquisition or merger of the two units. The affective trust networks were, however, less developed, and they showed stronger dependency on proximity and common history. This is an indicator that the development of a common identity is a longer-term project, in need of more elaborate strategies than simply having access to a range of information and communication technologies, where regular face-to-face-meetings may be one element in the strategy. The fact that trust tended to go through particular nodes in the networks, also suggests that attention should be given to employees acting as connectors or brokers for trust in distributed groups (Julsrud and Bakke 2007).

Literature

- Ahuja, Maju, and Kathleen M. Carley. 1999. "Network Structure in Virtual Organizations." *Organization Science* 10:741-57.
- Boon, S.D., and J.G. Holmes. 1991. "The dynamics of interpersonal trust: resolving uncertainty in the face of risk." Pp. 190-211 in *Cooperation and Prosocial Behavior*, edited by R.A. Hinde and J. Groebel. Cambridge: Cambridge University Press.
- Borgatti, Stephen, and Martin Everett. 1999. "Models of core/periphery structures." *Social Networks*:375-395.
- Borgatti, Stephen, Martin Everett, and Linton Freeman. 2002. "Ucinet 6 for Windows." Harvard: Analytic Technologies.
- Bradach, Jeffrey L., and Robert G. Eccles. 1989. "Price, Authority, and Trust: From Ideal Types to Plural Forms." *Annual Reviews in Sociology*:97-117.
- Burt, Ronald. 2005. *Brokerage and Closure. An Introduction to Social Capital*. New York: Oxford University Press.
- Burt, Ronald, and M. Knez. 1996. "Trust and Third-Party Gossip." Pp. 68-89 in *Trust in Organizations. Frontiers of Theory and research*, edited by R M Kramer and T R Tyler. Thousand Oaks: Sage.
- Corman, S.R., and C.R. Scott. 1994. "Perceived networks, activity, foci and observable communication in social collectives." *Communication theory*:171-190.
- Cummings, Jonathon N., and Rob Cross. 2003. "Structural properties of work groups and their consequences for performance." *Social Networks*:197-210.
- Dirks, Kurt T., and Donald L. Ferrin. 2001. "The role of trust in organizational settings." *Organizational Science* 4:450-467.
- Erickson, Bonnie. 1988. "The relational basis of attitudes." Pp. 99-121 in *Social Structures. A Network Approach*, edited by B. Wellman and S D. Berkowitz. Cambridge: Cambridge University Press.
- Freeman, Linton C. 1979. "Centrality in social networks: Conceptual clarification." *Social Networks*:215-39.
- Fukuyama, F. 2001. "Social Capital, Civil Society and Development." *Third World Quarterly* 1:7-20.
- Gambetta, Diego (Ed.). 1988. *Trust: Making and Breaking Cooperation*. Oxford: Blackwell.
- Gaver, William. 1991. "Technology affordances." Pp. 97-84 in *CHI '91*. New Orleans.
- Giddens, Anthony. 1984. *The Constitution of Society*. Berkeley / Los Angeles: University of California Press.
- Grey, Chris, and Christina Garsten. 2001. "Trust, Control and Post-Bureaucracy." *Organization Studies* 22:229-250.
- Haythornthwaite, Caroline. 2002. "Strong, Weak, and Latent Ties and the Impact of New Media." *The Information Society* 18:385-401.
- Haythornthwaite, Caroline, and Barry Wellman. 1998. "Work, Friendship, and Media Use for Information Exchange in a Networked Organization." *Journal of the American Society for Information Science* 12:1101-1114.

- Hinds, Pamela, and Cathleen McGrath. 2006. "Structures that Work: Social Structure, Work Structure and Coordination Ease in Geographically Distributed Teams." in *CSCW'06*. Banff, Alberta, Canada.
- ITU. 2006. "The Regulatory Environment for Future Mobile Multimedia Services." in *Issues Paper*, edited by International Telecommunication Union. Mainz.
- Jarvenpaa, Sirkka L., and Dorothy E. Leidner. 1999. "Communication and Trust in Global Virtual Teams." *Organization Science* 10:791-815.
- Johansen, Svein T, and Marcus Selart. 2006. "Expanding the Role of Trust in Organizational Change." Pp. 258-279 in *New Perspectives on Organizational Change and Learning*, edited by Rune Lines, Inger G. Stensaker, and Ann Langley. Oslo: Fagbokforlaget.
- Julsrud, Tom E., and John W. Bakke. 2007. "Building Trust in Networked Environments: Understanding the Importance of Trust Brokers." Pp. 117-138 in *Computer-mediated Relationships and Trust: Organizational and Managerial Effects*, edited by Linda Brennan and Victoria Johnson. Hershey PA: Idea Group Publ.
- Kadushin, C. 2005. "Networks and Small Groups." *Structure and Dynamics:eJournal of Anthropology and Related Science* 1.
- Kanawattanachai, Prasert, and Youngjin Yoo. 2002. "Dynamic nature of trust in virtual teams." *Strategic Information Systems*:187-213.
- Katz, J, and M Aakhus. 2002. "Conclusions:making meaning of mobiles - a theory of Apparateist." Pp. 301-320 in *Perpetual Contact. Mobile communication, private talk, public performance*, edited by J Katz and M Aakhus. Cambridge: Cambridge University Press.
- Katz, J., and R. Rice. 2002. *Social consequences of Internet Use*. Boston: MIT press.
- Katz, Nanct, David Lazer, Holly Arrow, and Noshir Contractor. 2005. "The Network Perspective on Small Groups." Pp. 277-312 in *Theories of Small Groups*, edited by M. Scott Poole and A B. Hollingshead. Thousand Oaks, California: Sage.
- Krackhardt, David, and J R Hanson. 1993. "Informal Networks: The Company behind the Chart." *Harvard Business Review* 71:104-111.
- Krackhardt, David, and R N Stern. 1988. "Informal Networks and Organizational Crises: An Experimental Simulation." *Social Psychology Quarterly* 51:123-140.
- Lewicki, Roy L., and Barbara B. Bunker. 1996. "Developing and Maintaining Trust in Work Relationships." Pp. 114-139 in *Trust in Organizations. Frontiers of Theory and research*, edited by R. Kramer and T. Tyler. Thousand Oaks: Sage.
- Lewis, J.D., and A. Weigert. 1985. "Trust as a social reality." *Social Forces* 63:967-985.
- Licoppe, Christian, and Zbigniew Smoreda. 2004. "Are social networks technologically embedded? How networks are changing today with changes in communication technology." *Social Networks*:317-335.
- Lin, Nan. 2001. *Social Capital. A Theory of Social Structure and Action*. New york: Cambridge University Press.
- Ling, Richard. 2004. *The Mobile Connection. The cell phone's impact on society*. San Fransisco: Elsevier, Morgan Kaufmann.
- Mayer, Roger C., J.H Davis, and F.D Schoorman. 1995. "An integrated model of organizational trust." *Academy of Management Review* 3:709-734.
- McAllister, Daniel J. 1995. "Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations." *Academy of Management Journal* 1:24-59.
- McEvily, Bill, V. Perrone, and A. Zaheer. 2003. "Trust as an organizing Principle." *Organization Science* 1:91-103.

- McKnight, D H, L L Cummings, and N L Chervany. 1995. "Trust formations in new organizational relationships." in *Information and Decision Sciences Workshop*. University of Minnesota.
- Meyerson, Debra, Karl Weick, and Roderick Kramer. 1996. "Swift Trust and Temporary Groups." Pp. 166-195 in *Trust in Organizations. Frontiers of Research and Theory*, edited by R Kramer and R Tyler. Thousand Oaks, CA: Sage.
- Miles, Raymond, and Charles Snow. 1992. "Causes of Failure in Network Organizations." *California Management Review*.
- Monge, P.R., and E.M. Eisenberg. 1987. "Emergent communication networks." Pp. 304-342 in *Handbook of organizational communication. An interdisciplinary perspective*, edited by F. M. Jablin, L.L. Putnam, K.H. Roberts, and L.W. Porter. Newbury Park, CA: Sage.
- Nahapiet, Janine, and Sumantra Ghoshal. 1998. "Social Capital, intellectual capital and the organizational advantage." *Academy of Management Journal* 23.
- Norman, Donald. 1998. *The Design of Everyday Things*. London: MIT press.
- Ring, P.S., and A.H. Van de Ven. 1992. "Structuring cooperative relationships between organizations." *Strategic Management Journal* 13:483-498.
- Rousseau, Denise M., S.B. Sitkin, R.S. Burt, and C. Camerer. 1998. "Not So Different After All: A Cross-Discipline View of Trust." *Academy of Management Journal* 3:393-404.
- Scott, John. 2000. *Social Network Analysis: A handbook*. Thousand Oaks CA.: Sage.
- Sennett, Richard. 1998. *The Corrosion of Character. The Personal Consequences of Work in the New Capitalism*. London: W.W. Norton & Company.
- Sparrowe, Raymond, R Liden, S Waynes, and M Kraimer. 2001. "Social networks and the performance of individuals and groups." *Academy of Management Journal* 44:316-325.
- Tilly, Charles. 2005. *Trust and Rule*. Cambridge: Cambridge University Press.
- Wasserman, Stanley, and Katherine Faust. 1994. *Social Network Analysis. Methods and Applications*. Cambridge: Cambridge University Press.
- Wellman, Barry. 1988. "Structural analysis: from method and metaphor to theory and substance." Pp. 19-61 in *Social Structures: a network approach*, edited by B Wellman and S.D. Berkowitz. New York: Cambridge University Press.
- Wellman, Barry, Anabel Quan-Haase, Jeffrey Boase, Whenhong Chen, Keith Hampton, Isabel Isla de Diaz, and Kakuko Miyata. 2003. "The Social Affordances of the Internet for Networked Individualism." *Journal of Computer Mediated Communication*
8:<http://jcmc.indiana.edu/vol8/issue3/wellman.html>.

Sixth paper (F)

Core/periphery structures and trust in distributed work groups: a comparative case study

Tom Erik Julsrud^{ab}

^a Telenor Research & Innovation, N-1331 Fornebu, Norway

^b Norwegian University of Science Technology, N-7491 Trondheim, Norway

Abstract: Trust is crucial for modern organizations and in particular in cases of virtual and distributed work. In such organizations much of the communication is based on electronic media, and the collaborators often know very little about each other when they start collaborating. Due to geographical boundaries it often takes a longer time to build trust in such organizations, and in difficult situations there is a risk of developing distrust rather than trust. This paper is concerned with how trust can be developed in highly distributed groups, and the network related mechanisms that are used to build trust under such conditions. Based on a comparative study of vocational strong ties (intense, work-related) in four distributed groups, the study suggests that groups with higher levels of trust have a integrating core of collaborators that connects to central employees at the involved local sites. In contrast the groups with lower trust had moved in the direction of establishing dual core structures with fewer boundary-crossing strong ties. The establishments of such constellations is discussed and it is argued that integrating cores can grow out of a few stronger relations, and that such structures are enhancing the development of trust in distributed groups.

Key Words: Distributed work, trust, cohesion, core/periphery, boundaries, integrating cores.

Citation: Julsrud, Tom E. 2007. "Core/periphery structures and trust in distributed work groups: a comparative case study." *Structure and Dynamics: eJournal of Anthropology and Related Science* 2. <http://repositories.cdlib.org/imbs/socdyn/sdeas/vol2/iss2/>

1. Introduction

Today's networked organizations tend to grow by mergers and acquisitions, making collaboration across distance a common experience for an increasing number of employees. A common situation occurs when two organizations merge and new groups are established with co-workers situated in different places and also within different organizational cultures. Rather than moving or shutting down departments, it appears just as sensible to establish distributed groups basing more of their interaction on mediated communication. Similarly, distributed work groups are established as a response to the need for task-solving in projects involving partners from different places and/or organizations. In such instances moving people or establishing physical departments is often too expensive and complex.

The upside of this trend is that it creates new cross-cultural groups, with a potential option for creating synergies as well as knowledge and innovation (Ackerman, Pipek and Wulf 2003; Cummings 2004; DeSanctis and Monge 1999; Lipnack and Stamps 2000). The challenge, however, is to establish groups that can function well despite a lack of physical presence or a common history. It is widely agreed that *trust* is a crucial value for the success of distributed work groups (Handy 1995; Jarvenpaa and Leidner 1999; Johansen and Selart 2006; Panteli 2005b; Piccoli and Ives 2003; Wilson, Straus and McEvily 2006; Zolin, Hinds, Fruchter et al. 2004). As an alternative to hierarchical organizing principles, trust seems much more suitable for complex systems, with reduced opportunities for traditional control and supervision (Bradach and Eccles 1989; Powell 1996). Yet, as organizations become more distributed, and closer relations get more difficult to establish, trust is also less likely to grow. This leads to what has been called the "paradox of trust" in modern organization (Handy 1995). It is a "need-to-have value" since control and observation are difficult due to the distance. But at the same time the lack of proximity makes trust increasingly difficult to develop. An essential question then is how distributed work groups can escape from this paradox. Is it possible to develop trust in highly distributed work groups?

Studies of trust in distributed and virtual work have found that distributed work groups use different strategies to deal with this paradox. One stream of research has found that distributed work groups, much like temporary teams, seem to rely on a simpler and more calculative form of trust, so-called "swift trust" (Heckscher 1994; Meyerson, Weick and Kramer 1996). Empirical studies of globally distributed teams of students have found evidence of swift trust being important for performance in such ad-hoc groups and teams (Jarvenpaa and Leidner 1999). This line of study has received support from more recent work, indicating that trust in distributed work groups often relies on quickly developed impressions or images. A lack of interaction and proximity makes people develop trustfulness on a rather weak evidence in the beginning of the collaboration, and this impression tends

to keep stable over time (Zolin, Hinds et al. 2004). This suggests that early impressions may substitute for much of the lack of immediate interaction in the groups. On the other hand, research has found that trust in distributed groups has the potential of reaching the same level as co-located groups, although it takes a longer time (Wilson, Straus and McEvily 2006).

Thus, existing studies have tended to avoid the problem somewhat, by stating that lighter and more functional forms of trust in most cases will be sufficient, or alternatively, that more time is needed to reach the same level. This article suggests, however, that there are other options for handling the paradox of trust in distributed organizations if one focuses on the group's structural networks. Approaching the distributed work group as a *network of relations* opens for a more fine-grained understanding of the constellations of stronger and weaker ties that hold the group together. One of the central features of a social network approach to small groups is that it can provide detailed information on the relationships between the involved actors in a group (Katz, Lazer, Arrow et al. 2005). It can also indicate if, and how, different involved sub-units or locales are connected. As such, the network approach stands out as a unique but largely unused strategy to investigate qualities of distributed work groups.

The central research question guiding the study is "what kind of structure characterizes high-trust groups that work across distance?" While previous studies have given somewhat contradictory answers to this question, the current study will explore this in more detail on the basis of quantitative and qualitative analysis of four cases, including researchers, product developers, technical advisors and financial controllers. Focussing on central aspects of their internal networks of stronger vocational ties, preliminary findings indicate that the high-trust groups had developed a stronger core-periphery structure than the low-trust cases. In both the high-trust cases *integrating cores* seemed to stabilize the groups and enhance the development of trust and performance. The findings presented here add to a growing body of research investigating network patterns of well performing distributed groups (Ahuja and Carley 1999; Cummings and Cross 2003; Hinds and McGrath 2006; Koku and Wellman 2002). It also contributes to the rapidly growing field of studies addressing the issue of trust in distributed groups (Aubert and Kelsey 2003; Jarvenpaa and Leidner 1999; Panteli and Duncan 2004; Wilson, Straus and McEvily 2006).

2. Trust, networks and the new boundaries of work

2.1 Trust in a network perspective

Although there are many different ways to understand and describe trust, a central feature is that it describes a relationship between two people or (in some cases) between people and abstract

systems and/or objects.¹¹³ A much used point of departure is the definition presented by Mayer and his colleagues (Mayer, Davis and Schoorman 1995). They define interpersonal trust as: “A willingness of a party to be vulnerable to actions of another party based on the expectations that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” (Ibid: p.3).

This definition emphasizes interpersonal trust as a particular mindset or risk-taking attitude, of a trustor toward a trustee. As most definitions, it has a clear relational fundament, denoting the quality of a relation between two persons. This definition also demonstrates the appropriateness of a social network approach as this approach in particular encompasses theories, models and applications that are expressed in terms of relational concepts or processes (Scott 2000; Wasserman and Faust 1994; Wellman 1988).

In network theories trust is usually related to particular types of *stronger ties*. As argued by Granovetter the strength of the ties is the outcome of “the combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services that characterize the tie” (Granovetter 1973). A strong tie is usually seen as a provider of more trustful relationships than a weak one. Even though a wide spectre of research has indicated the value of having a broad network of weak ties, studies have also indicated that strong ties are important. The “strength of the strong ties” is according to Krackhardt that they help reduce risks in insecure environments and predict the behaviour of others (Krackhardt 1992). Trust may, however, be seen as a multidimensional construct that includes both rational and affective dimensions (Lewis and Weigert 1985; Rousseau, Sitkin, Burt et al. 1998). While affective trust is most typical for intimate and family relations, a more rational type of trust – i.e. calculative trust – is most prominent in professional relationships. From a network perspective, trust in groups may be analyzed as interconnected patterns of both affective and cognitive ties (Julsrud and Schiefloe 2007).

Following a tie-strength approach, then, trust is related to stronger reciprocal ties that build up over time.¹¹⁴ Studies of trust within the field of social networks also see this as closely related to the larger network structures: Within the area of social capital, trust has usually been related to particular constellations of social networks (Adler and Kwon 2002; Cohen and Prusak 2001; Coleman 1988; Nahapiet and Ghoshal 1998). Social capital can be defined as “the sum of actual and potential resources embedded within, available through and derived from the network of relations possessed by an individual or social unit” (Nahapiet and Ghoshal 1998). As such, the concept of trust is recognized as an important resource embedded in a social network structure rather than as (only) individual perceptions about particular others. A key term here is *network closure*, i.e. networks that are closed in

¹¹³ The idea of system trust has in particular been elaborated by Luhmann and Giddens (Giddens 1994; Luhmann 1988)

¹¹⁴ Note that the gradualness involved in building up trust is a crucial point made by social exchange theories (Blau 1964; Homans 1950; Kollock 1994). Blau, for instance, argues that although a certain portion of trust is necessary to initiate a relation, relational trust will gradually be produced as a successful chain of exchanges takes hold (Blau 1964 p. 94).

the sense that two persons are united by a third common acquaintance or friend (Burt 2005; Coleman 1990). A central and consistent idea within network studies has been that denser networks have other qualities than open and more sparsely connected networks. The closure sets in as soon as a dyad is growing in to a triad: Having a common connection to a third party reduces the risk of trusting others, because the third party is a “witness” of the interaction. The benefits of interconnected triads for trust and stability have been followed up in recent studies of cohesive sub-groups in intra-organizational networks (Krackhardt 1999; Krackhardt and Kilduff 2002). In larger constellations the third party effect escalates, and the reputation effect sets in as well. As the network grows denser the risk of getting a bad reputation is always present, as this will usually increase the risk of cheating. In contrast, interacting in very open networks, with few third-party connections, is usually more risky.

A network approach, then, sees trust both as a quality of a particular (dyadic) relation and as a quality of a larger network or group. It deals with trust on an interpersonal but also on a structural level, and this makes it a suitable point of departure for studies of trust in distributed workgroups.¹¹⁵ If a closed network structure of three or more people tends to reinforce existing meanings and attitudes through a reputation mechanism, ensuring that people do as they are expected (Burt 2001; Burt 2005), the effect may be to generate trust and support, or to create disadvantages and negative outcomes. In an empirical study of the relationship between senior managers, Burt and Knez (1996) found evidence that third party relationships influenced positively on the levels of trust, as well as on the levels of distrust if they both held negative attitudes toward the third person. According to the authors, this can be explained by the actual or potential gossiping between two persons embedded in a denser network. Because two parties usually display information that is consistent with their existing attitudes, their common attitudes toward the third party tend to get amplified. They argue that direct connections affect the directional trust level held by each party toward the other, and that indirect connections in reinforcement from a mutual third-party connection amplify or exaggerate the trust intensity, whether positive or negative, consistent or inconsistent. This is an important correction to over-simplified ideas of the value of dense networks. However, these authors do not disagree that network closure is important for creating agreements and trust: their point is that *between* denser sub-units, ties of mistrust can often be enhanced.

A controversial issue in studies of trust and social networks, that should be mentioned at this point, is whether one prefers to see the network as an outcome of interaction in networks, or the other way around. On the one hand network oriented scholars have tended to argue that trust comes out of repeated interaction over time (Blau 1968; Tilly 2005) and that a rich network represents a foundation for development of relational trust. This is also the general argument made by Coleman and most subsequent studies of social capital and trust in organizations. On the other hand it has been argued

¹¹⁵ The appropriateness of social network theory for studying trust has recently been recognized by several studies of organizational trust. See McEvily et al (2003) and Möllering (2006).

that trust is an important “attitude” driving the establishment of relations and denser networks in groups and organizations (Bradach and Eccles 1989; McEvily, Perrone and Zaheer 2003). This issue is not easily solved, and in this paper I will not go in to this complicated discussion, but recognize that trust and networks tend to be closely interconnected in a relationship that may go in both directions.

2.2 The risks of boundaries

For work groups in general a dense network of “strong ties” would be optimal for developing trust. In the context of distributed groups, however, there are at least four types of boundaries that impede the development of denser structures¹¹⁶. First of all, the *geographical distance* between groups and co-workers makes it more difficult to develop social relations. While physical proximity has proved important for the development of networks and relations, distance will in general impede the development of relations and social networks (Blau 1964; Feld 1981; Homans 1950). Efficient use of communication technologies may soften some of the disadvantages related to physical distance, in particular if it is used in combination with regular face-to-face meetings (Maznevski and Chudoba 2000). Still, lack of co-presence tends to reduce options for informal communication; an issue that is usually seen as crucial for trust building (Kiesler and Cummings 2002). A second boundary that often comes together with geographical distance is *difference in time*. Time boundaries are particularly problematic for globally distributed groups located in different time zones (Walther 2002). As a result communication in real time might be difficult, limiting the available means of communication. Thirdly, *diversity in disciplines* is often common in distributed work groups. Often – but not always – distributed groups include employees with heterogeneous knowledge. Such diversity can be advantageous, yet several studies have recognized that greater vocational diversity also makes the collaboration more vulnerable for breakdown (Albert, Ashforth and Dutton 2000). And fourthly, *institutional belonging* may represent boundaries for developing social relations when collaborations involve multiple organizational units. Institutions are often important sources of trust, and conflicting norms and values can make the development of trust more difficult (Zucker 1986). Previous findings have indicated that involvement of multiple organizations and institutions is problematic for distributed groups (Cummings and Kiesler 2005). Often, however, several of the above mentioned boundaries will operate in concert in cases of distributed work. As in the case studies presented later in this paper, distance-related boundaries may coincide with boundaries related to time and institutional belonging, making the development of social relations particularly challenging. Still, the most basic boundary involved in distributed work is geographical distance, and in this paper I will focus on

¹¹⁶ In a very general way the concept of boundaries, as used here, may be described as obstacles to the possibilities of developing social relations.

groups where distance boundaries were salient, although recognizing that this overlapped with institutional boundaries.

The boundary of distance represents important challenges for the development of trust in distributed groups. Trust relations usually build up more easily within boundaries, among co-located individuals, than across them, and physical proximity is a central factor in the development of social networks (Blau 1964; Feld 1981; Homans 1950; Kraut, Fussel, Brennan et al. 2002). As such, the risk of developing *local* cohesive sub-units and *local trust* can be expected to be high in groups that involve several locations, with reduced face-to-face interaction. Following the arguments made by Burt and Knez (1996), *distrust* might easily be generated between such local units in situations involving uncertainty and risks. Experimental studies have brought evidence that uncertainty and risks may enhance local identities and increase conflict levels between organizational units (Krackhardt and Stern 1988).

Social identification theory is often used as a theoretical foundation to explain why conflicts between local groups and units so commonly develop (Ashforth and Mael 1989; Tajfel and Turner 1986). Following this theory, individuals tend to classify themselves and others in particular social categories. In general, individuals usually put themselves in categories together with individuals that have similar characteristics as themselves (so-called “in-groups”); while dissimilar others are categorized in “out-groups”. In other words, mental boundaries are constructed based on perceived similarities and differences.¹¹⁷ According to faultline theories (Lau and Murnighan 1998), the *composition* of such groups affects the possibilities of developing in-groups and out-groups. Following this more recent stream of research, social categorization processes can be expected to be most disrupting when there are strong dividing lines (i.e. faultlines) that can categorize the group in sub-units. Faultlines are most significant when they divide a group in two sub-units of approximately the same size and power. It is easy to imagine that geographical boundaries may represent one important dividing line in a group, and recent studies have generated some evidence that the location of employees may create faultline mechanisms among groups of distributed workers (Polzer, Crisp, Jarvenpaa et al. 2007).

Thus, while a dense interconnected network of stronger ties would be optimal for trust in distributed groups, boundaries related to geographical distance make such networks difficult to achieve. Physical boundaries can evolve into “mental” boundaries related to identification if no efforts are made to interconnect local units. Thus, there is a risk that boundaries of distance together with institutional differences may lead to local trustfulness, but mistrust in the larger groups per se.

¹¹⁷Note that several network studies have found evidence that networks are more easily generated between similar others (i.e. homophily mechanisms). These findings in general fit well with social identification theories. Homophily mechanisms have been studied on the basis of similarity in age, gender, education, prestige, social class, tenure and occupation (Ibarra and Andrews 1993; Marsden 1988; McPherson, Smith-Lovin and Cook 2001).

2.3 Handling the boundaries of geographical distance

As a dense network of collaboration might be difficult to achieve in a remote work group, what may the alternatives be? Network research on distributed and virtual groups has started to explore these issues. So far, however, the findings have been inconclusive: On the one hand some studies have found that distributed groups might be better off with a hierarchical and centralized structure than with traditional co-located teams (Ahuja and Carley 1999; Hinds and McGrath 2006). Ahuja & Carley (1999) analyzed the network structure of a larger virtual organizational group consisting of 66 researchers. The study looked in particular for structural properties of communication networks and the way the structure fitted with different tasks. The study found a high degree of centrality and hierarchy in the communication networks. They concluded that virtual teams might be decentralised from an authority standpoint but that from a communication standpoint they may be centralized and hierarchical. Although this study did not focus on trust per se, it still indicated that a more hierarchical interaction-based structure may be most efficient in a highly virtual setting. On the other hand, there is evidence to suggest that work groups working with non-routine tasks need more integrated structures to coordinate their work. In a more recent study of the social structures of work groups, Cummings and Cross (2003) found that centralized structures were negatively related to performance as rated by the group members. Even though these findings were based on a mix of co-located and distributed employees working within the same organization, it indicated that cohesion may be a necessary feature in many knowledge-intensive groups.

The network-oriented studies above have looked for general patterns of high-performing groups, analyzing ties of communication and coordination. Some of the ambivalence on the structural question, however, may be due to a lack of attention to the particular *constellations of distant and co-located nodes*. The findings from faultline theories suggest, however, that the constellations of co-located and remote workers may be decisive for how well distributed groups function. In the light of these studies, general measures of centrality and/or density may be insufficient to capture the differences in distributed networks of collaborators. In this explorative study, we will therefore try to go one step further and look at the structural features within the groups, as well as their particular constellations of remote and co-located nodes.

1. Methodology and research design

Although there has been a renewed interest for applying a network approach on small organizational groups, this is so far mostly done on larger samples (Bélanger 1999; Cummings and Cross 2003; Sparrowe, Liden, Waynes et al. 2001). The overall methodological approach applied in this study is on the contrary a *comparative, in-depth study* of a limited number of cases. The case

study approach has been applied successfully in different areas and disciplines, and it is particularly suited for exploring diversity between a limited set of cases (Eisenhardt 1989; Ragin 1994; Yin 2003). Drawing on a limited number of distributed work groups, we looked for evidence of trust within the groups, as well as potential factors that could explain variance along these dimensions. As a general strategy we grouped the cases into “successful” and “problematic” cases of distributed work, and used the categorization as a point of departure to look for similarities and differences. In this paper we will focus in particular on the way the successful cases constructed their internal networks of weaker and stronger ties across the boundaries of distance.

Multiple techniques were used to compare the cases: First, the respondents were *interviewed individually* for 30 – 40 minutes. This part of the study aimed at getting an understanding of the general patterns of collaboration in the groups, and how satisfied the employees and managers were with the collaboration. Second, a *quantitative study* was used to get an indication of well-being, performance and trust within groups. Standardized inventories for the measurement of trust and performance were used, as well as indicators for well-being and belonging. Third, a *social network study* was used to indicate structural networks based on interaction frequency and professional collaboration. A triangulation of these techniques gave us good opportunities to understand differences and similarities between the cases, in regard to trust, performance and well-being.

In this paper we will in particular highlight findings from the social network study, and we will display results that indicate structural aspects of distributed groups with high levels of trust. Starting with an overview of the differences between the networks, based on a descriptive analysis, we will move on to a closer description of how the structures were established, and how they actually worked to stabilize trust. Regarding the issue of causality, we will not anticipate certain mechanisms, but rather explore how the network structure in the high-trust groups had been established and how it could be related to general trustfulness in the group.

3.1 Selection of cases

For comparisons of case studies, it is important to sample cases that are comparable in sharing membership in a meaningful, empirically defined category (Ragin, 1994; p.113). This study is based on the comparative study of four cases of distributed work groups, broadly defined as; *groups of professionals that collaborate across geographical distance assisted by information and communication technology*. There is no single way to define distributed work groups. Most authors define this in a general way, as group-based work where members are located in different cities or countries, supported by use of information and communication technology (Lipnack and Stamps 2000; Zolin and Hinds 2004).

Further, to understand variations in the structures, it is useful to have a pool of cases where there is a high level of similarities along central dimensions. In this study all four cases have employees situated in at least two different organizations. Thus, this involves distributed work groups on a relatively high level of complexity. Second, all cases had employees located in three or four different sites. These sites were in different parts of the country, and in some of the cases (Omega, Delta, and Beta) even in other countries. Third, all of the cases comprised employees involved with tasks demanding high levels of communication and interaction. The work task can be described as non-routine and knowledge-based, typical for non-bureaucratic organizations. Fourth, all groups based their interaction heavily on ICT-mediated communication (i.e. information and communications technology). In all cases e-mail, mobile phones and various conferences services (audio and video) were used on a regular basis. And finally, all groups had worked together for about one year when we conducted our study. Thus we intervened in the groups after the collaboration had been well established.

3.2 Categorizing cases

To categorize the cases into high or low-trust groups (Table 1), different tools were applied. First, an inventory of group-based trust was used, based on an instrument developed by Pearce et al., and by Schoorman et al. (Jarvenpaa and Leidner 1999; Pearce, Sommers, Morris et al. 1992; Schoorman, Mayer and Davis 1996). This instrument included four items: 1) “We are usually considerate of one another’s feelings”; 2) “The people in my group are friendly”; 3) “I can rely on those with whom I work in my group”; and 4) “Overall, I find the people in my group trustworthy”. For all items, the respondent could indicate agreement/disagreement on a five point Likert-scale.¹¹⁸

Table 1. Cases and categorizations

Name	Type	Category	Trust (mean)	Std. Error of mean	Org. units	Countries	N
Gaia	Researchers	High trust	4.417	.072	3	1	15
Omega	Product developers	High trust	4.324	.102	2	2	17
Delta	Technical advisors	Low trust	4.033	.111	2	2	15
Beta	Financial advisors	Low trust	4.071	.223	2	2	7

¹¹⁸ Chronbach’s Alpha = .754 indicates an acceptable level of reliability of the applied scale.

If more than 30 % of the employees in the group disagreed (strongly or weakly) with any of the statements, the group was treated as a low-trust case. If not, it was classified as a high-trust case.¹¹⁹ Second, incidents of mistrust and dissatisfaction were analyzed based on the qualitative interviews. If several such incidents were reported this influenced the categorization. Such incidents were more frequently found in the low-trust cases and it was used to elaborate our understanding of the groups.

3.3 Measures of networks and ties

In professional groups, close affective relations are usually rare. More common is a type of cognitive trust, based on recognition of knowledge and mutual recognition of expertise and competence (Lewicki and Bunker 1996; McAllister 1995). In our cases we were interested in finding the *vocational ties*, and those where trust was salient. To capture these, two types of relations were combined. Firstly, we asked for the intensity of the interaction. The questionnaire asked: *Whom in your group are you in contact with on a daily basis?* This question does not distinguish between mediated or face-to-face interaction but includes communication of all kinds. Still, interaction alone can be misleading as an indicator of a strong tie, as it may for instance be based on a high level of individual dependency. Therefore, we also asked for the relations that were recognized as particularly important when discussing work related problems. We asked: *Whom in the group have you discussed important work related issues with during the last five weeks?* This question tried to capture the network of colleagues who were important for developing common meaning, trust and identity within the group. For both questions a “roster design” was used, where a relation could be indicated on a complete list of employees in a group. The list was distributed on an email questionnaire, and full anonymity was granted beforehand (we use pseudonyms to distinguish group members).

For each question, we got two matrices; one for interaction (M1) and one for work discussions (M2). The two networks were then merged into a directed and valued matrix that indicated the stronger and weaker vocational ties¹²⁰ (M3). If two persons in a group had daily contact and at least one of the partners recognized this as a useful relation when discussing professional matters, it was coded as a stronger tie. If there was only daily interaction, or only professional recognition without regular interaction, it was coded as a weaker tie. Although this conception of a strong vocational tie is not as strong as an affective tie between friends or family members, it indicates a particularly important relationship between collaborators in a group.

In the network section of the study we wanted to compare structures of the four different groups along some central dimensions. The structural cohesiveness was captured by analysing network density for each group. *Density* measures the average degree to which all members are

¹¹⁹ A one-way test of variance (ANOVA) rejected the hypotheses that the high and low trust groups were equal (Sig. = 0.006, F = 8.064).

¹²⁰ That is: M3 = M1 + M2

connected to other members based on the number of actual ties as a proportion of the maximum possible ties.¹²¹ For a valued network it is the total of all values divided by the number of possible ties. To capture the degree of *centralization* we applied Freeman's network in-degree centralization index (Freeman 1979). This measure gives an indicator of how well a network fits an ideal centralized structure (i.e. a network formed as a "star" with one central person and no interconnection among the other members). A third aspect of the network that we wanted to investigate was the degree of *core-periphery structure*. A common conceptualization of a core-periphery structure is that of one integrated core of nodes surrounded by more weakly connected nodes. We will here use the measure developed by Borgatti and Everett, that captures the degree to which a network fits an ideal core-periphery structure (Borgatti and Everett 1999). As discussed above, the boundary-crossing ties are particularly important in distributed work, since such groups usually consist of employees located at different sites. To capture this important dimension we applied the *I-E Index* analysing the share of ties in a network that connects to two or more sites (Krackhardt and Stern 1988). This enabled comparison of the number of boundary-crossing ties for each of the small networks.

3.4 Qualitative network data

Prior to the main quantitative network study, semi-structured interviews were conducted with employees and managers to get a better picture of their work situation. The interviews followed an interview guide focusing on each respondent's main work tasks, social relations, and identity in groups/organizations and trust issues. The informants were not asked directly about whether or not they trusted others in the group. Trust related issues were, however, captured indirectly by asking about satisfaction by asking about collaboration patterns, satisfaction and organization of the work.

Each interview lasted 30-40 minutes. Of the 57 employees, 40 involved were interviewed.¹²² In addition, interviews were conducted with a selection of individuals outside the group, including the leader's superior executive and other managers in the company. The rationale for this was to get a better understanding of the group's tasks and position in the company by including "outside perspectives". During the qualitative study, intermediate reports and preliminary analyses were made. The interviews were coded as text files (using NUD*IST software) and the main issues and topics from the interviews were classified. Write-ups were made for each of the cases and cross-case comparisons were done accordingly, including findings from the network study.

¹²¹ The density measure is criticized for being insufficient as regarding cohesion. For some more elaborated approaches, based on connectivity of a graph, see White and Harary (2001) and Moody and White (2003).

¹²² Some employees were impeded by job shifts and sickness. Five of the interviews were conducted by telephone for practical reasons.

4. Results

Four groups of distributed workers will be presented in the following section: Gaia, Omega, Delta and Beta. We will first give a brief description of each group and the collaboration that was going on during our period of investigation. As interaction and communication are seen as particularly important for developing trust, we will draw attention to this in the text, as well as the actions taken by the manager to enhance the trust within the group. We will then move on to present evidence on the network structures within the groups, focussing in particular on the constellations and core-periphery structures. Finally, we will discuss further the development of the relations within the cores, and how they operated to foster and sustain trust in the groups. In this part we will therefore in particular draw attention to the two high-trust cases (Gaia and Omega). Note that all while only pseudonyms are given for individuals and groups, the genders of participants are unchanged.

4.1 Case descriptions

Gaia: Gaia is a group of researchers situated at two universities (A and B), located in different regions of Norway, and one private research institution. The project included nine PhD and master students as well as one professor and five researchers. The goal of the group was to conduct behavioural research in the area of information technology services, yet the participants also had their own goals, related to their education or research.¹²³ The project lasted for three years and several sub-goals had to be reached during the progress of the work, including carrying out joint work tasks, publication of reports, papers, et cetera. The group organized regular meetings approximately four times a year, and in between they had meetings by videoconference or audio-meetings. In addition, informal communication by e-mail or phone was common. Gaia was established as a joint project, where the industrial partner was the one that took the initiative to establish the cooperation. Later on, however, one of the university partners took over the management of the group, based on a common agreement. Gaia had a relatively long period of establishment, where students and researchers were slowly added to the group. A central challenge for the leader of the group (Edwin) was to include and involve participants situated in different parts of the country, each with individual tasks. Many of the discussions at the early meetings revolved around the issue of establishing a common framework for the group's work. The solution reached, after approximately six months, was to split the work into some general "work streams", following parallel tracks. This seemed to work better as the project avoided the continuous discussions of researching a common framework for the research activities. In sum, however, the satisfaction with the collaboration was in general high for the participants. Words like "positive climate" and "trustfulness" were often used to describe the collaboration in the groups.

¹²³ Note that the author of this paper was involved as a contributor to the Gaia project.

The group accomplished its work at the end of 2006 and most informants described the project as a success.

Omega. The second case is a group of 17 product developers in an ICT organization responsible for a wide range of products. The group's main objective is to coordinate and collaborate on issues related to the development of existing and new consumer technologies. After an acquisition between two companies, the group was established with a majority of the employees as well as the manager located in Norway. Five employees have their regular work places in Denmark, and two Norwegian employees are located at a local office in another city. Omega experienced a tough start after the merger of the groups, characterized by many conflicts. Disagreements about technical questions were made more complicated by a lack of organizational structure that worked across two countries. A few weeks before our interviews the group had gotten a new manager (Torhild), who decided to assign a new set of sub-unit managers responsible for particular technical areas. This seemed to help the group focus their work around particular tasks and to generate clearer goals and intentions. In the group there were meetings at the Norwegian headquarters approximately every three months. This ensured that everyone in the group had met each other face-to-face. In addition there were audio conferences approximately every fortnight.

Delta: The third case is a group of technical advisors in a company consisting of employees situated in two countries. As was the case for Omega, this group also developed in the wake of an organizational merger and involved collaboration across Norway and Denmark. Delta also experienced significant problems and conflicts during their first year of collaboration. The interaction between the two national groups after some time was minimal, and some respondents admitted that they had problems even remembering the names of their colleagues in the other country. The group had regular face-to-face meetings on a monthly basis. However, the manager (Carl) had decided to run the group meetings as mainly local happenings, involving one "guest" from the other country. The idea was to ensure some integration and overlap, but there was much dissatisfaction with this. As a consequence the manager decided to start using videoconferences much more intensively. Still, there was significant dissatisfaction with the way the group was managed. Earlier conflicts and disputes about technical issues developed into a more permanent situation of mistrust toward the manager as well as the more distant group members. A few months after we withdrew from the group Delta reorganized into more local units, partly due to the significant collaboration problems.

Beta: The last case is a small group of economic advisors working together in a large Nordic computer company. A central task for the group is investigations of irregularities in economic transactions within the firm. The group comprises seven individuals from two countries. The manager is situated in Norway, although the majority of the staff is located in Sweden. Our initial investigation of the group found that the group was performing well and there were not many open conflicts. The group had regular meetings every month, and videoconferences were used to support their weekly

group meetings. However, there had been changes in the organization of the group, and a new leader (Ann) had recently been made responsible for the managerial tasks. This had turned out to be difficult, as she was not as involved in the internal relations of the group as was the former manager. The group was dependent on having a leader with good connections to different parts of the larger organization and some members of the group had doubts as to whether the new leader had sufficient experience and contacts to manage this. There was also some uncertainty about the future of the group in the company, and where the different tasks should be located. In the interviews, several respondents expressed dissatisfaction with the new situation, even if they felt that they handled their work reasonably well.

The different communication patterns for the groups are indicated in Figure 1 by employees' registrations of the extent of use of audio-conferences, video-conferences and regular face-to face meetings. It is interesting here to note that the frequencies of videoconferences per se seemed to have little effect on the general level of trust in the groups: The most eager users of such conferences were Beta followed by Delta.¹²⁴ Face-to-face meetings, however, seemed to be more important, as the high-trust groups in general scored higher along this dimension. One reason for this was that at least in one low-trust group, the use of videoconferences had been added recently as part of a strategy to counteract dissatisfaction in the group. As such, use of videoconferences was here added as a *result* of the low-trust situation. Still, the finding suggests that advanced communication tools themselves are not sufficient to guarantee high trust in distributed groups.

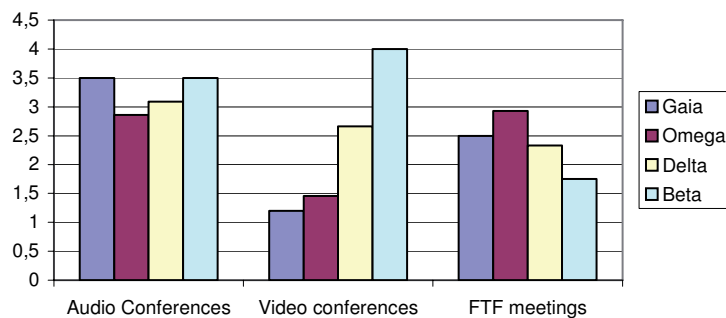


Figure 1. Intensity of mediated and face-to face interaction in the groups, showing mean values of estimated frequency among all members (1 = almost never, 2 = monthly, 3 = every fortnight, 4 = weekly)

¹²⁴ The connection between being in a group with high intensity of videoconferences (i.e. Beta and Delta) and individual trust level is actually negatively correlated a 0.01 level ($r = -0.366$).

4.2 Network structures

Four general structures were analyzed for each group (Table 2): in-degree centralization (maximum 1), value density (in this case with a maximum of 2), core-periphery (2 blocks) and the proportion of ties going beyond the local sites (E-I index). The high coreness values for Gaia and Omega for the vocational strong ties (ST), ranging from 0.652 to 0.669 (in bold), correlate with differences in trust. Thus, these cases had a structure more similar to an ideal core-periphery structure than Delta and Beta. The E-I index further indicated that there were no strong ties (ST) across the local sites in the low-trust cases, while there was a certain proportion of boundary-crossing strong ties in the high-trust cases. The in-degree centralization index (all ties) was strikingly lower for Beta, but did not correlate with those for strong ties (ST). Beta was also consistently highest in value density (bold), although its smaller set of nodes makes it difficult to compare it to the other cases along the indicator of density (2000 p. 97). Beta was lowest in the E-I index for all ties, and Beta and Delta for this index with strong ties (bold).

The structures of the Gaia and Omega networks are shown in Figures 2 and 3. Each comes in a “flat” upper figure, with cores encircled and managers labelled,¹²⁵ as contrasted with a “complex” version that shows how arcs are reciprocated (lower figure). Valued matrices for weak and strong ties are given in the Appendix along with trust ratings by individuals. Different colors for individuals in the graphs identify employees belonging to different spatially separated organizational units (“sites”) within each distributed network.

Table 2. Coreness, centralization, density and E-I indexes for the four cases.

Category	Case	Coreness [†]		In-Degree Centralization [‡]		Value Density		E-I index	
		All ties	ST	All ties	ST	All ties	ST	All ties	ST
High trust	Gaia	0.532	0.652	0.306	.168	0.2714	0.1238	-0.313	-0.273
	Omega	0.657	0.669	0.352	.320	0.3063	0.1471	-0.545	-0.375
Low trust	Delta	0.534	0.462	0.367	.076	0.3467	0.1429	-0.429	-1.000
	Beta	0.557	0.472	0.139	.222	0.8571	0.2857	-0.294	-1.000

[†] Borgatti and Everett (1999).

[‡] Wasserman and Faust (1994 p. 180, equation 5.5), computed by Pajek/Network/Degree/Input.

¹²⁵ The old managers of Omega and Beta were working elsewhere in their organizations by the time the study began and so they do not appear in the networks.

In the case of Gaia there are three such units within Norway, with red showing employees for one university, blue for those at another university, and black for those at a private research institution. For Omega (Figure 3) and Delta (Figure 4) the red indicates employees located at the Norwegian sites and the blue employees at the Danish sites.

Comparing cases, the two high-trust cases seemed to have managed to combine a strong core-periphery structure with a network containing stronger ties across the geographical boundaries. Gaia and Omega display two interesting cases of core-periphery structures that integrate and connect a distributed group. Table 3 gives the results of a simple, categorical core-periphery analysis for each network shows for Gaia that Tommy, Edwin and Jacob constitute a core representing all the involved local units (and institutions). Even though not every participant of the group is integrated in the strong-tie network, the core members have strong relations to central nodes in every local site. The Omega network core consists of four members; Torhild, Martin, Kari and Kai. In this case, however, the core did not include individuals from different locations and was located at one site, with different core members having strong ties to three of the four members in the Danish (blue) group. The interconnections between these peripheral members in the local Danish group were surprisingly weak, with only one weak tie and no strong ties amongst them, and thus no signs of a “rival” core in the Danish site. For the two lower-trust cases there were no single unified core structures. The structures of the Delta and Beta networks are displayed in Figures 4 and 5. In the graph for Beta those at the Norwegian site are colored red and the Swedish employees blue. Delta had a strong basis in both the Danish and the Norwegian parts of the organization. The group had a network (C-P) core on the Norwegian side (Table 3) of approximately the same size as the less cohesive Danish group located with the manager (Carl).

Table 3. Members of core units for vocational strong-tie network (ST) and for networks of all ties (weak and strong), based on a Ucinet categorical center-periphery (C-P) analysis.

Category	Group	Core		Value Density in core	
		ST	All ties	ST	All ties
Higher Trust	Gaia (N=15)	Tommy, Edwin, Jacob	Tommy, Edwin, Jacob	1.333	1.333
	Omega (N=17)	Martin, Kari, Kai, Torhild	Martin, Kari, Kai, Torhild	1.500	1.750
Lower Trust	Delta (N=15)	David, Maria, Trygve	David, Maria, Trygve, Stein	1.333	1.500
	Beta (N=7)	Kristin, Thomas, Rita	Kristin, Thomas, Rita, Linda	1.000	1.333

Beta had a similar two-core structure with no strong ties across the geographical boundaries. This group had a strong bias toward the Swedish site, however, although with the manager located in the distant Norwegian core. Note that in Delta and Beta the cores based on all ties were each enlarged with an extra member: Stein and Linda, respectively. The reason for this is that these two employees had such a rich network of weaker ties that the C-P algorithm included them in their cores. When it comes to the development and transmission of trust, however, the weak-tie members were probably less important than the members of the strong-tie cores.

Summarizing from the network analysis, at least three aspects appeared different between the high and low-trust cases: Firstly, the high-trust cases represented a densely integrated core that had *strong relations to all local sites involved*. The cores had a well developed network of weaker ties toward all peripheral participants. This was in particular the case for Omega where all but one of the Danish group members had strong ties to one or more members of the core. Alternatively, they displayed a core with representatives from each of the participating units, as in the case of Gaia. Secondly, the cores in the higher-trust groups had *no competitive core*. As can easily be seen from the maps of Delta, this group had two local cores, situated in each of the sites. This was also the case for Beta, although this group was one-sided, with the larger group at the Swedish site. And thirdly, the cores of Gaia and Omega had the *managers included in the core* of the group. As such the groups were almost working as (informal) “steering boards” where much of the work was coordinated and discussed.

Taken together, these structural aspects, especially those of strong ties, undivided cores, and managers within the cores, suggest qualities that were important for the development of trust and cooperativeness despite boundaries of geographical distance. In short, they had an integrating core that structured the work and held the group together across the distance boundaries. Given that these cores are important aspects of the development of trust in distributed groups, an important question is how these cores operated to produce trust and stability. In the next section we will elaborate further on the way these cores operated to develop and enhance trust in the groups, based on our qualitative data.

Figure 2. Vocational ties in Gaia (strong and weak), all Norwegian: Red/Blue=Universities A/B; Green=Private institution.

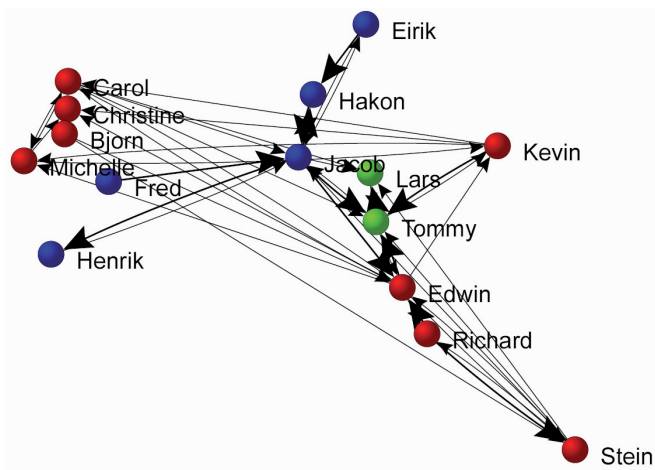
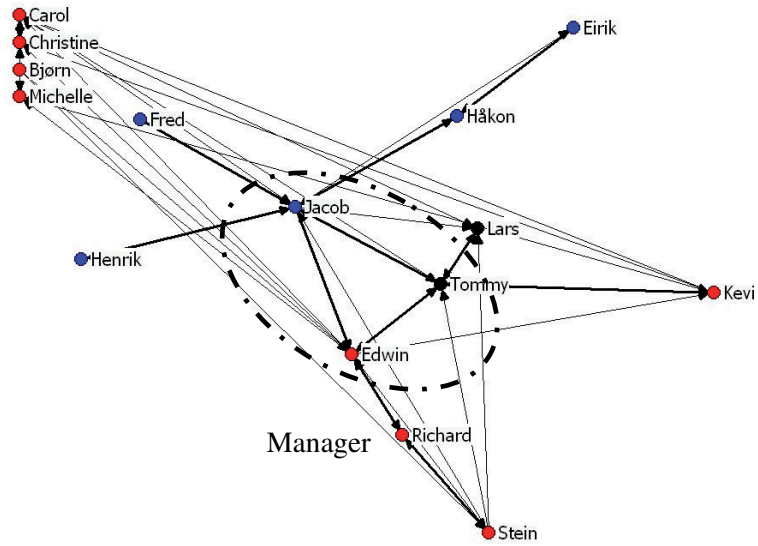


Figure 3. Vocational ties in Omega (strong and weak); Red=Norwegian, Blue=Danish

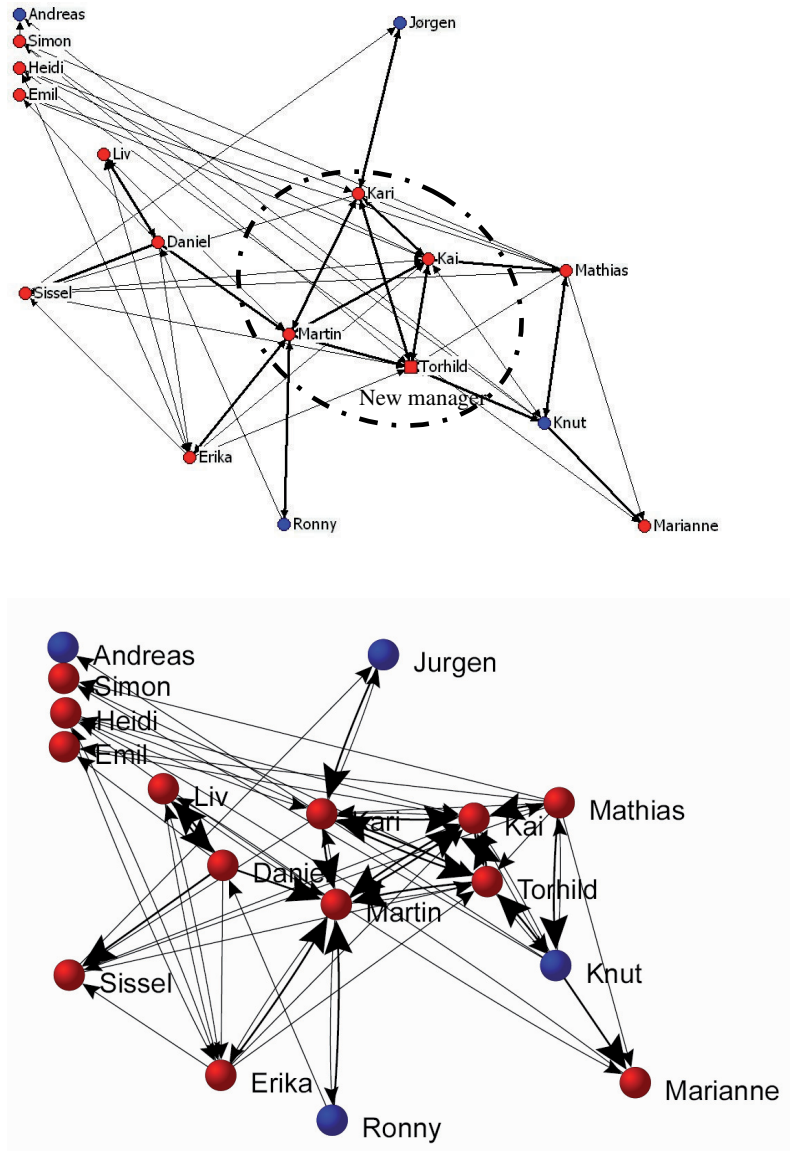


Figure 4. Vocational ties in Delta (strong and weak); Red=Norwegian, Blue=Danish

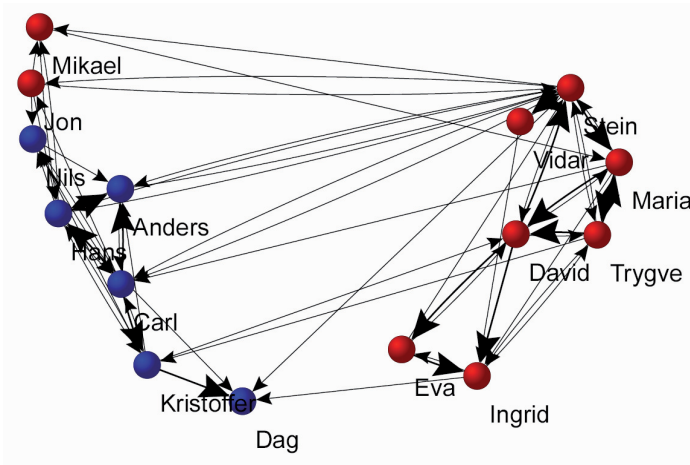
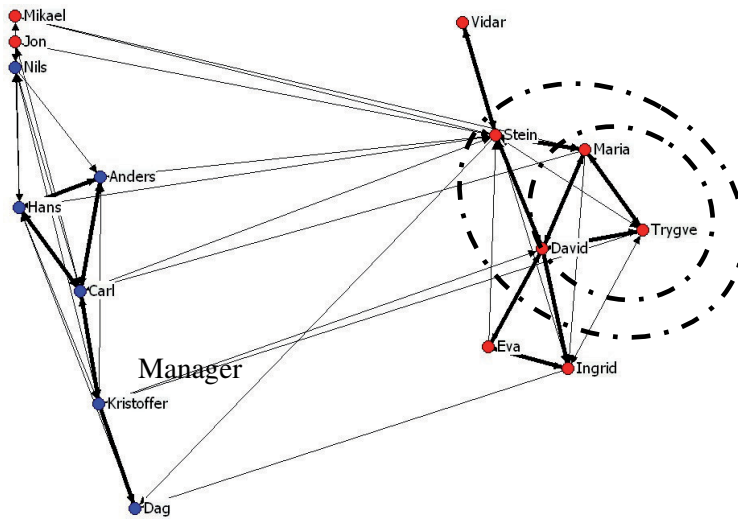
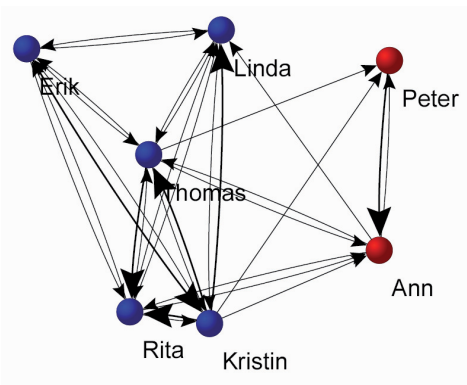
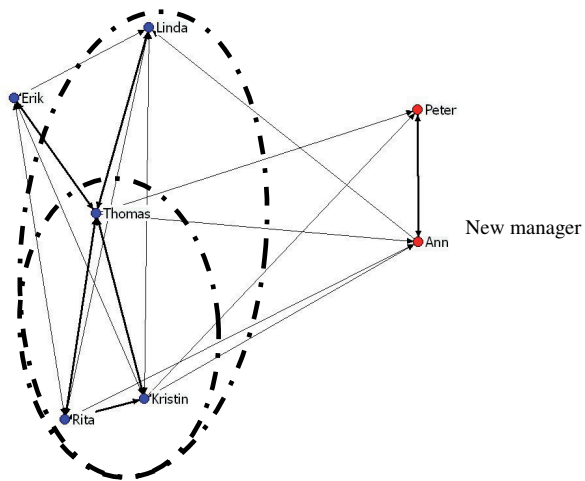


Figure 5. Vocational ties in Beta (strong and weak); Red=Norwegian, Blue=Swedish



4.3 Trust-building activities

4.3.1 Establishment of the integrating cores

The interviews gave us insight into the way the cores were constructed and how they operated. For Gaia, the triadic core was actually the point of departure for the project itself: Two of the members had worked together in earlier projects (Lars and Edwin) and the older relationship was used to establish a relation to the University B. The relation to university A was also based on acquaintances between Tommy and Jacob. The more peripheral members were, with some exceptions, students and researchers that were brought in little by little. The inner core of Omega was, in a similar way, affected by relations established earlier. Three of the members (Martin, Kari and Kai) had actually worked together for more than five years, prior to the present organizational form.

Thus, the several of the core relations in both these cases were established before the existing groups. Another important similarity was the decision to create smaller professional units operating more independently within the groups. In Gaia the manager together with Tommy and Edwin decided to divide the work in clearer “work-streams”, and this seemed to help the partners involved in their collaborations. In Omega it was decided to organize the work in three technical sub-fields, and the new manager gave some employees (Kari, Knut and Martin) a new responsibility as sub-unit managers. Interestingly, in both these high-trust cases persons that were responsible for different knowledge units seemed to be represented in or strongly tied to the informal core in both groups.

Most employees in Gaia and Omega recognized that there were informal core structures operating within the group, and there were no strong objections to this. Still, there was sometimes a slightly different perception of who the members of the informal core were, so the boundaries between central and peripheral parts of the groups were fuzzy, at least in the minds of the participants. Therefore, one should probably not overstate the strength of the boundary dividing members of core and periphery.

4.3.2 Trust-building mechanisms

In what way did the cores operate to sustain trust in the groups? According to our interviews there were at least three ways that the inner cores enhanced and sustained trustfulness. First of all they conducted *immediate coordination* that was important for holding the group together. Members of the core groups in Omega and Gaia emphasized the value of immediate contact with a limited set of close collaborators:

“The work I do here really depends on some like-minded individuals that I have a very good dialogue with. This makes things work despite the problems that sometimes occur...” (Martin, Omega)

“The contact with Tommy, Edwin and Lars is important for my understanding and overview of the project. For me this is a central entry to understand every aspect of the work that we are doing [...] I feel that I have very good relations to these people, and I talk to them at least every week” (Jacob, *Gaia*).

Much of the day-to-day adjustment and problem solving in the groups was done within the group of core members, and their stronger relations ensured that this could be done briefly and sometimes also with simple media, like Instant Messaging and email interaction. Thus, the inner groups worked to coordinate the work informally, and to solve immediate problems on a day-to-day basis. This would probably not have been successful without good relations to peripheral parts of the groups. However, in both Omega and Gaia there seemed to be important links connecting the core to the local sites. For instance, a peripheral Gaia member, located at University B, stressed that he appreciated the relations that he had to Jacob, who was part of the core:

“I feel that Jacob is doing what he can to make the work easy for us. He is my most important contact in this project and I feel that we have a good dialogue going on...” (Håkon, *Gaia*)

Thus, the immediate coordination was efficient because the core members had managed to establish good and trustful relations to the peripheral members. This ensured a common focus and also helped the group retain a clear direction and goal. As mentioned above, there were those in both Gaia and Omega who made strategic decisions to establish some professional sub-units within the groups, and this clearly helped to strengthen the core–periphery ties.

Secondly, the integrated cores were important as they assisted in *making the work visible* for all involved participants. For members of distributed groups, feelings of isolation are a continuous challenge, and face-to-face meetings are not always enough to counteract this. A core representing various parts could accomplish better contact with employees than, say, a centralized group, by having individual relations of stronger ties toward important sub-units in a distributed group. In Gaia and Omega few members complained that their work was neglected or marginalized. Core group members in Omega, like Kai, Martin and Torhild, underscored the importance of sharing information across sites:

“There are many mails and even more telephone calls. I often call to hear how things are going, so that they shall feel that they are being followed up, and that there is interest for what they are doing. Since we cannot sit aside them and see what they are doing, we have to call them up and ask...” (Kai, *Omega*)

In contrast, in the lower-trust cases, employees often expressed that their work was neglected by the group manager. Employees’ feelings of working in isolation were clearly a significant factor

driving the Delta group toward distrust, rather than trust. In particular, the manager of Delta (Carl) was accused of not seeing what they were doing in the Norwegian unit:

“He uses very little time on us, and when he is here usually has meetings with others [...] He almost never sends e-mails or calls me up on the phone, and he has only vague ideas of what I am doing...” (Ingrid, *Delta* employee)

It is interesting to note here that the more intense use of videoconferences in the lower-trust groups had little effect on these matters (see Figure 1). Thus it seemed like the personal contact between the manager and the employees was as important, for developing trust in the group, as regular group meetings.

Thirdly, the core groups seemed to *moderate conflicts* that occurred in different ways. Conflicts occurred in both of the high-trust cases, but they were solved on a local level. Episodes of conflict that had occurred in one of the university groups in Gaia were unheard of in other parts of the network. The integrating cores also helped negotiate issues before conflicts grew to intolerable levels. In Omega there were several conflicts, particularly in the first months of the collaboration. Again, a central aspect that helped to solve these conflicts was important personal relations that helped to establish trustfulness across the sites. For instance, in Omega, the peripheral member Ronny enhanced the importance of being connected to Martin:

“Us in the little group...we have a manager that I can talk to about professional issues and everything. He is the first Norwegian I have met who really knows what he is talking about [...] The fact that he now works with us, with his professional competence, really makes me believe in this” (Ronny, *Omega*)

The quote indicates that a relation had been established across the national boundaries that could be used to “talk about everything”. This statement underscores that it was not only a professional connection, but a tie involving significant levels of trust that had been established between these two collaborators (Ronny and Martin). Clearly, without such boundary crossing, stronger vocational ties conflicts might have escalated to higher levels in Omega, than they did.

4.3.3 *Challenges to a core-periphery structure*

The establishment of integrating cores was not without difficulties. Most threatening for Gaia was the continuous risk of disconnecting the more peripheral members. During the course of the collaboration two peripheral members decided to leave the group, and some individuals complained about being “not really part of the group”. The bonds toward peripheral parts were, then, sometimes not strong enough. A second challenge was to avoid fragmentation of cores that were operating well. As for Beta, the operating core structure seemed to have broken down before we started our investigation, and at the moment of our investigation the group was in a state of fragmentation. The

removal of a leader had disconnected a core that united the local units, and the new leader had not (yet) managed to establish new, stronger ties. A third, and perhaps obvious, challenge for the integrated cores is to avoid establishment of competing cores. In Delta there were two denser units located in each of the locations involved, and the group suffered from this polarization. For integrated groups like Omega and Gaia it would probably be threatening if some of the local units were disconnected, although we found no indications of such developments.

5. Toward a network-based understanding of trust in distributed groups

This article has displayed results that indicate that the distributed work groups with higher levels of trust have different network structures than the groups with lower trust. Inductive evidence from four cases suggested that well-functioning distributed groups took advantage of having a stronger core-periphery structure, and they also had some stronger ties to the involved local units. In this study we found two slightly different constellations of integrated cores: one that was mainly located in one site with strong ties to the periphery; and one with all local units involved. In both cases “integrating cores” appeared to operate in a way that moderated conflicts, enhanced the sharing of information and enhanced immediate coordination. In contrast, the lower-trust cases seemed to move in the direction of developing a dual core-structure with few interconnecting ties between them. In this last section we will describe more closely the way these findings complement existing theories of trust-building in distributed groups, and how the findings may be followed-up in later studies.

5.1 Theoretical contributions

The aim of this paper has been to generate a better theoretical understanding of trust in distributed groups, based on a limited set of cases analyzed in detail. The argument for this is that it is a set of case studies that aim toward analytical generalization, rather than empirical generalization (Yin 2003). Therefore, although the small sample of four cases has given us insight that is useful for developing new theories in the field, they should not be used as a basis for drawing strong conclusions or to generalize to larger samples. The aim of this work has been to get a deeper understanding of how trust can be related to particular network constellations of vocational strong ties, ones cutting across geographical distance.

In the field of network theory this study adds to the literature on network structures in virtual teams. Prior contributions have found evidence of a centralized structure as most efficient for

coordinating work, as well as the necessity for some level of structural cohesiveness. Against this, the present study suggests that an integrated core might be optimal as a way to balance the need for efficient coordination of tasks and integration across local units. The mechanisms related to the operation of the integrating cores provide additional hypotheses on how such groups operate, and why they succeed or not. The findings in this study seem to go together well with findings from previous experimental studies, indicating that opposing organizational units may result in higher levels of conflicts and distrust in situations of uncertainty and risk (Krackhardt and Stern 1988). This was largely the case with the two low-trust cases that experienced a “vacuum” of stronger vocational ties in between the local departments. At this point the evidence displayed in the low-trust cases could also be explained by faultline theories that predict that units with two groups having “boundaries” that divide the group into two subunits, of similar size and similar power, will tend to run into more conflicts than other constellations (Polzer, Crisp et al. 2007). Still, the more formal network methodology used here gives a much more detailed understanding of the relational structures involved, and of the roles of individuals in establishing and sustaining these structures.

This work also contributes to a dynamic, interdisciplinary field focussing on trust in distributed work groups and virtual teams (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002; Panteli 2005a; Wilson, Straus and McEvily 2006). A central hypothesis in this area has been that distributed groups can better manage with more task-oriented forms of trust, based on common understanding of roles, i.e. “swift trust” (Jarvenpaa and Leidner 1999; Kanawattanachai and Yoo 2002). To this picture, the present study adds that it is not only the quality of the relations that matters, but also the way they are interconnected. Applying a network approach to trust adds a relational dimension to studies of trust in distributed groups, and the findings here indicate that there is a connection between high-trust groups and their inner network of relations. Further, compared to most other studies of trust in distributed groups, the present study has certain methodological benefits: While most existing studies of trust in distributed work is based on field experiments with groups of students, this study has the advantage of being based on real work groups of professionals conducting knowledge-intensive collaborative work. It also has the strength of exploiting a combination of a structural network analysis with a qualitative approach. This is a combination that manages to capture an outside perspective of the networks with an inside analysis of the social relations; a combination that has been sought after by network scholars (Kilduff and Corley 2000).

5.2 Limitations and further research

We should note, however, that this study has some clear limitations: Firstly, the study has been devoted to analyzing structural dimensions of the distributed collaboration, with a focus on core-periphery structures. Besides the factors that have been examined, others might be needed to provide a

fuller explanation of the variations in trust between these groups, such as ties external to the individual groups. Such an effort would necessarily fall beyond the scope of this article. Secondly, we should also note that this work has not tested – or confirmed – any hypotheses regarding the causality of trust and network structure. The evidence brought forward here is mainly descriptive and does not propose that trust is a product of a particular structure (or the other way round). To achieve such conclusions, larger samples and other statistical tools are needed. And thirdly, the network data here is largely based on self-reported interaction data, and perceived closeness of the other participants in the group. Self-reported categorization of interactions will usually have problems of bias or reliability compared to data based on observations or technical records of interactions (Bernhardt, Killworth and Sailer 1982). Still, self-reported data have been found to be fairly reliable when it comes to the individual ranking of different activities, and useful to compare interaction patterns across different groups, as is done here (Hartley, Brecht, Pagerly et al. 1977).

The relevance of the core-periphery structures as described here should clearly be further confirmed or confronted by additional empirical studies. Such investigations may want to apply more sophisticated techniques to detect, map and compare networks than have been used here. There are multiple ways of exploring core-periphery structures and cohesive areas within distributed collaborative networks, and it would be of interest to explore this further (Borgatti and Everett 1999; Moody and White 2003). Another option would be to explore in more detail the mechanisms involved in creating functional cores in distributed groups, through network-building mechanisms. The role of individual actors, working deliberately to build stronger relations across distance, appears as a particularly important area for further research. Existing work in the field of boundary spanning (Friedman and Podolny 1982; Podolny and Baron 1997; VanSell, Brief and Schuler 1981) and network brokering (Burt 2005; Fernandez and Gould 1994; Gould 1991; Gould and Fernandez 1989) appear as useful points of departure.

6. Conclusion

The challenge of developing trust in distributed work groups has been a much-discussed issue during the last decade. Most studies have been pessimistic about the possibilities for developing stronger forms of trust when the employees are located at a distance. This paper has suggested, however, that the establishment of relatively small distributed networks with some central relations crossing the physical boundaries can overcome much of these obstacles. These cases provide evidence that integrating cores within the distributed groups seemed to stabilize the total network and generate trust on a more general level. As such, a core-periphery structure appears as a more rational solution to the problems of developing of trust in a group of dispersed collaborators, than simply trying to

enhance trust within the group on a general level. The existence of integrating cores may therefore represent one way of dealing with “the paradox of trust” as discussed earlier in this paper: When trust can flow through a few interconnected individuals, centrally positioned in the larger network structure, trust may be enhanced for the total group.

As organizations and groups tend to move in the direction of becoming more elusive and opaque, investigating their local, structural properties appear to be increasingly relevant and interesting for researchers as well as the organizations themselves. Social network methodologies and theories are in a good position to do such analyses, as they have the capability of analyzing and visualizing the complex combination of co-located and remote connections involved. Clearly, the present study has only scratched the surface of these possibilities.

References

- Ackerman, M, V Pipek, and V Wulf. 2003. *Beyond Knowledge Management: Sharing Expertise*. Cambridge: MIT press.
- Adler, Paul S, and Seok-Woo Kwon. 2002. "Social capital: Prospects for a New Concept." *Academy of Management Journal* 27:17-40.
- Ahuja, Maju, and Kathleen M. Carley. 1999. "Network Structure in Virtual Organizations." *Organization Science* 10:741-57.
- Albert, S, B Ashforth, and J Dutton. 2000. "Organizational identity and identification: Chartering new waters and building new bridges." *Academy of Management Review* 25/1:13-17.
- Ashforth, B.E, and F. Mael. 1989. "Social Identity Theory and the Organization." *Academy of Management Review* 14:20-39.
- Aubert, B.A., and B.L. Kelsey. 2003. "Further understanding of trust and performance in virtual teams." *Small Group Research* 34:575-618.
- Bélanger, France. 1999. "Communication Patterns In Distributed Work Groups: A Network Analysis." *IEEE Transactions on Professional Communications* 42:261-275.
- Bernhardt, Russel H., Peter Killworth, and Lee Sailer. 1982. "Informant accuracy in social network data V." *Social Science Research*:30-66.
- Blau, P. 1968. "Interaction: Social Exchange." Pp. 452-458 in *International Encyclopedia of the Social Sciences*, edited by D.L. Sills. New York: Macmillian.
- Blau, Peter M. 1964. *Exchange and Power in Social Life*. New York: Wiley.
- Borgatti, Stephen, and Martin Everett. 1999. "Models of core/periphery structures." *Social Networks*:375-395.
- Bradach, Jeffrey L., and Robert G. Eccles. 1989. "Price, Authority, and Trust: From Ideal Types to Plural Forms." *Annual Reviews in Sociology*:97-117.
- Burt, Ronald. 2001. "Structural Holes versus Network Closure as Social Capital." Pp. 31-56 in *Social Capital: Theory and Research*, edited by Nan Lin, Karen S. Cook, and Ronald S. Burt: Aldine de Gruyter.
- . 2005. *Brokerage and Closure. An Introduction to Social Capital*. New York: Oxford University Press.
- Burt, Ronald, and M. Knez. 1996. "Trust and Third-Party Gossip." Pp. 68-89 in *Trust in Organizations. Frontiers of Theory and research*, edited by R M kramer and T R Tyler. Thousand oaks: Sage.
- Cohen, and Prusak. 2001. *In good company. How social capital makes organizations works*. Boston, MA: Harvard Business School Press.
- Coleman, James. 1988. "Social capital in the creation of human capital." *American Journal of Sociology*:95-120.
- Coleman, James S. 1990. *Foundations of Social Theory*. Cambridge MA: Harvard University Press.
- Cummings, Jonathon N. 2004. "Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization." *Management Science* 50:352-364.
- Cummings, Jonathon N., and Rob Cross. 2003. "Structural properties of work groups and their consequences for performance." *Social Networks*:197-210.
- Cummings, Jonathon N., and Sara Kiesler. 2005. "Collaborative Research Across Dicipinary and Organizational Boundaries." *Social Studies of Science* 35:703-722.

- DeSanctis, Gerardine, and Peter Monge. 1999. "Introduction: Communication processes for virtual organizations." *Organization Science (Special Issue)*:693-703.
- Eisenhardt, Kathleen M. 1989. "Building Theories from Case Study Research." *Academy of Management Review* 14:532-550.
- Feld, Scott L. 1981. "The Focused Organization of Social Ties." *The American Journal of Sociology* 86:1015-1035.
- Fernandez, Roberto M, and Roger V Gould. 1994. "A dilemma of state power: Brokerage and influence in the national health policy domain." *American Journal of Sociology*:1455-91.
- Freeman, Linton C. 1979. "Centrality in social networks: Conceptual clarification." *Social Networks*:215-39.
- Friedman, Raymond A., and Joel Podolny. 1982. "Differentiation of Boundary Spanning Roles: Labor Negotiations and implications for Role Conflict." *Administrative Science Quarterly* 1:28-47.
- Giddens, Anthony. 1994. "Risk, trust, reflexivity." Pp. 184-197 in *Reflexive Modernization*, edited by U. Beck, A. Giddens, and S. Lash. Cambridge UK: Polity Press.
- Gould, Roger V. 1991. "Multiple Networks and Mobilization in the Paris Commune, 1871." *American Sociological Review* 56:716-729.
- Gould, Roger V., and Roberto M. Fernandez. 1989. "Structures of Mediation: A Formal Approach to Brokerage in Transaction." *Sociological Methodology* 19:89-126.
- Granovetter, Mark S. 1973. "The Strength of Weak Ties." *American Journal of Sociology*:1287-1303.
- Handy, Charles. 1995. "Trust and the Virtual Organization. How do you manage people whom you not see?" *Harvard Business Review* 73:40-50.
- Hartley, Chris, M. Brecht, P. Pagerly, G. Weeks, A. Champanis, and D. Hoecker. 1977. "Subjective time estimates of work tasks by office workers." *Journal of occupational Psychology*:23-36.
- Heckscher, Charles. 1994. "Defining the Post-Bureaucratic Type." Pp. 14-62 in *The Post-Bureaucratic Organization. New Perspectives on Organizational Change*, edited by C. Heckscher and A. Donnelon. Thousand Oaks, CA: Sage.
- Hinds, Pamela, and Cathleen McGrath. 2006. "Structures that Work: Social Structure, Work Structure and Coordination Ease in Geographically Distributed Teams." in *CSCW'06*. Banff, Alberta, Canada.
- Homans, George C. 1950. *The Human Group*. New York: Harcourt Brace.
- Ibarra, Herminia, and S.B Andrews. 1993. "Power, social influence, and sensemaking: Effects of network centrality and proximity on employee perception." *Administrative Science Quarterly*:277-303.
- Jarvenpaa, Sirkka L., and Dorothy E. Leidner. 1999. "Communication and Trust in Global Virtual Teams." *Organization Science* 10:791-815.
- Johansen, Svein T, and Marcus Selart. 2006. "Expanding the Role of Trust in Organizational Change." Pp. 258-279 in *New Perspectives on Organizational Change and Learning*, edited by Rune Lines, Inger G. Stensaker, and Ann Langley. Oslo: Fagbokforlaget.
- Julsrud, Tom E., and Per M. Schiefloe. 2007. "The development, distribution and maintenance of trust in distributed work groups. A social network approach." *International Journal of Networking and Virtual Organisations* 4:351-368.
- Kanawattanachai, Prasert, and Youngjin Yoo. 2002. "Dynamic nature of trust in virtual teams." *Strategic Information Systems*:187-213.

- Katz, Nanct, David Lazer, Holly Arrow, and Noshir Contractor. 2005. "The Network Perspective on Small Groups." Pp. 277-312 in *Theories of Small Groups*, edited by M. Scott Poole and A B. Hollingshead. Thousand Oaks, California: Sage.
- Kiesler, Sara, and Jonathon N. Cummings. 2002. "What Do We Know about Proximity and Distance in Work Groups? A Legacy of research." Pp. 57-82 in *Distributed Work*, edited by P Hinds and S Kiesler. Cambridge, Mass.: The MIT Press.
- Kilduff, Martin, and Kevin G. Corley. 2000. "Organizational Culture From a Network Perspective." Pp. 211-221 in *Handbook of Organizational Culture and Climate*, edited by N Ashkanasy, C P M Wilderom, and M F Peterson. New york: Sage.
- Koku, Emmanuel F., and Barry Wellman. 2002. "Scholarly Networks as Learning Communities: The Case of TechNet." Pp. 299-338 in *Designing Virtual Communities in the Service of Learning*, edited by Sasha Barab and Rob Kling. Cambridge: Cambridge University Press.
- Kollock, Peter. 1994. "The Emergence of Exchange Structures: An Experimental Study of Uncertainty, Commitment, and Trust." *The American Journal of Sociology* 100:313-345.
- Krackhardt, David. 1992. "The strength of strong ties: The importance of philos in organizations." Pp. 216-239 in *Network and Organizations; Structure, Form and Action*, edited by N Nohria and R Eccles. Boston: Harvard University Press.
- . 1999. "The ties that torture: simmelian tie analysis in organizations." *Research in the Sociology of Organizations* 16:183-210.
- Krackhardt, David, and Martin Kilduff. 2002. "Structure, Culture and Simmelian ties in entrepreneurial firms." *Social Networks* 3:279-290.
- Krackhardt, David, and R N Stern. 1988. "Informal Networks and Organizational Crises: An Experimental Simulation." *Social Psychology Quarterly* 51:123-140.
- Kraut, Robert, S.R Fussel, S.E. Brennan, and J. Siegel. 2002. "Understanding Effects of Proximity on Collaboration: Implications for Technology to Support Remote Collaborative Work." Pp. 137-163 in *Distributed work*, edited by P. Hinds and S. Kiesler. Cambridge: MIT press.
- Lau, Dora C., and Jack K. Murnighan. 1998. "Demographic diversity and faultlines: The compositional dynamics of organizational groups." *Academy of Management Review*:325-340.
- Lewicki, Roy L., and Barbara B. Bunker. 1996. "Developing and Maintaining Trust in Work Relationships." Pp. 114-139 in *Trust in Organizations. Frontiers of Theory and research*, edited by R. Kramer and T. Tyler. Thousand Oaks: Sage.
- Lewis, J.D., and A. Weigert. 1985. "Trust as a social reality." *Social Forces* 63:967-985.
- Lipnack, Jessica, and Jeffrey Stamps. 2000. *Virtual Teams. People Working Across Boundaries with Technology*. New York: John Wiley.
- Luhmann, Niklas. 1988. "Familiarity, confidence, trust: Problems and alternatives." Pp. 94-107 in *Trust: Making and Breaking Co-operative Relations*, edited by D. Gambetta. Oxford: Basil Blackwell.
- Marsden, P.V. 1988. "Homogeneity in confiding relations." *Social Networks*:57-76.
- Mayer, Roger C., J.H Davis, and F.D Schoorman. 1995. "An integrated model of organizational trust." *Academy of Management Review* 3:709-734.
- Maznevski, Martha L., and Katherine M. Chudoba. 2000. "Bridging Space Over Time:Global Virtual Team Dynamics and Effectiveness." *Organizational Science* 11:473-492.
- McAllister, Daniel J. 1995. "Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations." *Academy of Management Journal* 1:24-59.
- McEvily, B., V. Perrone, and A. Zaheer. 2003. "Trust as an organizing Principle." *Organization Science* 1:91-103.

- McPherson, M, L Smith-Lovin, and J M Cook. 2001. "Birds of a Feather. Homophily in social networks." *Annual Review of Sociology*:415-444.
- Meyerson, Debra, Karl Weick, and Roderick Kramer. 1996. "Swift Trust and Temporary Groups." Pp. 166-195 in *Trust in Organizations. Frontiers of Research and Theory*, edited by R Kramer and R Tyler. Thousand Oaks, CA: Sage.
- Moody, James, and Douglas R. White. 2003. "Structural cohesion and embeddedness: A hierarchical concept of social groups." *American Sociological Review* 68:103-127.
- Möllering, Guido. 2006. *Trust: Reason, Routine, Reflexivity*. Amsterdam: Elsevier.
- Nahapiet, Janine, and Sumantra Ghoshal. 1998. "Social Capital, intellectual capital and the organizational advantage." *Academy of Management Journal* 23.
- Panteli, Niki. 2005a. "Situating Trust within Virtual Teams." Pp. 20-40 in *Virtual Teams: Contemporary Insights*, edited by S. Reddy. Hyderabad, India: ICFAI University Press.
- . 2005b. "Trust in Global Virtual Teams." in *Ariadne*. www.ariadne.ac.uk/issue43/panteli/: University of Bath, UK.
- Panteli, Niki, and Elizabeth Duncan. 2004. "Trust and temporary virtual teams: alternative explanations and dramaturgical relationships." *Information Technology and People* 17:423-442.
- Pearce, WB, S M Sommers, A Morris, and M Frideger. 1992. "A configural approach to interpersonal relations: Profiles of workplace relations and task interdependence." Irvine, CA: Graduate School of Management, University of California.
- Piccoli, Gabriele, and Blake Ives. 2003. "Trust and the Unintended Effects of Behavior Control in Virtual Teams." *MIS Quarterly* 27:365-395.
- Podolny, Joel, and J Baron. 1997. "Resources and relationships, social networks and mobility in the workplace." *American Sociological Review*:673-693.
- Polzer, Jeffrey T., C Brad Crisp, Sirkka L. Jarvenpaa, and Jerry W. Kim. 2007. "Geographically-Colocated Subgroups in Globally Dispersed Teams: A Test of the Faultline Hypothesis."
- Powell, Walter. 1996. "Trust-based Forms of Governance." Pp. 51-67 in *Trust in Organizations. Frontiers of Theory and research*, edited by R. Kramer and T. Tyler. Thousand oaks: Sage.
- Ragin, Charles A. 1994. *Constructing Social Research*. Thousand Oaks, CA: Sage.
- Rousseau, Denise M., S.B. Sitkin, R.S. Burt, and C. Camerer. 1998. "Not So Different After All: A Cross-Disipline View of Trust." *Academy of Management Journal* 3:393-404.
- Schoorman, F.D., R C Mayer, and J H Davis. 1996. "Empowerment in veterinary clinics: The role of trust in delegation." in *The 11th Annual Conference, Society for industrial and Organizational Psychology*. San Diego.
- Scott, John. 2000. *Social Network Analysis: A handbook*. Thousand Oaks CA.: Sage.
- Sparrowe, Raymond, R Liden, S Waynes, and M Kraimer. 2001. "Social networks and the performance of individuals and groups." *Academy of Management Journal* 44:316-325.
- Tajfel, Henri, and John Turner. 1986. "The social identity theory of intergroup behaviour." Pp. 7-24 in *Psychology of intergroup relations*, edited by S. Worchel and W.G. Austin. Chicago: Nelson-Hall.
- Tilly, Charles. 2005. *Trust and Rule*. Cambridge: Cambridge University Press.
- VanSell, M, A P Brief, and R S Schuler. 1981. "Role Conflict and Role Ambiguity: Integrating of the litterature and Directions for Future Research."43-71.

- Walther, Joseph B. 2002. "Time Effects in Computer-Mediated Groups: Past, Present, and Future." Pp. 235-253 in *Distributed Work*, edited by Pamela Hinds and Sara Kiesler. Massachusetts: MIT press.
- Wasserman, Stanley, and Katherine Faust. 1994. *Social Network Analysis. Methods and Applications*. Cambridge: Cambridge University Press.
- Wellman, Barry. 1988. "Structural analysis: from method and metaphor to theory and substance." Pp. 19-61 in *Social Structures: a network approach*, edited by B Wellman and S.D. Berkowitz. New York: Cambridge University Press.
- White, Douglas R., and Frank Harary. 2001. "The Cohesiveness of Blocks in Social Networks: Node Connectivity and Conditional Density." *Sociological Methodology* 31:305-359.
- Wilson, Jeanne M., Susan G. Straus, and Bill McEvily. 2006. "All in due time: The development of trust in computer-mediated and face-toface teams." *Organizational Behavior and Human Decision Processes*:16-33.
- Yin, Robert. 2003. *Case Study Research. Design and Methods*. Thousand Oaks: Sage.
- Zolin, Roxanne, P. J. Hinds, R. Fruchter, and R.E. Levitt. 2004. "Interpersonal Trust in Cross-Functional Global Teams. A longitudinal Study." *Information and Organization* 1:1-26.
- Zolin, Roxanne, and Pamela Hinds. 2004. "Trust in Context: The Development of Interpersonal Trust in Geographically Dispersed Work." Pp. 214-238 in *Trust and Distrust in Organizations. Dilemmas and Approaches*, edited by Roderick M. Kramer and Karen S. Cook. New York: Russel Sage Foundation.

Interview template

1. Background information and general work situation

What is your formal education?

How long have you worked in the NN company?

Have you worked other places before you came here?

Would you tell us about your "history" within the company?

What are your daily work tasks (tasks, routines, places, etc)?

What types of projects and activities are you involved in?

2. Main challenges and tasks for the group

What do you consider as the main objectives for the XX group?

What kind of role does the group have in the company? (Is this role clear?)

What is most critical knowledge that the group needs to have?

Which risks are related to the collaboration and work in the group?

3. Implementation of distributed work

Do you think that the group collaborates well across the national boundaries?

What do you think about the way the group is coordinated and managed?

Are there actions that could be taken to strengthen the collaboration between the distant units in the group?

4. Social relations and networks

Who in your group are you collaborating mostly with?

For how long have you knew these individuals?

Who are you mostly dependent on in your work?

Is there anyone in the group that you consider as close friends?

Do you collaborate with anyone located in the distant units?

Do you communicate frequently with people outside the group?

Who is this, and how important are these for your work?

How do you communicate with these people?

Is there someone in the group that is particularly important for the work in the group?

5. Trust

Would you say that trust is an important quality for your group?

Would you say that there is a high level of trust in your group?

6. Use of ICT

To whom do you send E-mail / SMS?

To whom do you have mobile phone dialogues?

How often are there physical meetings? (formal and informal)

How often are there virtual meetings?

Survey Questionnaire

Stage 1

Group networks (Note: ego-network section excluded)

1. Gender
Scale: M/W

2. Age
Scale: 20-29 / 30-39 / 40-49 / 50-59 / 60 and older

3. Place of work
- Place A
- Place B
- Place C
- Etc

4. Department/group
- Group A
- Group B
- Group C
- Group D

5. Number of years employed
Scale: Less than a year / 1-2 years / 3-4 years / 5-9 years / 10 and more

6. Main field area of work
- Administration
- System development
- Product development
- Sales/marketing
- Consultancies
- Management
- Other

7. Main role/position
- Project member
- Project manager
- Department manager
- Member of administrative staff
- Other

8. Please indicate the persons below that you are in contact with regularly in your work. Leave the fields open if none of the alternatives are correct
Scale: Weekly / Daily

- Person A
- Person B
- Person C
- Etc

9. Have you had important professional discussions with any of the persons on the list below, during the last 4-5 weeks?

- Person A
- Person B
- Person C
- Etc

10. Whom of the persons on the list below is included in your mobile phone address book?

- Person A

- Person B
- Person C
- Etc

11. Whom of the persons on the list below has god knowledge about the work tasks that you do?

- Person A
- Person B
- Person C
- Etc

12. Whom of the persons on the list below would you turn to if you are in need of an advice in your daily work?

- Person A
- Person B
- Person C
- Etc

13. How many phone calls have you had (sent/received) from the persons on the list below during the last 7 days? Please leave the fields open if you haven't exchanged any messages

Scale: 1-4 / 5-10 / 11-20 / More than 20

- Person A
- Person B
- Person C
- Etc

14. How many E-mails have you exchanged (sent/received) from the persons on the list below during the last 7 days? Please leave the fields open if you haven't exchanged any messages

Scale: 1-4 / 5-10 / 11-20 / More than 20

- Person A
- Person B
- Person C
- Etc

15. How many SMS have you exchanged (sent/received) from the persons on the list below during the last 7 days? Please leave the fields open if you haven't exchanged any messages

Scale: 1-4 / 5-10 / 11-20 / More than 20

- Person A
- Person B
- Person C
- Etc

16. What is your opinion about the work that is done in your group on the following areas:

Scale: Very bad / Bad / Uneven quality / Good / Very good

- Resource control
- Innovation and change
- Efficiency
- Conflict solving
- Overall quality of work

17. All in all, how satisfied are you with the collaboration in your group?

- Not at all satisfied
- Somewhat dissatisfied
- Don know
- Satisfied
- Very satisfied

18. What is your opinion about your group on the following areas:

Scale: Strongly disagree / Disagree / Don't know / Agree / Strongly agree

- We are usually considerate of one another's feelings
- The people in my group are friendly
- I can rely on those with whom I work in my group
- Overall, I find the people in my group trustworthy

19. To what degree do you identify with the following units?

Scale: No identification / Weak identification / Identification / Strong identification

- Your department
- The organization you work in
- The projects you work in
- Your co-workers

Survey questionnaire

Stage 2

Group Networks

1. Please indicate the persons below that you are in contact with regularly in your work. Leave the fields open if none of the alternatives are correct

Scale: Weekly / Daily

- Person A
- Person B
- Person C
- Etc

2. Whom of the persons on the list below would you turn to if you are in need of an advice in your daily work?

- Person A
- Person B
- Person C
- Etc

3. How many phone calls have you had (sent/received) from the persons on the list below during the last 7 days? Please leave the fields open if you haven't exchanged any messages

Scale: 1-4 / 5-10 / 11-20 / More than 20

- Person A
- Person B
- Person C
- Etc

4. How many E-mails have you exchanged (sent/received) from the persons on the list below during the last 7 days? Please leave the fields open if you haven't exchanged any messages

Scale: 1-4 / 5-10 / 11-20 / More than 20

- Person A
- Person B
- Person C
- Etc

5. How many SMS have you exchanged (sent/received) from the persons on the list below during the last 7 days? Please leave the fields open if you haven't exchanged any messages

Scale: 1-4 / 5-10 / 11-20 / More than 20

- Person A
- Person B
- Person C
- Etc

6. If you were planning to apply for a job similar to the one you have today, but in another company, whom would you prefer to discuss this with?

- Person A
- Person B
- Etc

7. Are there anyone on the list below that you consider as your close friends?

- Person A
- Person B
- Etc

8. How often do you meet the people below in person?

Scale: Weekly / Daily

- Person A
- Person B
- etc

9. What is your opinion about the work that is done in your group on the following areas:

Scale: Very bad / Bad / Uneven quality / Good / Very good

- Resource control
- Innovation and change
- Efficiency
- Conflict solving
- Overall quality of work

10. All in all, how satisfied are you with the collaboration in your group?

- Not at all satisfied
- Somewhat dissatisfied
- Don know
- Satisfied
- Very satisfied
-

11. What is your opinion about your group on the following areas?

Scale: Strongly disagree / Disagree / Don't know / Agree / Strongly agree

- We are usually considerate of one another's feelings
- The people in my group are friendly
- I can rely on those with whom I work in my group
- Overall, I find the people in my group trustworthy

12. How often would you say that you group use the following communication forms?

Scale: Weekly / Every 14. day / Once a month / More seldom

- Telephone conference
- Videoconferences
- PC-based conferences
- Physical meetings

