
Flows, bridges and brokers: exploring the development of trust relations in a distributed work group

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Abstract: During the last few decades several important empirical studies have documented that trust is important for the efficiency of distributed groups (Piccoli and Ives, 2003; Wilson *et al.*, 2006). It has also been documented that more task-oriented forms of trust (*i.e.*, swift trust) develop more easily in such teams than affective trust forms (Meyerson *et al.*, 1996; Jarvenpaa and Leidner, 1999; Kanawattanachai and Yoo, 2002). More poorly understood are 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 are 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.

Keywords: interpersonal trust; active trust; distributed work; trust brokers; social networks.

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1 Introduction

The phenomenon of *distributed work* has received significant attention during the last few decades (Jackson and derWilen, 1998; Lipnack and Stamps, 2000; Hinds and Kiesler, 2002; Jones *et al.*, 2005; Duarte and Snyder, 2006). Spurred by organisational macro-trends like internationalisation, subcontracting, 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). Although there is no single definition available for the term ‘distributed work’, we will, in line with most current studies, define this broadly as “collaboration across geographical distance assisted by various information and communication technologies” (Townsend *et al.*, 1998; Lipnack and Stamps, 2000). The increased use of communication technologies, infrastructures and tools supports 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 such as e-mail, Instant Messaging (IM) and mobile communication provides rich opportunities for instant communication, it often lacks the differentiating cues that influence judgements 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 *et al.*, 2006). It has also been documented that more task-oriented forms of trust (*i.e.*, swift trust) are developed with greater ease in such teams than more affective trust forms (Jarvenpaa and Leidner, 1999; Kanawattanachai and Yoo, 2002). More poorly understood are 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?

The purpose of this article is to explain further how trust can be established in distributed groups, based on a case study of distributed workers. The article first maps out one crucial dimension in discussions about the development of trust, emphasising different ways of understanding trust: as embedded in everyday routines and institutions, or as related to active trust building. It 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 who were challenged to work together across national and cultural boundaries over a period of 15 months. Based on an analysis of the internal trust networks, the article provides evidence of how certain individuals were important for the development of affective and cognitive trust across geographical distance. The term ‘trust brokering’ is applied to describe the central role of the employees and managers in these networks. The article also demonstrates how cognitive and affective trust followed slightly different patterns within the Delta group. Methodologically, the study adds to the literature by applying a structural approach to an analysis of affective and cognitive trust relations within a distributed group.

2 Building trusting relations across distance

During the last few decades trust has increasingly been discussed as a core term important for understanding various organisational processes, including the running of successful distributed work groups (Jarvenpaa and Leidner, 1999; Panteli, 2003; Piccoli and Ives, 2003; Zolin *et al.*, 2004; Wilson *et al.*, 2006). Turning to the broader field of organisational trust theories, however, different aspects are 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.

2.1 Active and passive trust

One such dimension is concerned with the role of individual actors. In ethno-methodologically and phenomenologically inspired understandings, trust is usually seen as embedded in everyday actions, role taking and routines (Goffman, 1959; Garfinkel, 1967; Schütz, 1967). From this point of view, trust is often envisioned almost as a passive state of mind that regulates much of people's ways 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 been redeveloped 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 in a profession or association or by intermediate mechanisms such as bureaucracy, banking or legal regulation. Theories of trust as embedded in economically and technically based systems also emphasise how particular settings and institutions evoke trustfulness (Luhmann, 1988).

On the other hand, there is a stream of theories that sees 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 (Elster, 1983; Axelrod, 1984; Dasgupta, 1988). Axelrod (1984), for instance, approached trust from the perspective of game theory, and he systematically investigates advantages and 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 doing whatever the other did in the previous round. Secondly, there is a more recent stream of theories seeing trust not as a strategic game, but as based more on individuals' deliberate actions. Going beyond the mechanistic predictions of the game-theoretical approach, these approaches emphasise the necessity of seeing trust as an active process that individuals cannot take for granted (McEvily and Zaheer, 2004; Möllering, 2006). Most notably, Giddens (1991; 1994) 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. Active trust implies a reflexive process, which requires that it be 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, p.186). Based on the work of Giddens, Möllering has more recently elaborated on the active approach, focusing on the importance of a particular ‘leap of faith’ (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 few 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 organisational units. Current studies of distributed work have noted that it is advantageous for someone in the group to take particular responsibility to facilitate interaction between distributed units or partners (Pauleen, 2003; Duarte and Snyder, 2006). 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.

2.2 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 *et al.*, 1998, p.395). This widely used definition emphasises 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 depend to a high degree 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, and strongly constrained, created or supported by social factors.

Trust may have a general form, as in the form of dispositional trust (Mayer *et al.*, 1995). Yet in many situations this is a positive attitude towards particular others at the workplace, in the neighbourhood or in the family. This dimension of trust is often denoted as interpersonal or *relational trust*. Recognising 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 *et al.*, 2003; Tilly, 2005; Möllering, 2006). 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 former case studies, trusting ties is useful as input for conducting structural relational network analysis (Krackhardt and Hanson, 1993; Burt and Knez, 1996). As such, trust relations can be studied as a particular kind of structural property of a particular group or an organisation. Trust networks are usually directed binary networks based on a limited number of indicative

questions to find out whom individuals tend 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 of trust opens up a dedicated analysis of the role that individuals display in trust networks (Boissevain, 1974; Rogers and Kincaid, 1981; Krackhardt and Brass, 1994). Turning the attention to trust as a flow within a web of relations opens up a deeper understanding of the position individuals display in the trust flows. In network structures, typical positions are connectors, hangers-on, isolates, bridges and brokers. As argued above, here I will look in particular for nodes in trust networks that are central in connecting decentralised 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.

2.3 *Affective and cognitive dimensions*

Interpersonal trust is a multidimensional construct with both cognitive and affective foundations (Lewis and Weigert, 1985; Boon and Holmes, 1991; 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 of 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 dominate, because there are fewer opportunities to develop affective ties (Meyerson *et al.*, 1996; Jarvenpaa and Leidner, 1999). Yet recent studies of trust in organisations tend to emphasise the importance of also capturing the affective side of the concept (Kramer and Tyler, 1996). Kanawattanachai and Yoo (2002) 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. Hence, the studies of trust flows within groups should strive to capture both cognitive and affective dimensions, and I will include both dimensions in this article.

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 positively affects 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 in applying a network approach to small organisational groups, this is so far mostly done on larger samples, and mainly by analysing interaction-based ties (Sparrowe *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 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 results presented in this article are 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 nationalities of the units.

3.1 Research questions

The interest of 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. Secondly, 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, semistructured 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/organisation and trust issues, and lasted 30–40 min. Eleven of the 13 employees in Delta were interviewed. (Two of the employees in the group were not available for interviews owing to a shift in job assignments and illness.) 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 one week. The data was gathered after a period of 19 months of 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 for the network study, whereby each group member received a list of the other members in 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 questionnaire. The data was coded as regular 1-mode social network data in sociomatrices for valued data, and analysed by Ucinet and NetDraw software packages.¹

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

Table 1 Questions used to track trust flows and interactions in Delta

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 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)?

The idea behind the affective trust formulation is that this type of discussion would imply trustfulness, as a disclosure of such plans would be damaging to the reputation of the individual in question.² Indirect questions are the most common way to analyse trust-based relations in organisations (Krackhardt and Hanson, 1993; Burt and Knez, 1996). It should be noted, however, that such questions always involve the risk of neglecting individuals who 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 nonmediated channels, and the intensity of interaction (daily, weekly, monthly). In this article the daily interaction frequency will be used as an indicator of 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 explained in the next section.

4 Empirical study

4.1 *About delta*

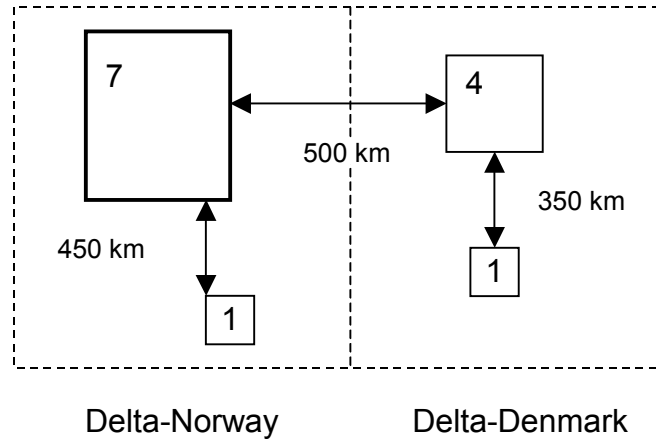
Delta is a group of 13 technical experts working across the boundaries of two Nordic companies, situated in Norway and Denmark. The group was established after a Norwegian engineering company bought a smaller Danish company. In the new and more international company, the Delta group got an important role in building up a common technical product line that could be used in two different markets. As such, the group was central to 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 place with 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 with collaboration in the group in 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 organisational) boundaries. The Danish employees were worried that their Norwegian colleagues were taking over all the attractive tasks and assignments, as they appeared as the stronger party 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 Danish manager, who, according to several employees, spent too little time at their location. However, the organisational 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, many of the employees' tasks were related to technology-oriented projects, which often had a long duration and involved employees outside the group. According to the manager of the group (and also some of the employees), the projects were the prime focus for most employees. This made the group vulnerable to activities and constraints placed on the employees by projects.

Moreover, their work was challenged by different types of boundaries. On the one hand, the national boundary also reflected a difference in organisational cultures. While the Danish 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 purely distance boundary that was present not only between the two countries, but also within the two countries. In both countries one employee was located in a different city, owing to personal and organisational circumstances. In this article, however, we will pay attention mainly to the boundary composed of national and organisational boundaries.

Figure 1 Number of employees at main locations in Delta

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 *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.

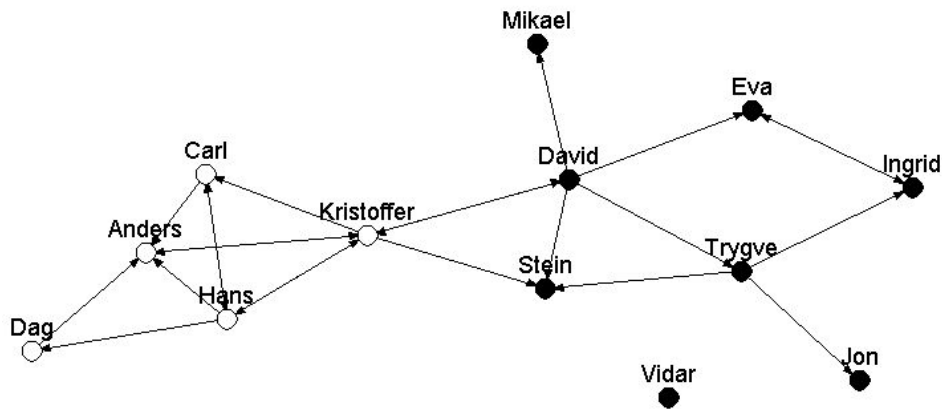
Indegree centrality indicates the number of incoming lines for each node in a directional node-by-node network (Wasserman and Faust, 1994). The indegree of a node n_i in an ordered set of nodes is then the number of arcs that terminate at n_i . The *density* of a network is measured as the number of 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 (1988), will be used. This indicator compares the external ties with the internal ties for groups within a network, ranging from -1 to $+1$. Given the 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.³

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 subgraph within a larger network. In directed networks, cliques are usually found by focusing on those ties that are reciprocated, and the Bron and Kerbosch (1973) algorithm is used to find all cliques larger than 3 (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 indicates important areas for the establishment of trust and stability across boundaries.

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 Danish group was interacting more frequently with their local unit than across the boundary. The density for the interaction network was as high as 0.8. The highly 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 who had his office in a different city from the main office's.

Figure 2 Daily interaction (white = Danish, black = Norwegian)



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 centralisation index, however, is higher for cognitive trust than the interaction network, indicating that the competences 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 group, indicating that they tend to turn to each other for advice while the Danes also turn to the Norwegians.

The *affective trust network*, based on personal dimensions of trust and personally 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 E-I index) there is one boundary-crossing relation. Interestingly, however, the local density of the affective trust

was much lower for the Danish employees than for the Norwegian group. Even though the interaction networks were denser among the Danish employees, there appear to be lower levels of affective trust in this part of Delta. Actually, there was only one affective trust relation within the Danish group, from Kristoffer to Carl. Figures 3 and 4 illustrate the structure of the cognitive and affective trust networks in Delta.

The two trust flows were highly similar, although not isomorphic. A simple QAP correlation⁴ based on permutations showed that there was a significant correlation between the two trust forms ($r = 0.278$, $P < 0.01$). Affective and cognitive trust, then, do go rather closely together in this case. The same goes for 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. One important reason is probably that much of the interaction in the group evolved around solving immediate problems in their work. In the day-to-day work, the cognitive trust relations were most actively used. The affective trust network, on the other hand, was often based on collaboration in former projects and past experiences, and less salient in the daily collaboration.

Figure 3 Cognitive trust (white = Danish, black = Norwegian)

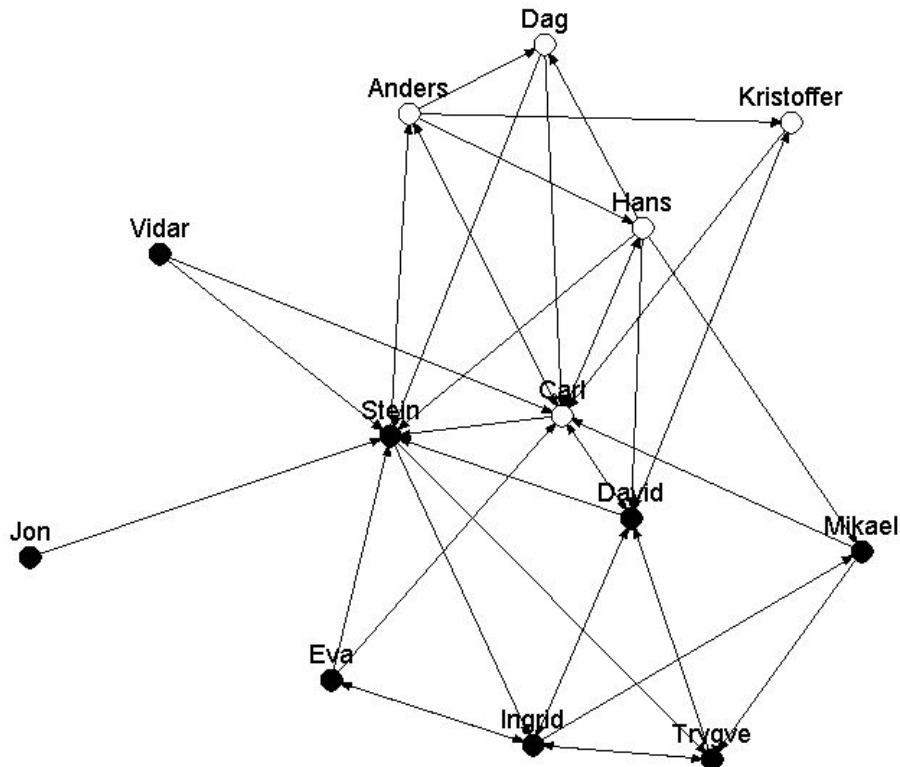
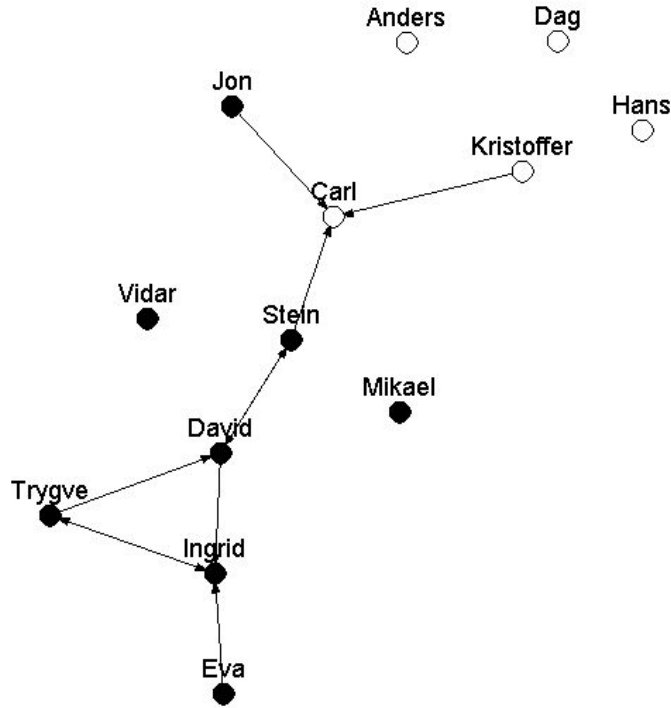


Figure 4 Affective trust (white = Danish, black = Norwegian)



4.4 Brokers in the trust networks

A role-oriented analysis of trust networks can help illuminate who in the distributed group is central in connecting affective and cognitive trust networks. The general indegree centralisation scores for the two trust networks in Delta indicate that the manager, Carl, as well as Stein and David are the most trusted when it comes to solving professional problems (see Table 3). When it comes to the affective dimension, however, Carl and Ingrid are the most trusted. Two employees, Jon and Vidar, are only weakly connected to the trust networks.

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

Relation	Arcs	Density	Network centralisation (indegree)	Boundary-crossing cliques (prop.)	Local density	E-I index
Interaction	36	0.154	20.83	0.33 (1/3)	0.286 (N) 0.800 (D)	-0.778
C-trust	62	0.429	45.83	0.5 (5/10)	0.429 (N) 0.275 (D)	-0.290
A-trust	16	0.064	20.14	0 (0/1)	0.179 (N) 0.100 (D)	-0.500

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.⁵ 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 the exploitation of the ‘structural holes’ between disconnected nodes, but rather to connecting 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 by 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).

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

Type	Description	Illustration
Gatekeeper	Being trusted by a distant node, and trusting others in the local unit	
Representative	Trusting a distant node and being trusted by a local node	
Consultant	Being trusted by a distant node and trusting a distant node	

Calculating the number of brokerage relations for each individual in the trust networks indicates, first, that Carl, Stein, David, Anders, Ingrid and Mikael are the ones receiving cognitive trust across boundaries in Delta, acting as gatekeepers (see Table 4). Most important among these were Carl, Stein and David, and they were also the ones who tended to trust others more frequently across the boundary. Carl, Stein and David were also the members who 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. 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).

Table 3 Normalised indegree centralisation for Delta: affective trust, cognitive trust and daily interaction

<i>Name</i>	<i>A-trust</i>	<i>C-trust</i>	<i>Interaction</i>
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 centralisation	20,14	45,83	19,44

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 around), 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.⁶ In this group of distributed workers, Stein is also the only one who had both affective and cognitive trust ties across the boundary.

Table 4 Broker positions in trust networks

<i>Name</i>	<i>Gatekeeper</i> (receives trust across distance)		<i>Representative</i> (has trusting ties to distant others)		<i>Consultant</i> (receives and gives trust across distance)		<i>Sum</i>
	<i>A-trust</i>	<i>C-trust</i>	<i>A-trust</i>	<i>C-trust</i>	<i>A-trust</i>	<i>C-trust</i>	
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

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 are low, and there is uncertainty about how to interact and collaborate. In the literature these are sometimes 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 (Mischel, 1977; 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.

5.1 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 positively affect affective trust over time (McAllister, 1995; Lewicki and Bunker, 1996).

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 study found that cognitive and affective trust ties were closely interrelated.

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, but 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 to 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.

5.2 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 argued, on the one hand, that trust needs time to develop in distributed groups (Wilson *et al.*, 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 emphasised 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 manager and the way the group was run, Stein was the only one in the interviews who emphasised the importance of building internal relations in Delta:

“...this group needs to develop relations between the participants over time [...]. We cannot move the Danish 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 (1994). In contemporary life, and perhaps particularly in highly flexible organisations, trust needs to be worked on, as much of the traditional institutional frames are lacking or changing or 'reconstructed'.

5.3 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 *et al.*, 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 this data is that it is based on 'real' distributed workers within a knowledge-based organisation, and not groups of students (as with most of the previous contributions dealing with trust in distributed groups).

By focusing 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 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, IM, mobile phone applications and web-based application. 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 Conclusion

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 organisations 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.

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Notes

- 1 A closer description of social network measures and techniques can be found in Wassermann and Faust (1994) and in the Ucinet software manuals (Borgatti et al., 2002).
- 2 This strategy is similar to the one used by earlier network studies on trust in organisations (Krackhardt and Hanson, 1993; Krackhardt and Brass, 1994; Burt and Knez, 1996).
- 3 Note that owing to the differences in numbers, the Danish employees are described in this analysis as 'external' and the Norwegians as 'internal'.
- 4 Ucinet's QAP correlation procedure is based on permutations 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.
- 5 For information brokerage between three groups, five types of brokerage may occur, including coordinator, consultant, gatekeeper, representative and liaison. See Fernandez and Gould (1994).
- 6 A cut-point is one whose removal would increase the number of components by dividing the subgraph into two or more separate subsets between which there is no connection (Scott, 2000).