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Facilitating Trust Building in Networks: A Study from the Water Technology Industry

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Abstract   This paper analyses how action researchers can facilitate trust building processes in inter-firm networks and develops a framework for network development. A longitudinal case study of developing a regional network of water technology SMEs constitutes the empirical base. The paper argues that researchers can directly facilitate processes with a capacity to build two types of trust in different phases of network development, both characteristic-based and process-based trust. The findings indicate that processes to build characteristic-based trust can be facilitated through dialogue processes in temporary groups at network meetings. Processes to build process-based trust are stimulated by practical inter-firm teamwork. Furthermore, there seems to be a mutually reinforcing relationship between these two forms of trust formation, which can be influenced by action researchers. When the level of trust has reached a point of critical mass, new-coming firms seem to jump quickly through characteristic-based trust towards a relatively high level of process-based trust.

Keywords   Trust building · Process-based trust · Characteristic-based trust · Network development · Action research

Introduction

The rising complexity of products, processes and services, and the growing dispersion of personnel and resources that are necessary for their creation represent two profound

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changes of the last three decades. To adapt to these changes, firms increasingly require networks to collaborate and share resources with other firms (The Economist Intelligence Unit 2007; Boutellier et al. 2008; Eppinger and Chitkara 2009). There are three types of mechanisms which govern the collaboration in networks: (1) Spontaneous behavioral based on market mechanisms, (2) hierarchical or mechanistic governance based on regulations and sanctions, and (3) heterarchical or governance based on trust (Hatak and Roessl 2010). Type 1 is mostly occupied with short-term advantages, type 2 is costly and difficult to monitor, therefore type 3—trust—is the preferred mechanism in long-term relationships like networks. Still, many firms fall short in their attempts to strike up collaborations with other firms, and many networks end up as costly failures (Powell et al. 1996; Nooteboom 2002). A major reason behind this seems to be the lack of trust in a governing mechanism which steers the collaboration among the interacting parties (Das and Teng 1998; Sydow 1998; Newell and Swan 2000; Nooteboom 2002). For instance, a free rider problem can emerge if one participant organization chooses to shoulder less than a fair share of the network's joint activities (Cornes and Sandler 1984). Such behaviour can dampen the other participants' motivation to contribute, and ultimately induce them to withdraw from the network. In short, both practical experience and research have made clear that trust is a crucial condition underlying successful collaboration in networks (Newell and Swan 2000; Nooteboom 2002).

In recent years, a small stream of action research (AR) literature has addressed the topic of networks and examined ways in which social researchers can directly facilitate dialogue and practical collaboration between firms (Hanssen-Bauer and Snow 1996; Chisholm 2001; Hildrum and Strand 2006; Chisholm 2008; Gausdal 2008; Qvale 2008). However, while many studies take into examination specific AR interventions and the tangible effects that these have on inter-firm collaboration (Hanssen-Bauer and Snow 1996; Chisholm 2006, 2008; Qvale 2008), few studies direct explicit attention to the effects these interventions have on trust-building processes. This constitutes a missing link, since an appreciation of how AR affects networks requires insight into how those interventions affect the gradual generation of good faith between the people involved. Indeed, since one of the main tasks of action researchers is to help organizations develop trust-based collaboration platforms upon which practical improvement projects can be carried out, it is surprising that the issue of trust has not been subject to more attention in this field. The purpose of the present paper is to develop a new framework of trust building in networks—complementing past AR literature. The research question is: How can action researchers facilitate trust building processes among network participants?

To answer this question, we start with reviewing management literature on trust in networks. We direct specific emphasis on differences between institutions-based, characteristic-based and process-based trust and the roles that these different types of trust play in network collaborations. Next, we give an overview of methods that action researchers have previously used for the purpose of facilitating collaboration between firms. Here, we emphasise links between these methods and the creation of different types of trust. In the remaining sections, we explore these relationships further through an analysis of our own experiences from an ongoing AR-based network development project. This project, which is carried out under the auspices of the Norwegian Program for Regional Innovation and R&D (VRI), seeks to facilitate trust-based collaboration in a network in the water technology industry, the Norwegian Water Cluster (NWC). Finally, in the concluding section, we discuss how an examination of trust can enrich and provide a better understanding of the role of AR in networks.

Networks and Action Research

While networks have been on the social scientific research agenda for a long time, the lion's share of this research has addressed questions such as why networks exist (Richardson 1972), how they emerge (Grabher 1993; Powell and Grodal 2006) and what characterises successful networks (Piore and Sabel 1984; Porter 1990; Saxenian 1994; Castells 1997). According to Tidd et al. (1997), relatively less attention has been directed to the practice of creating networks. A small stream of action research literature, however, focuses on the practice of actively planning and creating networks (Hanssen-Bauer and Snow 1996; Ennals and Gustavsen 1999; Chisholm 2001, 2006, 2008; Gausdal 2008; Hildrum et al. 2009). According to this literature, action researchers can have an important role in facilitating collaboration and connecting people in networks. While AR projects might differ along many dimensions, there are arguably some phases, activities and methods that are common across many situations. For instance, drawing on a review of past action research on networks, Chisholm (2008) suggests that AR-based network development projects usually proceeds through an initiation phase and a development phase, each of which involves the use of specific methods and specific collaboration outcomes.

In order to create trust people must be connected. In networks, someone must engage in connecting people. In the initiation phase the main problem to be solved is that there is little or no interaction between two or more organizations that—from the perspective of the researchers—would benefit from collaborating directly on some theme (Chisholm 2008). At this early stage, important tasks facing the researchers are (i) define the boundaries of the prospective network (identify other potential participant firms), (ii) ascertain whether the firms share mutual challenges and (iii) determine whether they could tackle these better by collaborating in a network (Chisholm 2008). To complete these tasks, the researchers often cooperate with individuals who have extensive knowledge about the firms in question, such as top managers or union leaders (Pålshaugen 1998).

While the above literature suggests that actions researchers can contribute positively to planning, initiating and retaining successful networks, they do not direct explicit attention to the trust-building processes that occur in between interventions and outcomes. As we pointed out above, this constitutes a limitation; it is useful for action researchers to know which kinds of interventions and methods can be useful for triggering processes creating trust in different stages and in different situations.

Trust in Networks

Trust in people entails the willingness to submit to the risk that they may fail us, with the expectation that they will not, or the neglect or lack of awareness of the possibility that they will not (Nooteboom 2002, p. 45). Trust is essential for innovative co-operation (Keeble 2000) and is one of the most frequently mentioned concepts in the literature on networks (Grandori and Soda 1995; Newell and Swan 2000). In contrast to firms, networks have no single organizational authority that can set up rules and curb opportunistic behavior. For this reason trust is the main resource outside contracts that keeps the network intact and allows the members to collaborate efficiently. According to Nooteboom (2002), a certain minimum level of trust is indispensable for any network to form and function. Or, as Das and Teng (1998, p. 494) puts it, 'Because it is impossible to monitor every detail in most exchanges, firms must always have a minimum level of trust.' Some theorists,

e.g. Granovetter (1985), claim that trust cannot be intentionally created. We believe, together with other theorists (e.g. Nooteboom 2002), that the building of trust can be intentionally facilitated.

During the course of the last two decades, a sizable literature about trust in networks has developed in the management literature (e.g. in Zucker 1986; Ring and Van De Ven 1992; Newell and Swan 2000; Nooteboom 2002; Hatak and Roessl 2010). Contributors to this literature have examined trust in such varied areas as supplier relations (Lane and Bachmann 1998), R&D partnerships (Powell 1996), strategic alliances (Das and Teng 1998) and University research communities (Newell and Swan 2000). Many studies direct primary attention to distinctions between different forms of trust, and associated modes of trust creation (Zucker 1986; Nooteboom 2002). This orientation is useful in the context of the present paper as it can shed light on the ways in which action researchers can facilitate trust formation in different stages of network development processes. Ring and Van de Ven (1994) differentiate between fragile and resilient forms of trust, which are tied to the level of depth or resilience of the interpersonal relationship in question. Similarly, Abrams et al. (2003) distinguish between competence-based and benevolence-based trust. While the first type is based on the conviction that the other party is competent in some field and worth listening to, the second type is based on the belief that the other party has good intentions and will not try to take advantage of the situation. A comparable and much-cited distinction is offered by Zucker (1986), who marks out three types of trust with three associated modes of trust production; institutions-based, characteristic-based and process-based. Because of its widespread adoption in the management literature (see for instance Nooteboom 2002) we direct specific attention to Zucker's (1986) categorization in the following. Institutions-based trust, however, refers to the existence of local institutions—such as public regulations, treaties, locally embedded codes of conduct, traditions and business ethics—that mitigate opportunistic behavior in network settings (Nooteboom 2002). For instance, people and organizations that are co-located in a certain geographical area may nurture expectations about one another's behavior based on local societal norms and rules. Because production of institutions-based trust is situated more in the society than in firms or networks, this kind of trust production is not our concern here. We therefore concentrate our analysis on characteristic- and process-based trust.

Characteristic-based trust means recognition of each other's knowledge and experiences, and an expectation that the other participants have something valuable to contribute (Zucker 1986). Characteristic-based trust is rooted in personal similarity and develops as people learn that they have similar educational, occupational or other practice-based backgrounds (Zucker 1986). According to Meyerson et al. (1996), characteristic-based trust can be developed relatively swiftly through short periods of intensive interaction in temporary groups. In these intensive sessions, people get to know one another, and grow expectations about behavior based on discernible personal characteristics. It is important to note here that the development of practice-based, cultural or social similarity itself is by no means a swift process. The idea of swift trust takes into account the proviso that one does not usually trust an individual or an organization in every respect, but only with respect to certain kinds of behavior and events. This means that, in most cases, the development of characteristic-based trust must be complemented by deeper forms of trust to form a basis for collaboration (Meyerson et al. 1996).

Process-based trust—founded upon recurrent reciprocal exchange (Zucker 1986)—develops gradually as people accumulate shared experiences from joint problem solving, and gradually increases their acceptance of risk and their willingness to commit to closer forms of collaboration. This increasing acceptance of risk emerges out of a belief that the

network partners consider the long-term gains from future collaboration to be higher than the short-term gains from opportunistic behavior. In the words of Nooteboom (2002, p. 91), 'Process trust, by definition, has to grow. It cannot be created directly, but it can be facilitated through favorable conditions for interaction and collaboration.'

A Network Development Case in the Water Technology Industry

The main objective of the selected case is to facilitate an innovative network among water technology firms in the Norwegian region of Vestfold. There was a demand for a network in the regions' water technology industry before the project was initiated. The greatest need for a network was that the firms were (and still are) too small to take on large customer projects and R&D ventures on their own. As a result, they stand to be out-competed by larger foreign firms with a broader set of in-house competencies. The national and global market of the water technology industry is highly dependent on public regulations and public demand. The regional water technology firms were therefore also in need of a network organization that could defend their interests in association with national legislation and public regulation of water cleansing technology.

The network was initiated in 2007, and 3 years later, in 2010, a vibrant network organization of 27 small and medium sized enterprises (SMEs)—the NWC—has been built up. The NWC currently encompasses about 3000 workplaces and represents the largest concentration of water treatment industry in Norway. The technologies include water filtration membranes, UV radiation, biological water-cleansing processes and energy-efficient recycling of sludge and industrial waste water. The customer base covers sewer plants, waterworks, shipping firms, construction firms and relief organizations. There is a significant growth potential in this industry as the global demand for clean water and the need for energy-efficient water cleansing is rapidly increasing. Much of the original competence originates from the piping part of the regions past shipyard industry, with one shipyard in four of the region's five towns. There was relatively little interaction between the firms until 2007. One start-up firm was a spin-off from another firm, some enterprises had established bilateral relationships, but outside these there was fairly little contact. Within the boundaries of this network, the firms currently collaborate on various topics such as personnel recruitment, education, marketing, internationalization and R&D. In addition to a number of tangible payoffs—such as joint R&D projects, improved recruitment processes and enhanced water cleansing technologies—the network collaboration has also brought about increased interaction and a higher level of trust among the region's water technology firms. According to managers and middle managers interviewed for this study, the gradual generation of trust that has taken place during the project has enabled the participant firms to engage in progressively more complex and risky collaboration activities.

Research Methods and Empirical Material

This study is based on an action research (AR) strategy. As Greenwood and Levin (1998) have pointed out, action researchers typically collaborate with members of a community or organization(s) who are seeking to improve their situation. In this process, they both participate in and write about the actions that are necessary to achieve such improvements. Our research strategy reflects this duality. Moreover, we use longitudinal data (Pettigrew 1990) and case study methodology (Yin 1984; Eisenhardt 1989). It is a single case study

that provides the opportunity for unusual research access allowing exploration in a specific population (Yin 1984) and provides opportunities to explore and richly describe a phenomenon (Siggelkow 2007). A single case can also be a very powerful example providing a more convincing argument about causal forces than broad empirical research (Flyvbjerg 1991; Siggelkow 2007). Because the NWC case represents one such powerful example of trust formation and affords opportunities to explore and richly describe the processes, the selection of the case is based on theoretical sampling.

The primary research method was direct participation (Whyte 1991; Reason and Bradbury 2001) in the network activities from September 2007 until September 2010. Our goal here was to facilitate dialogues and trust-based relationship building between people in the network firms. Following Chisholm (2001), we carried out three types of activities to achieve this aim. First, we organised a number of meetings for the participant firms. Here we employed dialogue conference methodology (Pålshaugen 1998) and the Network IGP method. The Network IGP method is deduced from network reflection (Gausdal 2008) and developed by the first author of this paper. IGP is an acronym for Individual, Group and Plenary reflections; consequently it is a combination of individual and collective reflection. The participants—divided into inter-organizational groups of 3–6 members—begin with a preparing process through a short presentation, in which they tell their names, which firm they represent and some safe personal information, for instance their favourite leisure activity. After the preparing process, a time is set—for instance 3 min—for individual reflection on a given problem. This is followed by collective group reflections for a given time, for instance 60 min. The collective group reflection starts with talking rounds, where the participants share the result of their individual reflection one by one with limited talking time—normally 2 min—for each person on each round. They then move on to normal discussion and narrow down the suggestions for their answer to the given problem. The plenary reflection consists of short presentations—normally 2 min—of the answer to the initial question from each group. The purpose of Network IGP is to help network participants to reflect (individually and collectively) on their experiences, problems and challenges, to identify mutual challenges and to find practical ways of tackling them.

The second research method was employed more indirectly in planning and organizing the network formation. We assisted the firms in setting up articles of association and a formal network board with elected members from the participant firms and other stakeholders. Moreover, we contributed to establishing and coordinating a set of smaller inter-organizational teams with responsibility for practical collaboration on recruitment, marketing, staff development and R&D. One of us has been an elected member of the network board since 2008. In addition we have systematically gathered and analysed empirical material about the network development process. Most of this material stems from written notes and summaries taken in association with the network's meetings and conferences. All in all, from 2007 to 2010 we spent 195 h participating in meetings and observing the network participants. In addition, we interacted closely with key network participants when planning and executing many of these meetings. To complement these notes and summaries, we conducted 8 in-depth interviews with key network participants in 2008–2010. The informants are briefly presented in Table 1.

Finally, we carried out a telephone-based roster rating questionnaire (Wasserman and Faust 1994) on the NWC participants—with 100% response rate—in the spring of 2008 ($N = 22$). The purpose of this questionnaire was to document changes in interaction between the firms in the early stages of the project. Interaction was measured by using Hansens' (1999) scale for frequency of contact and feeling of closeness, which represents a further development of Granovetters' (1973) scale. The questionnaire is enclosed in

Table 1 Informants for qualitative interviews

Inf. no	Position	Interview guide
1	General manager of a NWC firm and member of team 2	Appendix 2
2	Middle manager of a NWC firm and member of team 1	Appendix 2
3	General manager of a NWC firm, member of team 2 and the NWC board	Appendix 2 in 2008. Open questions on network benefit in 2010
4	Action researcher facilitating the exploratory meeting	Open questions about the expl. meeting
5	Middle manager of a NWC firm and member of team 1	Appendix 2
6	The coordinator of the NWC	Appendix 2
7	General manager of a NWC firm, member of team 2 and the NWC board	Appendix 2

Appendix 1. The results of the questionnaire show a 30.5% increase in frequency of contact and a 28.9% increase in the feeling of closeness among the firms from the autumn of 2006 to the spring of 2008. Since Levin and Cross (2004) also found that the two items frequency of contact and feeling of closeness gave similar results, this may strengthen the validity of our results. A timeline for all interventions and data collection is provided in Table 2.

In addition we participated in 13 team meetings and 14 board meetings from September 2007 to September 2010.

Ethical Considerations

Each stage of the research process may involve ethical considerations in addition to purely scientific ones (Frankfort-Nachmias and Nachmias 1996). Data collection was carried out by informed consent. It was clearly explained to all the informants before the interviews that the aim was to collect data for research. As regards the quotations from informant 3 in chapter 5, the informant was asked for permission to use the quotations for this study some weeks later. The other interviews were taped and transcribed, and the transcripts were sent to the respondents for approval. All the transcriptions were approved by the informants. In reporting the results, informants and firms were made as anonymous as possible, e.g. all participants are referred to as 'he'.

We have tried to interpret and report the research results in an honest way, not hiding anything we did not want to find. Since we have been so much involved in the field, the interpretations are of course colored of our knowledge and feelings. There is a slight risk that we have interpreted too much as results of our interventions. We have tried to avoid this by being aware of the danger and by using our analysis strategies, i.e.: Relying on theoretical propositions; analyzing rival explanations; developing a (thick) case description; systematic use of coding procedures. Finally, we strived to further minimise the problem by having central persons in the network approve our description.

Findings and Discussions

AR-based network development projects typically proceed through an initiation phase and a subsequent development phase (and possibly a re-initiation phase), each of which has associated cycles of problem definition, practical tasks and methods (Chisholm 2008).

Table 2 Timeline for interventions and data collection

Time	Phase	Intervention	Data collection
Feb 2007	Initiation	Exploratory meeting	Documents and interviews with informant 4 and 6
Oct 2007		Participating in the first network meeting, facilitating a 10-min network IGP process	Observation and fieldnotes
Nov 2007		Planning and participating in the second network meeting, inviting representatives from another regional network, facilitating a 90-min network IGP process about network strategy and action plan	Observation and fieldnotes
Jan 2008		Planning and participating in the third network meeting, initiating teams and facilitating a 90-min network IGP process to start the teams	Observation and fieldnotes
Feb–Mar 2008		Planning the first general assembly, assisting in setting up articles of association	Observation and fieldnotes
Feb–May 2008		Establishing and coordinating of team 1 and 2	Observation and fieldnotes
April 2008	Development	Participating in the first general assembly	Observation and fieldnotes
April 2008		Performing a telephone-based roster rating questionnaire to 22 respondents	Quantitative data from the 22 members of the NWC.
August 2008		Planning and participating in a network meeting about EU projects and funding from Innovation Norway	Observation and fieldnotes
Oct 2008		Performing in-depth interviews with three informants	Transcribed interviews with informant 1, 2 and 3
Nov 2008		Performing an in-depth interview with one informant	In-depth interview with informant 4
April 2009		Participating in the second general assembly	Observation and fieldnotes
May 2009		Planning, organizing and facilitating the first R&D workshop	Observation and fieldnotes
Aug 2009		Planning and participating in network meeting, facilitating a 60-min network IGP process about product development	Observation and fieldnotes
Sep 2009		Establishing team 3	Observation and fieldnotes
March 2010		Performing in-depth interviews with three informants	Transcribed interviews with informant 5, 6 and 7
April 2010		Planning, organizing and facilitating the second R&D workshop	Observation and fieldnotes
May 2010		Participating the third general assembly	Observation and fieldnotes
August 2010		Performing in-depth interview with informant 3 together with representative from Research Council Norway	Transcribed interview with informant 3

While the initiation phase is characterized by dialogues and planning activities, the development phase is more action-oriented and typically involves practical collaboration on issues identified in the first phase. Although it is difficult to distinguish sharply between different phases in this project, we have used Chisholm's (2008) phase model in order to organize our empirical findings.

Characteristic-based trust and process-based trust depends on specific modes of trust-production and can serve a specific function within a network. In the following sections, we will examine whether and how action researchers can facilitate favorable conditions to create different kinds of trust in networks.

Trust Formation

Before we start to discuss how action researchers facilitated trust building processes among network participants, we want to focus on trust building in the NWC case. According to Zucker (1986), measuring trust directly is difficult and costly, one should rather search for reputation, brand names and other symbols that signals trust in a transaction. Ethnicity, sex, age and professional skills can be used as an index of trust (Zucker 1986). Moreover, interpersonal and inter-organizational trust may rest in membership of a subculture which holds specific expectations (Parsons 1951). In Table 3 we outline those behavior and attitudes in NWC that we believe indicate the presence of characteristic-based and process-based trust in the two phases of network formation, initiation phase and development phase (Chisholm 2008).

Network Initiation Phase and Characteristic-based Trust

The concrete events that led up to the initiation of the network were the following: During a discussion in December 2006, the director of a municipally-owned local business development organization, Tønsberg Development (TD), and the regional director of the national employers' association (NHO) agreed that there was an upsurge of water-treatment firms in the region, and that some of these firms would profit from a joint organization that could represent their interests and increase interaction. Subsequent to this meeting, action researchers at the regional university—who were in the process of preparing an application to the VRI Program—contacted the directors to identify appropriate regional industries for network creation through the program. After a joint meeting in January 2007, the directors and the researchers started planning a network development project, to be organised under the auspices of the new VRI program.

The first step in the plan was mapping out potential participant organizations. The idea was to get in touch with a broad group of stakeholders in the industry, including suppliers of water treatment products and services, large customers and local business organizations. To carry out the mapping, the TD director contacted a manager in a local water treatment firm and asked him to help defining the value chain from wastewater to drinking water. The mapping operation continued by way of seeking in national industry registers on the internet. The targeted firms were then invited for a dialogue conference in February 2007 to explore opportunities for creating a new network. The exploratory meeting conference—which was organised by researchers—started out with a series of brief presentations followed by a group-based dialogue session. During the meeting it turned out that the participants experienced very similar challenges, and they were very keen to form a joint network organization. One important shared challenge was that most firms were too small to take on the large water treatment projects that were increasingly emerging in the market, consequently, they needed

Table 3 Network results and trust formation

Kind of trust	Network results	
	Initiation phase (2007–2008)	Development phase (2008–2010)
Characteristic-based trust	Firms participate in the exploratory meeting Firms enter the network and pay participant fee Managers participate in network meetings and contribute actively in temporary groups Managers and middle managers work actively in network teams Firm manager are active members of the provisional network board Joint recruitment campaigns Connectedness increased 30.5% Feeling of closeness increased 28.9% Firms offer each other to use their laboratory facilities Most meetings held at the firms' plants including firm presentations Establish homepage for NWC Recruitment of new NWC participants	Managers continue participating in network meetings and contribute actively in temporary groups Managers and middle managers continue to work actively in network teams Firm manager as active network board members, including the chairman Joint participation and contribution on student arrangements and rock festivals to promote working in the water technology industry Sharing R&D ideas and challenges Collaboration in joint R&D projects Most meetings held at the firms' plants including firm presentations Active homepage for NWC
Process-based trust	Firms contact each other to discuss joint customer projects	Joint customer projects Sharing R&D ideas and challenges Collaboration in several joint R&D projects Firm managers promote NWC at regional and national arrangements and publications, emphasizing increased trust as the most important result (RCN 2010; www.vannklyngen.no, 2009) Two, partly competitive, firms collaborate with researchers on a project to use new technology—BioMEMS—to identify and measure bacteria One firm invites all the other NWC participants to use their newly established Egypt office (www.vannklyngen.no, 2009) Three firms collaborate in a pre-project concluding to establish a new team: ProductInnovation in 2010. Furthermore to engage a team manager in 20% employment from one of the firms

to enter into alliances with other firms in order to stay competitive. As one manager put it (all quotations translated to English by the author):

> (…) We saw the need for building a strong national foundation for the water treatment industry (…) We see that there will be a development in the market (…) When the bigger projects emerge, we are absolutely sure that large international players will appear on the scene (…) and the idea was to try to build a strong Norwegian concentration that would be competitive when this happens. (Informant 1, Oct 2008)

At the same time, the participating managers were apprehensive about committing their organizations to any concrete collaboration activities. Few participants knew one another personally, and many met for the first time during the conference. Because of their embeddedness in the same region and in same industry, we assume there was just some institutions-based trust among the participants. However, the managers saw the opportunities and at the end of the exploratory meeting they agreed to establish a joint network—the NWC. TD and the researchers were given the responsibility of planning the network formation process and to invite the participants to new network meetings.

Although the exploratory meeting of the NWC was experienced as successful by the participants, there were still several important obstacles to developing a trust-based network collaboration. Many of the managers involved had little or no knowledge of the other firms, and were therefore hesitant about committing their organizations to more practical forms of collaboration. In order to tackle this challenge, the researchers organised a series of meetings using the Network IGP method, and several interventions were organized in temporary inter-firm groups. In addition to inviting managers and employees from the NWC, the researchers also invited some external agents to the meetings, such as technical R&D and business development organizations. Representatives from a successful regional network of electronics firms (Electronic Coast) were invited as well, so they could tell about their experiences from network development. This involvement of external agents apparently had a positive effect as it offered valuable information about network development and instilled in the participants a form of 'community feeling'. One manager described it as follows:

> Participants got engaged because there were people there from many different environments. (…) That was experienced as positive because there were not only water treatment firms. There were many people (and organizations) from the outside world who had an opportunity to take a look at what we are doing. And we had discussions (…) Then we became visible (…) and we felt a little proud (…) and we felt as if we were part of something bigger (…) That feeling of pride (comes) because someone actually cares about what we are doing. Someone on the outside is paying attention…, and that gives you a little kick. (Informant 2, Oct 2008)

As a corollary of the inter-firm dialogues that took place during 2007, the participants gradually developed *characteristic*-based trust, i.e. recognition of each other's knowledge and experiences, and an expectation that the other participants have something valuable to contribute. There are several signs indicating that the participants became more trustful of one another in this initiation phase. In the autumn of 2007, a manager from one of the participant firms was engaged to carry out a survey of the network, and he wrote a report about the participants' activities, challenges and aspirations. According to this report, the participant organizations seemed to have developed closer and more trustful relationships during the course of 2007 (Andersen et al. 2008). For instance, some of the organizations

who had no mutual relations prior to the establishment of the network had signed bilateral customer–supplier relationships, while others were in the process of planning a joint R&D project. Moreover, as our questionnaire shows, interaction and feeling of closeness among the firms rose by 30% from the autumn of 2006 to the spring of 2008. Several new firms also entered the network. This expansion of the network is a sign that the participants trust and speak positively about their network partners, thus attracting new participants. According to several of the interviewed managers, this [characteristic-based] trust was a precondition for entering into riskier and more practice-based forms of collaboration.

In spite of these early collaboration results, a certain impatience arose among the participants about the general progress of the collaboration in late 2007. At the network meeting in November 2007, representatives from another regional network—the Electronic Coast (EC)—were invited to present their advice, successes and failures. After these presentations, the participants and EC representatives were divided into inter-organizational temporary groups—using Network IGP—to devise elements for a network strategy and an action plan. The creation of task-oriented teams was the most frequently suggested activity at the action plan—highlighting a wish to move the collaboration in a more practical and action-oriented direction. Several kinds of tasks appropriate for network teams in the NWC were outlined (Table 4a).

Network Development Phase and Process-based Trust

Following the suggestions to point the network in a more action-oriented direction, the researchers and TD organised a 3-h meeting for the network participants in January 2008. The main content of this meeting was the initiation of teams. Since in many ways this became a turning point in the network development process, we will devote some space here to describe how the meeting proceeded.

Table 4 AR actions and direct results

AR action	Result
(a) Initiation phase	
Facilitating the exploratory meeting using dialogue conference methods	Starting to build relationships
	The firms discovered joint challenges and possibilities in network cooperation
Facilitating network meetings using Network IGP and temporary groups	Building relationships and swift trust
Forming a network board and articles of association	Formalizing the network and securing democracy
Inviting external participants to network meetings	Community feeling
(b) Development phase	
Initiating teams	Cooperating in interorganizational teams creating value for themselves, the firm and the network
Facilitating team development	Mutual reinforcement of trust between the network level and the team level
Organizing Network IGP in temporary groups at team level and network level	Increased process-based trust
Promoting the network externally	Increased community feeling
Organizing R&D workshops	Sharing R&D ideas and challenges
	Collaboration in joint R&D projects

Team Initiation   At the start of the meeting, the manager who had surveyed the network in the course of 2007 presented his report, which also included some tasks for network teams. On the basis of the firms' suggestions at the November meeting and those contained in the report, the researchers outlined eight possible teams focusing on different collaboration tasks such as marketing, commercialization, internationalization, R&D and HR management. The team outline was displayed on a large screen. The researchers then asked the participants—29 people altogether—to reflect individually about which team they wanted to join, and then choose—through a 'hands election'—which teams to establish and which to discard. The participants had one vote each, and only teams with more than three votes would be established. The result of the final election was four teams with a sufficient number of votes. The participants voting for other teams had to choose among the four. The teams were then asked to go to separate rooms—with experienced researchers as team facilitators—and carry out a team-work task by using the Network IGP method. The task was to discuss which activities the team should focus on, how the team should be organized, whether the team would need assistance from a researcher and when and where the next team meeting would be carried out. After 1 h the teams met in a plenary session and presented their results. It turned out that most of the participants were quite thrilled about joining a team and committing themselves to working together with colleagues from other firms. The participants were also positive towards the suggestion of including a researcher in the team, who could take the role as a secretary and organizer of IGP processes. One manager described the meeting as follows:

> Many suggestions for new teams came up during the meeting… and thereafter these were squeezed down to two teams that are very active today (…) The suggestions for the new teams came from the participants themselves (…) The suggestions came because this is something that we care about. When people come up with the suggestions themselves (…) and we are talking about work that has to be done in any case (…) and you get the opportunity to work in a team (…) then it is great. (Informant 2, Oct 2008)

As a result, three teams were formally established. Shortly after the meeting, two of them merged into one—because of somewhat overlapping targets. The objective of the first team—*Team ManTek*—was to improve the network's personnel recruitment and competence development processes, and to share personnel and equipment. The objective of the second team—*Team Internationalization*—was to improve the network's international marketing processes, and to facilitate joint R&D projects among the network participants.

Team Development   In team ManTek, which focused on relatively low-risk activities such as shared employee recruitment campaigns and marketing stunts, collaboration has progressed smoothly from the start in 2008 and in the autumn of 2010 it is still very active. It has resulted in a number of valuable outcomes for the firms—such as improved recruitment, new R&D partners, closer collaboration with the regional university, new water subject for the regional engineer education and joint conference participation. According to the team members, this progress would have been difficult if the participant firms had not developed a threshold level of [characteristic-based] trust in the early stages of the project. Team Internationalization—which focused on more high-risk activities—was successful in planning joint activities and had good discussions in which they shared valuable technical information. Yet, the team was unable to convert the plans into action and therefore dissolved in the middle of 2009. These difficulties emerged at the point when managers

from the different firms had to make a decision about disclosing their internal R&D activities and allocating resources to the activities. Furthermore, in its short history the team suffered from discontinuity of AR researchers with three different persons, while team ManTek has been continuously facilitated by the same AR researcher.

In contrast to the plenary network meetings, which were useful arenas for broad-based dialogues and the development of characteristic-based trust, the teams seem to contribute to the development of process-based trust and to concrete learning effects. The firms host the team meetings, and use the opportunity to present their facilities and employees to the team members. According to the team-members we interviewed, the most important change induced by the formation of the teams is that the participants are personally involved in working for the network, and are held personally accountable for doing a good job. As one team member described it:

> What I experienced as (…) the point when I felt that it really took off was when we mobilised the participants… It happened at firm X last winter (…) where the different groups or teams were established. At that point we became personally engaged in a way that was totally different from the previous phase when the water cluster was established and there were some initiative-takers there and we became members. But suddenly you got some homework, things that we as participants were responsible for, things that were not under the control of the water cluster. And I think the main clue here was that one mobilised the participants (…) That's when I felt that it took off. And I think it took off because each and every one of us became personally engaged. (Informant 2, Oct 2008)

One team member described the relationship-building and the learning effects in the following way:

> Development tasks are typically de-prioritized in comparison to other (operational) tasks. One of the advantages with the teams is that one feels a kind of pressure, that one has a responsibility for getting things done, not only for one's own firm but for the other firms too (…). And then you get to know key personnel in the other firms (…) and that is important because the (long term) ambition of the Water Cluster is that the participant firms carry out development projects together (…) and the only way to (successfully) carry out such projects is to know the firm that you are collaborating with. And this is a nice way to get to know key personnel in the other firms (…) We have team meetings in different firms, we get to see their facilities, they give a presentation of their firms, and we get to meet the other employees (…) so there are some spin-offs in this sense (…) because the interaction is not restricted to the team-members (…). (Informant 2, Oct 2008)

After the teams were established, the development of the network continued. In a questionnaire in April 2008, 18 of 22 firms a displayed a positive attitude to share their personnel with other NWC firms, although 59% of the firms were somewhat understaffed. Moreover, from the autumn of 2006 to the spring of 2008 the results showed an increase of 30.5% in the frequency of contact, and a 28.9% increase in the feeling of closeness among the firms. During 2009–2010 the researchers contributed actively to promote the network both externally in the region and nation-wide.

R&D Workshops   In 2009 and 2010, the researchers organized practical all-day workshop meetings for the firms and regional researchers to develop and launch R&D projects. At the

Table 5 Number of participants, new-comers and old-timers in the R&D workshops

Year	Firms					Firm representatives				Researchers
	No	OT	NC	%NC	%NC join R&D p	No	OT	NC	%NC	No
2009	6	4	2	33	100	9	5	4	44	5
2010	8	6	2	25	100	11	3	8	72	10

2009 workshop the six participating firms shared their ideas and challenges, and discussed them with each other and the five participating researchers. On this occasion, six R&D ideas—some of them originating from the R&D team—were developed to VRI applications for R&D projects. Four of the applications were approved and effectuated, two of which included collaboration among three firms and a research institution. The remaining two involved one firm and a research institution. This latter development suggests that at this point—in May 2009—the network participants had developed a sufficient level of process-based trust to start committing to high risk activities. As a consequence, they gave more benefit of the doubt in judging the other participants' actions and accepted more risk because the network had acquired intrinsic value.

Table 5 gives an overview of the number (No) of participating firms and firm representatives, the number of old-timers (OT) and newcomers (NC), and the percentage of newcomers entering joint R&D projects. Old-timers are defined as experienced and newcomers as relatively new NWC participants. As Table 5 shows, from 2009 to 2010 the number of participants increased, the number of new-coming firms somewhat decreased, and the number of new-coming firm representatives increased sharply. In 2010, 72% of the firm representatives were newcomers and had never met before, however they still shared their own ideas for R&D and firm challenges. Moreover, they shared their knowledge actively in plenary and in temporary groups, together with the researchers, to help the other firms dealing with their challenges. We interpret this as a sign of a very interesting and important phenomenon: Because new-coming firm representatives seem to jump very quickly through the phase of characteristic-based trust to a relatively high level of process-based trust, the level of trust in NWC seems to have reached a point of critical mass 3 years after the network was initiated.

Our findings indicate that one important reason for reaching this point of critical mass seems to be the interaction between trust-building at network level and at team level that started in the spring of 2008, in the transition from the initial phase to the development phase.

Interaction Between Trust Building at Network Level and Team Level

In the initial phase, the interaction took place mainly on network level. By this, we mean that the participants developed relationships in plenary dialogue meetings, gradually committing their organizations (as entities) to network participation and making. The interaction in the teams was more informal and frequent, and the participants developed relationships and made commitments more on a personal level. One participant distinguished between these levels in the following way:

> I don't think we would have gained the same knowledge (of one another) if we had only participated in such broad network meetings (…) You don't sit down face-to-face (like in a team) you know and then someone tells a joke (…) And then people

get to know each other (…) and after a while you are working together towards a common goal (…) Because then we are talking about work meetings (…) and it is through work that people really get to know one another. In the broader and higher-level meetings you don't get the same kind of interaction. (Informant 3, Oct 2008)

While the dialogue processes—using Network IGP—and activities in the teams proved valuable to the participants and carried with them process-based trust, there also appeared to be a complementary relationship between reflective practices at team-level and reflective practices at network level. This mutually reinforcing relationship can be discerned in several of the network's collaborative activities in the development phase. Some team members argued that the dialogues and the joint reflection in the plenary meetings were necessary for them to agree to join a team and commit themself to spend time and resources collaborating on practical project. In the words of one team member,

I would not have entered a team and committed myself to doing teamwork if there had not been a series of broad meetings in advance. That is part of the process that is necessary to get a broad group of firms and such a large forum to move along and go further (…) There were firms there that nobody had heard about (…) there were many firms that had not heard of one another. So I think it was both sensible and necessary in order to move on and progress further (…) if there had been a smaller group of firms that knew one another from before, this could have been done differently. (Informant 1, Oct 2008)

In addition, our interviewees described the board meetings as important to the teamwork in the sense that the teams needed somewhere to report their progress and someone to monitor their work. Reciprocally, the dialogues and the shared activities in the teams were seen as creating stronger enthusiasm around the network. The team-based collaboration spawned increased interaction between the firms, not only informal interaction connected to teamwork, but also other kinds of formal and informal interaction. One manager described this relationship in the following way: "I think that the job that we are doing in the teams is really strengthening the community-feeling in the network." The interaction between team level and network level is illustrated in Fig. 1.

In addition to the activities initiated and facilitated by the researchers through the primary AR method—outlined in Table 4a and b, several activities were initiated or organized as results of the second—more indirect—AR method. These latter activities are outlined, together with the others, in Table 3. From being strangers in 2007, the firm representatives in this network collaborated in 2010 in joint R&D projects, customer
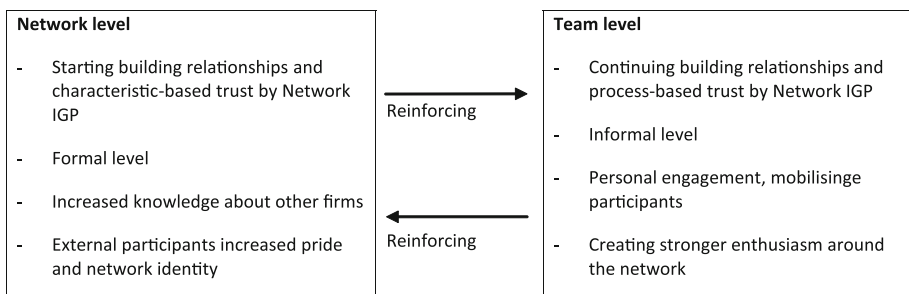

Fig. 1 Interaction between team level and network level

projects, personnel recruitment activities, internationalization and development of methods for product innovation.

Concluding Discussion

It is now time to return to the research question: How can action researchers facilitate trust-building processes among the participants of networks? In answering this question, the findings from the NWC case are utilized. Furthermore, the answer is organized in three parts: (1) the initial phase of network development and trust formation, (2) the development phase of network development and trust formation, and (3) a framework for network development and trust formation.

In the initial phase, the researchers contributed to initiating the network by facilitating dialogue conference methods at the exploratory firm meeting to inspire, discuss common challenges and fuel interest in starting a network. After the network was initiated, the researchers facilitated several network meetings. During these meetings, managers from the participant firms interacted quite intensively and became acquainted with each others' competencies, challenges and goals. Moreover, the researchers took several active steps to facilitate 'community feeling' among the participants, such as inviting external customers and participants from other networks to the network meetings. The researchers also facilitated the dialogues directly using the Network IGP method. They raised themes for discussion specifically aimed at helping different participants formulate common goals and development strategies; they organised the dialogue in such a way that each participant was able to express his or her opinion, and ensured that relevant topics were discussed and important decisions were made within the span of the meetings. Also, the researchers assisted in setting up the formal board and articles of association. As a consequence of the dialogues that took place in the meetings, the participants gradually developed mutual characteristic-based trust, meaning recognition of each other's skills and experiences, and a belief that the other participants had something positive to contribute. There are several signs that in this phase the participants became more trustful in one another. While some participants were apprehensive in the first meetings, they soon engaged in more frequent interaction both within and outside the formal network meetings. As our survey shows, interaction between the firms rose sharply in the first year of the project. In this phase, several new firms also entered the collaboration. The latter development is a sign that the participants speak positively about the network and in this way attract new participants. According to several of the interviewed managers, this characteristic-based trust was a necessary condition for the firms to enter into riskier and more practice-based forms of collaboration.

In the development phase, the researchers assisted the network participants in moving from a dialogue-oriented mode to an action-oriented mode. More specifically, in early 2008 the researchers contributed to initiating task-oriented teams. Furthermore, they facilitated the development of two teams—one focusing on human resource management and recruitment, and the other one focusing on internationalization and R&D. Team meetings and network meetings were both facilitated by Network IGP. The researchers have promoted the network externally, which resulted in increased internal community feeling and development of the NWC as a budding brand. In 2009 and 2010, the researchers facilitated practical R&D workshops where the firms shared some of their R&D ideas and challenges and shared their competence to help the others. Subsequently, several firms entered joint R&D projects. This development suggests that the network

participants had—at this point—developed a sufficient level of characteristics and process-based trust to start committing to high risk activities. As a consequence, they gave more benefit of the doubt in judging the other participants' actions and accepted more risk because the network had acquired intrinsic value. Moreover, in 2010, new-coming firm representatives seem to jump very quickly through characteristic-based trust towards a relatively high level of process-based trust. The level of trust in NWC seems therefore to have reached a point of critical mass after 3 years. The high level of trust is emphasized in the 2010 New Year's greetings from the chairman of the board to the NWC firms: 'The networks and the trust created among the firms represent perhaps the most valuable outcome for the single firm (…) Receiving an open invitation from one of the NWC firms to use their foreign office is just one of many examples of the trust created among the firms' (www.Vannklyngen.no, 2009). Furthermore, in August 2010 another firm manager declared:

> Trust is the keyword. The road to achieving such a high level of trust among us, allowing us to share business ideas and future plans, is long. In NWC we trust that what we tell each other will not be abused. We can therefore utilize each other's competence without negative implications for the firms. This level of trust is the most important result of NWC (Informant 3, Aug 2010).

Our findings indicate that one important reason for reaching this point of critical mass of trust seems to be the reinforcing relationship between the trust formation at network level and the team level. It is important to note here that the progress and achievements of the teams are communicated to the network participants and external interested parties on a continual basis. According to the participants, these positive news reports served to further boost the community feeling, the sense of a 'joint direction' and characteristic-based trust in the network as a whole. This suggests that there is a mutually reinforcing relationship between the development of characteristic-based trust on the network level and the creation of process-based trust and collaboration outcomes on the team level.

Building on Chisholm (2008) and the findings in this paper, we have developed in Table 6 a new framework for network development and trust formation.

Considered together, the above findings suggest that action researchers might play an important role in trust building and network development. Moreover, the development of trust-based relationships appears to having resulted in several valuable outcomes. During the course of the 3 years the NWC has been in existence, the collaboration has brought about joint customer (or delivery) projects, several shared personnel recruitment campaigns, two joint R&D projects, a joint product prototype, joint exhibition-stand participation, significant increased number of inter-organizational relationships, increased frequency of contact among the firms and increased know-who competence. Three years ago these firms and people were mostly strangers to one another. Although networks normally develop quite slowly, our findings show a relatively fast development. By participating actively in mobilizing the firms for dialogues, and by organizing and facilitating Network IGP and temporary groups in most network meetings, the researchers played an active role in these changes. This resonates with previous reports from action-oriented research, which emphasizes the potential value of researchers' active intervention in various organization development processes (Pålshaugen 1998; Qvale 2008). Future research should explore further the nature of the relationship between action research interventions and trust building in networks, and how the interventions can be planned and carried out so as to produce better network collaboration outcomes.

While there is no doubt that a successful network development process has taken place in the NWC, the question of the extent to which the researchers contributed to this success still remains to be answered. We do not deny the possibility that a trust-based network could have developed in any case through a process of spontaneous self-organization. Many of the managers were quite active during the network development process, and it is possible that they would have taken similar steps without the presence of the researchers. While these possibilities are real, there are also several strong arguments that the researchers made a valuable contribution to the trust-creation process and the collaboration outcomes, and that the network would not have progressed the way it did without their interventions. As one of the participants told us, "My firm would not have continued in the network if you had not organized it so professionally".

A single case study is a limited base for outlining a general theory, therefore further studies are needed. The aim of the present study, nonetheless, is that of increasing our understanding of the phenomenon and developing the existing theory. We also acknowledge that 3 years is a short time-span and that it is premature to conclude on the further success of the NWC. The findings and exploratory analysis need to be followed up, and the framework needs further testing. Additional factors need further inspection. There is a definite need for further studies on how action researchers can facilitate trust-building processes in networks.

There may be some special features in the NWC influencing the results, for instance cultural characteristics of this environmental industry and the level of institutions-based trust in the Vestfold region and Norway. Moreover, the level of trust between the researchers and the NWC firms seems to have grown high and may influence the results positively. This study focuses on network trust at the interpersonal level. Further research is necessary to examine whether this interpersonal trust also develops at the inter-organizational level. In spite of the limitations, we think the framework in Table 6 may be useful for AR researchers to build trust in networks in other branches and other societies. We argue, however, that a minimum level of institutions-based trust as a point of department represents an important precondition.

Table 6 A framework for network development and trust formation

Main challenge	(Re) initiation phase Lack of inter-firm contact	Development phase Lack of joint action
Tasks	Recognising a shared problem Identifying and convening key stakeholders Helping stakeholders envision a shared future and plan network activities	Moving from dialogues to practice Refocusing dialogues Expanding network participation
Interventions and methods	Facilitating exploratory meeting using dialogue conference methods Facilitating network meetings using Network IGP and temporary groups Inviting external participants to network meetings Forming a network board and articles of association	Evaluate and reflect on past experiences Initiate action-oriented teams Facilitating team development using Network IGP Promote the network externally Facilitating Network IGP in temporary groups at team and network level Organizing R&D workshops
Effects on trust-formation	Characteristic-based trust	Characteristic-based trust Process-based trust

This study contributes to AR research by analysing how AR researchers may influence trust development. It contributes to network theory and trust theory by a longitudinal process-based study of network and trust development. Moreover, it contributes to AR research, network theory and trust theory by developing the framework of network development and trust formation.

Appendix 1: Questionnaire: the NWC

April 2008

Building on Hansen's (1999: 111) survey questions.

(a) Frequency and Closeness of Contact with Other Firms Today

Frequency: How frequently do people in your firm interact with this NWC firm? (On average over the last year.) (6 = once a day, 5 = twice a week, 4 = once a week, 3 = twice a month, 2 = once a month, 1 = once every 2nd month, 0 = once every 3 months.)

   Closeness: How close is the working relationship between your firms and this NWC firm? (6 = very close, practically like being in the same firm, 3 = Somewhat close, like discussing and solving issues together, 0 = Distant, like an arm's length delivery of the input.)

   Please mark correct value for frequency and closeness **in the spring of 2008** with a circle.

Firm	Frequency								Closeness		
	6	5	4	3	2	1	0		6	3	0
Firm 1	6	5	4	3	2	1	0		6	3	0
Firm 2	6	5	4	3	2	1	0		6	3	0
Firm 3	6	5	4	3	2	1	0		6	3	0
....	6	5	4	3	2	1	0		6	3	0
....	6	5	4	3	2	1	0		6	3	0
Firm 22	6	5	4	3	2	1	0		6	3	0

(b) Frequency and Closeness of Contact with Other Firms in the Spring of 2006

Frequency: How frequently did people in your firm interact with this NWC firm? (On average in 2006) (6 = once a day, 5 = twice a week, 4 = once a week, 3 = twice a month, 2 = once a month, 1 = once every 2nd month, 0 = once every 3 months.)

   Closeness: How close was the working relationship between your firms and this NWC firm? (6 = very close, practically like being in the same firm, 3 = Somewhat close, like discussing and solving issues together, 0 = Distant, like an arm's length delivery of the input.)

Please mark correct value for frequency and closeness **in the spring of 2006** with a circle.

Bedrift/virksomhet	Frequency								Closeness		
	6	**5**	**4**	**3**	**2**	**1**	**0**		**6**	**3**	**0**
Firm 1	6	5	4	3	2	1	0		6	3	0
Firm 2	6	5	4	3	2	1	0		6	3	0
Firm 3	6	5	4	3	2	1	0		6	3	0
....	6	5	4	3	2	1	0		6	3	0
....	6	5	4	3	2	1	0		6	3	0
Firm 22	6	5	4	3	2	1	0		6	3	0

Appendix 2

Interview Guide—October 2008 and March 2010

1. Can you please describe how you experienced the establishment of the NWC

- Special/actual events:

2. How do you experience the further development of the NWC until this day?

- Special/actual events:
- Category questions:

    - On which way is the NWC important for you and your firm?
    - Can you describe specific results or effects on results?
    - Have you established some valuable relationships?
    - What kind of value do you see in collaborating with researchers (us) in the cluster development?

        - Is there something we do that is more important for the development than other things?

3. How do you experience your relationship to colleagues from the other firms?

- Category questions:

    - Generally?
    - At the network meetings?
    - At the team meetings?
    - Between the NWC meetings?
    - Do the others have something you can learn from or have they given you some useful advices?

- Contrast questions:

    - Do you find the ambience among you open or closed?
    - Do you feel safe and trust them, or do you feel a bit unsafe? (def willingness to rely on an exchange partner in whom one has confidence)
    - Do you share experiences and knowledge or do you experience secrecy

- Has the reputation of your colleagues from other NWC firms changed? To the worse or better? (deterence based trust)
- Has the reputation of the other firms changed? To the worse or better? (deterence based trust)

- Special/actual happenings among the team participants (during meetings and elsewhere):

4. Have the results of the collaboration contributed to:

– New ways of organizing?
– New production methods?
– New services?
– New markets?
– New raw materials?
– New suppliers?
– New products?
– New ideas?
– Further development of ideas?

- Special happenings:
- Category questions:

  - What do you collaborate on?
  - What are the specific results of the collaboration?
  - What is changed?

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