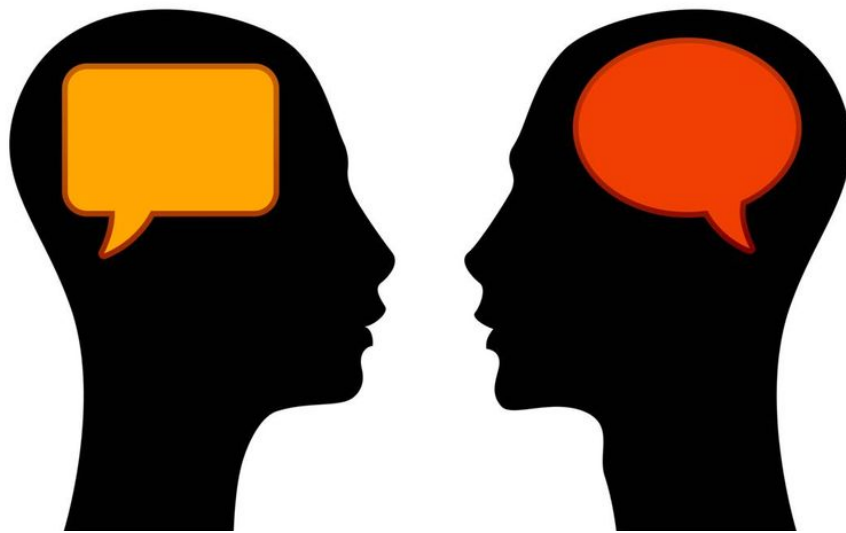


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# **Interaction in Integrated Operations**

**- from a relational and learning perspective**



**Master Thesis in Counselling**

**Department of Adult Learning and Counselling  
Faculty of Social Sciences and Technology Management  
NTNU**



*“With Integrated Operations everything is dependent on interaction.  
The team is the most important success factor.”*

*-Lars*



## **Abstract**

In this thesis I inquire how an interdependent relationship is perceived to affect virtual team member's interaction and the process of developing knowledge in the team. In order to explore these issues a qualitative case study was conducted and data gathered through the subjective experiences of team members constituting a virtual team in Statoil through the following research question:

*How is the interdependent relationship between virtual team members perceived to affect interaction and the process of developing knowledge in the team?*

In this thesis an interdependent relationship is understood as team members relating to each other as individuals that are mutually dependent on and responsible for the team's actions. This interdependent relationship is the fundament for interaction in which team members build on and refine each other's ideas and knowledge in order to reach their common goals and objectives. Principles from dialogue techniques, by the concepts of perspective making and perspective taking, are elaborated as a means to support interdependent interaction and knowledge creation in the virtual team.

The empirical findings in this particular case study suggest that the informants perceive their interdependent and technologically mediated relationship to represent both challenges and possibilities in relation to their interaction and the process of developing knowledge within the team. Further, acknowledging this interdependent relationship and having the capacity to take the other's perspective, seems decisive in order to develop shared understanding, complementary knowledge and high-quality decisions in the virtual team. The main findings in this study are:

- ✓ The interdependent relationship between the virtual team members is perceived characterized by involvement, vulnerability, power and shared responsibility
- ✓ Trust is seen as a vital precondition for interaction between the interdependent virtual team members
- ✓ Developing a shared situational understanding through listening to other's perspectives seems crucial in order to utilize the potential for developing knowledge in the virtual team



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Trondheim, July 2011

Anne-Marte Furmyr Johansen





## **Preface**

When I decided the topic for my master's thesis I was driven by curiosity and a desire to extend my own knowledge. I was interested in studying how interpersonal relations related to interaction and how this in turn could affect knowledge sharing and development. Through an empirical study I have explored this subject by looking at the experiences of team members comprising a virtual team in Statoil.

Prior research within this context has paid little attention to *pedagogical* and *relational* aspects (Torgersen & Steiro, 2009) which made me reflect upon the validity of this study. Enhanced knowledge on the relationship between relational aspects and technologically mediated interaction, and how this is found to support or inhibit development and learning, is of increasingly importance in a number of contexts in our society today, including educational settings (ibid.). I hope the empirical findings from this study can make a small, but valid contribution in an ongoing process of developing more knowledge in this regard. Secondly, there have been relatively few empirical studies focusing on the *subjective experiences* within IO settings (Skarholt, Næsje, Hepsø, & Bye, 2008). These subjective experiences can be studied through qualitative methodology, and the strength of this study is the insight of how interaction in IO settings is experienced *by the people involved*, and how this shapes the work practice. This insight might lead to reflections that make development of new work practices possible. Finally, I find the subject of this study to comply with the intentions in my master program, as the objective of pedagogical counselling is to facilitate processes of development and learning both on an individual and organizational level:“(...) the purpose of the study [Master of science in counselling] is to (...) help persons develop insight into their own situation and how it can be improved [by] understanding communication patterns, being able to arrange efficient work environments and good work practice, developing cooperative teams and staff resources” (NTNU, 2010).

During my time as a teacher and as a consultant in Human Relations, as well as a master student in pedagogical counselling, I have come to believe that relational aspects are of vital importance to interaction and the process of development and learning. The empirical findings from this case study have supported my belief in the importance of highlighting relational and pedagogical aspects in a broad field of settings, as the quality of interpersonal relations may significantly impact the practices and work experiences to those involved.



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## **1. Introduction**

Virtual interaction is today an important part of many people's lives due to the expanding amount of time spent on social media like Twitter, Facebook and Skype. Technologically mediated interaction, like videoconference, is also increasingly expanding in our professional lives, and within a variety of areas, ranging from psychotherapy, medicine, education and business. In a world of rapid change, with an expanded use of information technology and social media, knowledge on how to support technologically mediated interpersonal interaction, and how to develop it further in relations to the experiences we have made so far, becomes especially important in order to support the sharing of information and development of knowledge (Fukuyama, 1995).

In today's globalized, knowledge oriented and multicultural society, a continuous exploration of new knowledge and exploitation of existing knowledge is considered a critical factor in creating competitive advantage for both individuals and organizations (Nonaka & Takeuchi, 1995; Torgersen & Steiro, 2009). This has led to new ways of organizing and working together in organizations worldwide. Multidisciplinary virtual teams are employed as a means to accomplish interaction across practices and knowledge boundaries thus facilitating the development of complementary knowledge. However, utilizing the potential for developing complementary knowledge in such multidisciplinary virtual teams require a focus on relational aspects as practices are shaped in communities held together by interpersonal relations (Yates & Van Maanen, 2001).

### **The objective of this thesis**

In this thesis I explore how the perceived characteristics of the interdependent relationship between virtual team members are experienced to affect interaction and the process of developing knowledge in the team. This includes a focus upon the challenges and possibilities within multidisciplinary and technologically mediated interaction and how this is found to support or inhibit interdependent interaction and the process of developing knowledge. This study is thus conducted on the basis of the following research question:

*How is the interdependent relationship between virtual team members perceived to affect interaction and the process of developing knowledge in the team?*

## **Outline**

In this thesis the first chapter gives an introduction to the empirical field and Integrated Operations as a concept of organizational change in Statoil. This chapter also introduces the informants comprising the virtual team which constitutes the research sample in this case study. The next chapter offers theoretical perspectives as a basis for the concepts used when presenting and discussing the empirical findings in this case study. This includes theoretical perspectives on how to comprehend the concept of interdependency and characteristics of interdependent relationships as well as a definition of interaction. A theory related to technologically mediated interaction is then presented. Furthermore I look at how the process of developing knowledge in the virtual team can be understood through proposed theory on situated learning and how knowledge creation can be supported by the concepts perspective making and perspective taking. In the Methodology chapter I will account for the method used in the case study and how the empirical data was analyzed. This chapter also includes ethical and qualitative considerations I have made when planning and conducting this study. Reflections regarding the researcher's role in qualitative research, and how I have experienced the process of conducting this case study, are presented at the end of this chapter. The following chapter presents the empirical findings through selected quotations from the interviews with the informants, representing the six categories developed when analyzing the data. Discussions of how the empirical findings can be understood in relation to the proposed theoretical perspectives presented earlier in this thesis are followed by conclusions and implications for further research in the last chapters.

## **2. The empirical field and Integrated Operations**

The empirical field presented in this thesis is from the petroleum sector and the use of information and communication technology to connect interacting, distributed actors across geographical and organizational borders. The introduction of innovative technology and new work processes, like videoconference and applications for real time data and documents sharing, provide organizations with the flexibility to draw on knowledge, skills and perspective that would not be available to collocated teams. Virtual teams are thus increasingly applied in an expanding number of companies all over the world, which is also the case in operations of petroleum installations on the Norwegian continental shelf (Skjerve & Rindahl, 2010). In this thesis I will use the term Integrated Operations (IO) to define this concept, as this is the term used by the informants and in Statoil.

### **Integrated Operations**

There are different aspects related to Integrated Operations and also different definitions of the concept. The following definition will be used in this thesis:

IO is the enabling of new ways of working in operations through implementation of innovative technologies (Rindahl, Torgersen, Kaarstad, Drøivoldsmo, & Broberg, 2009).

Since the turn of the century Statoil has developed and implemented Integrated Operations practices and technologies both in Norway and in a global setting (Filstad & Hepsø, 2009) in order to increase production, reduce downtime, irregularities and number of HSE-related incidents (Ringstad & Andersen, 2007). IO has already added value to the company through reduced operating costs, enhanced production, competitiveness and more reliable and safe operations (OLF, 2003). Both employer organizations and the Norwegian government have described IO as having interesting consequences for knowledge development and learning as IO has been presented as “the great opportunity” with radical improved decision-making processes and better coordinated interaction through a number of factors (Filstad & Hepsø, 2009; Grøtan & Albrechtsen, 2008). First of all IO has increased the availability of real time data and supported team members with more accurate and detailed understanding of situations. This has led to more precise predictions and a proactive focus. Work performance independent of physical location has also made expert knowledge more available and in less time. As more work can be performed in a parallel fashion, interaction has become more relational and problems are solved in a broader context, more alternatives can be evaluated and decisions are more flexible (Ringstad & Andersen, 2007).

IO also represents challenges that might lead to negative effects in different areas. In relation to the objective of this thesis an important challenge is related to the extended use of new technology and how this might affect interaction among team members (Grøtan & Albrechtsen, 2008). As interaction in IO has become more relational and complex (Skjerve & Rindahl, 2010), the focus has shifted from primarily focusing on technological development, towards human factors and how complementary teams unite different competences and knowledge across boundaries of practices, attaining a more complex situational understanding and leading to better grounds for decision-making (Grøtan & Albrechtsen, 2008 ;personal communication Hepsø, 03.02.2011). Thus a balanced development of people, technology and organization is highlighted as the most critical factor in order to succeed in IO today.

### **The case**

Empirical findings in this thesis are founded on subjective experiences from team members constituting a medium-sized ( $10 < U < 20$ ) multidisciplinary virtual team in Statoil, a major Norwegian oil and gas company. In this thesis a virtual team is understood as:

An interdependent group of individuals who predominantly use technology to communicate, collaborate, share information and coordinate their efforts in order to accomplish a common work-related objective (Jones, 2008).

The team comprises both female and male team members, located on three different geographical locations representing both offshore and onshore personnel. The team members have been working together as a virtual team for a prolonged period of time and their interaction is mainly facilitated by electronic communication by the use of video conference, electronic mail and telephone. Approximately twice a year the team members get together in order to build relations. Together these team members constitute a leader team, analyzing the current situation and making strategic decisions related to management of a license on the Norwegian continental shelf. This implies a negotiation process with perceived risk and high task interdependence<sup>1</sup>. As this decision-making process entails no ‘correct’ answers, it prompts the need for making discussions and validating alternative solutions in the team. In order to accomplish this management task, the team members in the virtual team experience a need for sharing their knowledge of the situation at hand, and to develop a shared understanding. The work performed in the team is thus experienced as complex as it involves parallel, multidisciplinary and interdependent processes.

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<sup>1</sup> A narrative illustrating the perceived interdependence in the team is offered in Appendix 5



### **3. Theoretical perspectives**

The theoretical perspectives presented in this chapter are chosen due to its perceived relevance in relation to the objective of this thesis and on the basis of the empirical findings presented in the next chapter. The appropriation of theory has thus been an integral process throughout the process of conducting this study.

As can be seen in the research question, how the interdependent relationship between the multidisciplinary virtual team members is perceived to affect interaction, and subsequently the process of developing knowledge, will be a focus of interest in this thesis. This chapter thus introductorily elaborates the concept of interdependency through the works of Martin Buber (1995, 2002; 2003), Knud E. C. Løgstrup (2000; 1987) and John MacMurray (1999). The thoughts of Buber and Løgstrup (still) have a considerable impact within pedagogy and psychology and I find them especially relevant to the focus of interest in this thesis as interpersonal relations based on interdependency and trust makes the fundament in their work. MacMurray's (1999) thoughts on interdependent interaction, as described in his contact-withdrawal-return cycle, is further perceived as relevant in relation to development and relational learning. I further offer a definition of interaction by Torgersen & Steiro (2009) and a particular focus on how technology might affect interaction and the development of trust is offered through Media Richness Theory by Daft, Lengel & Trevinor (1987). The process of developing knowledge will be addressed by perspectives from learning theory by Argyris & Schön (1996) as well as theory on situated learning by Lave & Wenger (2003), Boland & Tenkasi (1995) and Brown & Duguid (1998; 2001). At the end of this chapter a theory on perspective making and perspective taking by Boland & Tenkasi (1995) is presented as a means to support relational learning and the development of knowledge.

#### **Interdependency**

Interdependency is known as a fundamental principle from system's theory (Senge, 1992) acknowledging that humans are related to, and mutually dependent on, each other. Both Løgstrup (2000; 1987), Buber (1995, 2002; 2003) and MacMurray (1999) argue that all human beings live in an interdependent relationship to one another, either directly or indirectly, and interdependency is thus a central concept in their work. The paradigm of interdependency recognizes the mutual need we have for each other by valuing the individual contributions we each make in our relations with others (Allgood, 2003). Interdependency can thus be understood as a relational concept comprised of both dependency and independency. The latter is perhaps the most prominent and primary paradigm in our western culture today

where we prefer to regard ourselves as competent and self-reliant (Kvalsund, 2003; Eide, Grelland, Kristiansen, Sævareid, & Aasland, 2011). From a social constructivist perspective and in the postmodern notion, knowledge is regarded as dynamic and relational and so the thought of being independent, and having power independently through knowledge, is outmoded (Kvalsund, 2003, p. 33).

### **Interaction**

The concept of interaction, as it is understood in this thesis, is best described by the Norwegian word *samhandling* and is viewed from a social constructivist perspective where meaning, knowledge and understanding is seen as developed in social interaction (Lock & Strong, 2010; Postholm, 2010). From this point of view interaction is a prerequisite for an active construction of knowledge among team members in the virtual team and interdependency is a fundamental element in the concept. In this thesis the concept of interaction is used in coherence with Torgersen and Steiro's (2009) definition:

“Interaction is an open and equal communication and development process between actors with complementary competence who exchange competence and are working, (...) mediated through technology (...) towards a common goal, and where the relationship between the actors at any time is founded on trust, involvement, rationality and knowledge of the trade” (p. 130).

In this definition interaction is understood as a holistic and complementary activity, qualitatively different from collaboration through knowledge exchange, supplementing each other and developing and learning through a relational process.

### **Characteristics of interdependent relationships**

I will now present what I find to be some common elements and important characteristics of interdependent relationships through the works of Løgstrup (2000; 1987), Buber (1995, 2002; 2003) and MacMurray (1999).

First of all, being in an interdependent relationship implies being with the other as 'persons in relation', relating to one another as persons, not as objects (Macmurray, 1999). This implies understanding and valuing the other and their thoughts, feelings, beliefs and knowledge. It is a responsibility to treat the other as a human being, not as an object for our use. This does however not mean that we cannot use each other's competence or knowledge for reaching some shared purpose in a mutual endeavour (Allgood & Kvalsund, 2003). Like MacMurray (1999), Buber (2003) states that interdependent relationships imply a personal presence. This presence is to understand both as an *attentive attitude* in relation to the other and as a

dimension of time, to be present in the *here and now*. In this authentic presence the focus is on what happens in the encounter between persons, in the interpersonal interaction, which according to Buber (2003) can be supported by relating to the other through an *I-Thou* perspective. People who relate to the world from this perspective, understand and perceive the world on basis of what occurs *in between* the actors, in other words in interaction. The interdependent relationship from the I-Thou perspective implies that the other is different from myself and that I therefore must try to understand the other's perspective while at the same time retain 'my own grounds' in the relationship.

Secondly, Løgstrup (2000) points to how the interdependent relationship requires involvement by exposing ourselves to the other, and how this makes us dependent on the other's willingness to accept and acknowledge that which we bring with us into the relationship. Being with others in an interdependent relationship thus implies being vulnerable. To be present to another person means that there must be sincerity in the relationship and this demand for authenticity requires us to be open and willing to involve and makes us vulnerable (Buber, 1995). The vulnerability implicit in interdependent relationships implies the possibility for someone to have 'power over' the other and this is why an interdependent relationship involves power structures (Allgood & Kvalsund, 2003; Løgstrup, 2000). Interdependency can thus be understood as related to risk.

A third characteristic of interdependent relationships is related to the above mentioned presence of vulnerability and power, as Løgstrup (2000) and Buber (2003) find that interdependent relationships involve a responsibility in the encounter with the other. This is also why Løgstrup (2000) illuminates interdependency from an *ethical* point of view. He asserts that there is an ethical demand to interact with others with good intentions and in a way that is experienced to support the other, rather than to interact in ways that are less supportive, or even offensive or hostile. According to Løgstrup (2000) each and every one of us must make a choice related to how we use the power given to us in an interdependent relationship. Buber (1995, 2002; 2003) does not refer to interaction in interdependent relationships as an ethical demand even though his works can be understood as a *morality* to include others, just as they are included in us. Also in Buber's philosophy 'the other' requires a response and therefore a responsibility. According to Buber (2003), in interdependent relationships there is a mutual responsibility for developing an equal and inclusive interaction where we relate to others as persons and not as objects.

The last characteristic presented in relation to interdependent relationships is implicit in those above mentioned, and is related to the choice of free will. Løgstrup (2000) notes that being in an interdependent relationship does not mean that the individual must renounce their individuality and their own free will. The responsibility that follows from the ethical demand does not imply taking command over, or to control, the other. The response we offer must never be forced upon the other, in an attempt to make oneself superior to the other. This requires sensitivity and an empathic attitude towards the other and to act in accordance to our own and the other's understanding of moral and ethics.

The above mentioned characteristics of an interdependent relationship illustrate how interdependency means that a person's interests cannot be fulfilled without reliance on another party (McEvily, Weber, Bicchieri & Ho, 2006). This implies that there is a need for trust between interdependent team members if interaction is to succeed. If there is a mutual experience of positive interdependency in an interdependent relationship, trust may develop (Løgstrup, 2000).

### **Trust in interdependent relationships**

Trust tends to be a complex concept, hard to define. Yet all of us have experienced trust or the absence of trust. It is an integrated part of all human interaction and in our society as a whole and has been studied from a number of different disciplinary perspectives. Within the field of pedagogy and counselling the concept of trust is regarded as a premise for facilitating the process of development and learning. In this thesis I can only touch upon some core aspects of trust which is perceived as relevant in relation to interdependency by the informants and I have chosen to present perspectives on trust mainly through the works of Buber (1995, 2002; 2003) and Løgstrup (2000; 1987) as I find it complementary in relation to the above presented theory on interdependency.

### **How to comprehend the concept of trust**

As trust tends to be defined according to the context within which the concept is discussed, the definition may vary (Eide, et al., 2011). This is due to different conceptualizations about the object, nature and preconditions of trust (Gargiulo & Ertug, 2006). According to Buber (1995), his works on interpersonal relationships are philosophy and not theory:“ (...) it is an invitation, a reminder of something that each and every one of us knows through our own life experience” (p. 13). This is also why neither Buber nor Løgstrup offer any precise definition,

from a social science's perspective, of the concept of trust (Kristiansen, 2005). In this thesis I have thus offered a definition of trust by Gargiulo & Ertug (2006) which I find to coincide well with important perspectives on trust as presented in the works of Buber and Løgstrup:

Trust is the willingness of a party to be vulnerable to the actions of another party based on the expectation that the trustee intends and is able to perform in ways that will not harm the trustor in particular situations, irrespective of the trustor's ability to control the trustee's behaviour ( p.167).

From this definition we can understand trust is an *intention* or *willingness* to depend on another party and as an *attitude* towards other team members. The definition thus points to the objective of trust as it refers both to intention and behaviour. A person may not be able to behave according to his intentions, but the other party may still trust him because he trusts his intentions as well as his capacity to behave in accordance to this intention: "I trust that you are motivated and capable and have the team's best interest at heart. So if you've done something I wouldn't have done, it must be because you thought it was the right thing: help me understand" (Baan & Maznevski, 2008).

The proposed definition of trust can be understood as attending to both cognition-based trust, developed on the basis of an individual's perceptions of other's competence, reliability and integrity, as well as affective-based trust related to an individual's perceptions of other's willingness to authentically help. This willingness to behave out of good intentions describes the nature of trust in Buber and Løgstrup's works. In this respect there is a difference in the conceptualization of the nature of trust in the works of Buber and Løgstrup compared to the definition by Gargiulo & Ertug (2006). The latter base their definition of trust on the expectation that the behaviour is non-harmful. The definition does not specifically require actions from the trustee to be actively helping, not even intentionally. At this point I find the concept of trust presented in works of Buber (1995, 2002; 2003) and Løgstrup (2000; 1987) to exceed the proposed definition. In relation to the preconditions of trust, Gargiulo & Ertug (2006) claim that trust is more likely to emerge in an interdependent relationship as it is related to risk and the possibility for defection. This vulnerability can be found in the proposed definition as the trustor is unable to control the trustor's behaviour. This corresponds well with the characteristic of vulnerability in interdependent relationships as perceived by Løgstrup (2000; 1987), Buber (1995, 2002; 2003) and MacMurray (1999).

### **Technologically mediated interaction and trust**

Trust is particularly challenging to establish between members of distributed, virtual teams as a technologically based environment may constrain and limit a team's functions and change the context of human relationships, resulting in high levels of uncertainty among team members (Jarvenpaa & Leidner, 1999; Jarvenpaa, Shaw & Staples, 2004; Skjerve & Rindahl, 2010). The development of trust in virtual teams is thus pivotal to reduce ambiguity and uncertainty in social perceptions and as a prerequisite for productive activity to take place (Dirks & Ferrin, 2001; McKnight, Cummings, & Chervany, 1998).

According to *Media Richness Theory* (Daft, et al., 1987) different media can be placed along a spectrum from 'rich' to 'lean' media according to the degree of emotional, normative or attitudinal cues present. Due to the simultaneity of cues, face-to-face communication is considered the richest media. According to Media Richness Theory the possibility for developing trust in virtual teams may be prohibited, as communication mediated through technology is leaner on communication cues to convey interpersonal affections, such as warmth and attentiveness. When team members communicate they rely on nonverbal and paraverbal cues like body language, eye-contact, tone or pitch of voice. Such cues affect conversation flow, turn-taking and understanding of intention (Warkentin, Sayeed, & Hightower, 1997). High information richness makes communication more accurate and may reduce confusion and misunderstandings. Communication media that has a high degree of information richness offers a high level of *social presence* (Larsen, 2008). Social presence refers to how well the medium facilitates personal connections by mediating warmth and intimacy. Communication media facilitating spontaneous and synchronous conversations have the highest level of social presence, making face-to-face discussions on top, followed by videoconferences (ibid.).

Media Richness Theory has been subject to criticism (van der Kleij, Lijkwan, Rasker, & De Dreu, 2009) as the degree of information richness given by a technology is influenced by contextual factors, like how well team members know each other (Carlson & Zmud, 1999) or their preferences, skills and attitudes (Arnfolk & Kogg, 2003). Empirical studies have also found that technology has the capability to communicate such social information exchange, but at a slower rate than in face-to-face interaction (Hill, Bartol, Tesluk, & Langa, 2009; Walther, 1992). According to the *Media Naturalness Perspective* (MNP) problems associated with communication mediated by technology may be caused by "(...) a lag in people's ability to adapt to the technology, since evolution has accustomed humans to face-to-face

communication” (Rhoads, 2010, p. 116). In spite what according to MNP may be an unnatural way of communicating, thus resulting in some preliminary resistance, DeRosa et al. (2004) argue that people adapt to technology and that virtual teams thus can develop the same levels of trust as collocated teams. Giving virtual teams sufficient time to get to know each other and organizing parallel face-to-face meetings seems decisive in order to overcome the social disadvantages in virtual teams (Hill, et al., 2009).

In the above, I have presented some characteristics of interdependent relationships through the works of Buber (1995, 2002; 2003), Løgstrup (2000; 1987) and MacMurray (1999). As interdependency is closely related to trust, I have further presented a definition of the concept of trust and offered some perspectives on how trust relates to technologically mediated interaction in virtual teams. I will now turn to look at how interdependent interaction may relate to the process of developing knowledge as this is a prerequisite for decision making, the objective of the virtual team constituting the case study in this thesis.

### **Developing knowledge through the process of learning**

In virtual teams the development of knowledge is dependent on knowledge sharing among physically dispersed team members and knowledge creation is crucial for maintaining and improving the team’s competence and skills. A traditional understanding of the nature of knowledge has been called the “epistemology of possession”, as it treats knowledge as something people possess and that they can explicitly spell out or formalize (Cook & Brown, 1999, p. 381). The expanding use of virtual modes of work has led to a broad recognition that the process of developing knowledge is a complex process that goes beyond the mere transfer of knowledge because knowledge is socially situated. The tendency to treat knowledge as an individual property, learned through individual acquisition of knowledge, is thus substituted by an understanding of knowledge as social and cultural phenomena (Boland & Tenkasi, 1995; Engeström, Punamäki-Gitai, & Miettinen, 1999; Lave & Wenger, 2003; Osterlund & Carlile, 2005). As knowledge involves beliefs and is context-specific and relational, it has a temporary nature. This implies that knowledge is developed in social practice through interpersonal relationships and being knowledgeable is a question of knowing how to perform and apply knowledge in social practices (Filstad & Hepsø, 2009). Knowledge is thus related to knowing and developed through a process of learning which is mediated by social interaction and the use of tools (Vygotskij, Hanfmann, & Vakar, 1962). In this thesis I thus address the development of knowledge as a potential utilized in the process of learning through the social practice of Integrated Operations.

### **Situated learning and knowledge boundaries**

In *practice theory* knowledge is believed to be situated in different *communities of knowing* (Boland & Tenkasi, 1995) or *communities of practice* (Lave & Wenger, 2003) implying a relational thinking where “Subjects, social groups, networks, or even artefacts develop their properties only in relation to other subjects, social groups, or networks” (Osterlund & Carlile, 2005, p. 92). Practice theory thus emphasizes relational learning as knowledge is embedded in social practices. Brown and Duguid’s (1998; 2001) adaptation of Lave and Wenger’s work is the most widely adopted approach to situated learning in organizational settings as they address knowledge sharing across communities of practice (Osterlund & Carlile, 2005). They argue that in situations where people share practices, knowledge flows easily as knowledge and learning are constructed by relations among people engaged in a common activity in a shared social context. On the other hand, when people from different communities of practice interact, they tend to maintain different assumptions, outlooks and interpretations of the world (Brown & Duguid, 1998, p. 96). Team members belonging to different communities of practice will look at the same phenomenon as another community, but see things in different ways by seeing different problems, different opportunities and different challenges (Czarniawska, 1992). They live in different worlds from those in other communities of practice (Kuhn & Nydal, 2007). This implies that knowledge cannot be transferred unchanged from one context to another due to *knowledge boundaries* between different communities of practices in complementary teams, which may represent challenges related to the development of knowledge between team members in multidisciplinary teams (Brown & Duguid, 2001; Osterlund & Carlile, 2005).

### **Adaptive learning and transformation of knowledge**

According to practice theory it is through the dynamic interaction between different communities of practice that new meaning and knowledge is created (Boland & Tenkasi, 1995). The creation of new knowledge in organizations is the result of a *transformation* of an organization’s communities of practice by team members belonging to different communities creating new processes and relationships among themselves through questioning and revising their assumptions (Argyris, 1999). In multidisciplinary teams, team members are encouraged to re-examine their assumptions, which increases the likelihood that unwarranted assumptions are reconsidered (Johnson & Johnson, 2009). In learning theory this is known as *adaptive learning* and differs from *additive* learning which is basically increased knowledge and behavioural repertoire, understood in relation to Argyris’ & Schön’s (1996) concept *single*



*loop learning* and March's (1991) concept *exploitation*. This is the kind of learning that takes place in more simple, routine decisions where team members take advantage of knowledge at their disposal. Additive learning is application of existing knowledge. Adaptive learning on the other hand, challenges our mental models, our assumptions and beliefs. This learning process relates to the theoretical concepts *double loop learning* (Argyris & Schön, 1996) and *exploration* (March, 1991). In adaptive learning the focus is on creating new knowledge, or *transforming* knowledge, rather than reproducing knowledge (Ellström, 2005).

The process of adaptive learning requires multidisciplinary team members to share their domain-specific knowledge through three progressively complex processes – *transfer*, *translation* and *transformation* (Carlile, 2004). Knowledge can similarly be represented on three different levels, known as the *syntactic*, *semantic* and *pragmatic* level (ibid.). As novelty increases, the effort required to share and assess knowledge also increases. At the lowest level, the *syntactic level*, the focus is on storage and retrieval of knowledge, known as *knowledge transfer* (Argote, 2005). At the *semantic level* team members acknowledge that they have different interpretations of knowledge, resulting in different understanding of a situation. This implies knowledge being situated and interpretive. Focus on this level is to reconcile discrepancies of meaning to create common ground and shared understanding (Nonaka & Takeuchi, 1995). This calls for an externalization process that pays attention to how team members can make *tacit knowledge* (Polanyi, 2000) explicit by *translating* what they know to team members belonging to other fields of expertise and communities of practices (Nonaka, 1994). At the highest level, the *pragmatic* level, knowledge must be *transformed* in order for other communities of practices to get access to it: “At the pragmatic level team members must be able to represent current and novel forms of knowledge, learn about their consequences, and transform their domain-specific knowledge accordingly” (Carlile, 2004, p. 559).

Team members holding different perspectives and knowledge may resist giving it up as they are challenged to alter their knowledge or acquire different knowledge through the processes of *translating* and *transforming* (Carlile, 2002). Such internal structural adaptation is often both time-consuming, distressing and emotional. It is ‘outside the comfort zone’ so to speak. The difficulty team members may have in altering previous knowledge is referred to as the “curse of knowledge” (Camerer, Loewenstein, & Weber, 1989). Because reflection on their own perspectives is difficult and often not attempted, there is a tendency for team members to

reuse knowledge, even in a novel situation (Carlile, 2004). If different communities of knowing are to work jointly, they need to overcome the degree of incommensurability between them (Boland & Tenkasi, 1995, p. 355). Interaction between communities of knowing is necessary in order to detect anomalies within communities. Such anomalies, together with attraction towards new perspectives, create the conditions for changing perspectives and developing knowledge through an adaptive learning process. It is through this interaction process, where knowledge is exchanged, evaluated and integrated through the successive processes of transfer, translation and transformation, that the forming of new knowledge is possible (Boland & Tenkasi, 1995). A means to achieve this development of knowledge is through the dialogue techniques of perspective making and perspective taking.

### **Perspective making and perspective taking**

As suggested by Boland & Tenkasi (1995) it is not enough to simply combine, share or make data commonly available for the development of knowledge to occur: “Simply providing a common technology platform or shared access to new information resources will not necessarily lead to fruitful collaboration and the sharing of information” (Hepsø, 2009). Through the concepts of *perspective making* and *perspective taking* different team members can interact in order to make their unique thought worlds and *community of knowing* visible and accessible to other team members (Boland & Tenkasi, 1995). In order to make their knowledge and understanding available to other team members for discussion and analysis, team members must develop their own perspectives through *perspective making* (Boland & Tenkasi, 1995). Perspective making thus requires team members to reflect upon their taken for granted, tacit knowledge (Polanyi, 2000) by questioning their underlying logics, values and identities. Solely focusing on perspective making may however create a highly specialized language among team members sharing the same community of knowing and hinder the ability to communicate efficiently with other communities of knowing. The result may be fragmented knowledge, epistemic inhibition and conflicts in the team as too strong emphasis on common vocabulary and predefined decision models does not value diversity and may prohibit the possibility of taking an alternative perspective (Boland & Tenkasi, 1995).

Communication that increases the ability to take another’s perspective is called *perspective taking* and requires team members to open up for new insights and understandings by taking other team member’s perspectives into account (Boland & Tenkasi, 1995). It can thus be compared to the foundational concept of empathy which is rooted in existential-humanistic

philosophy and focuses on understanding in the relationship in between people (Ivey, 2007). Through perspective making and perspective taking people share and develop knowledge by actively build on and refine the ideas of each other (Tan, Wei, Huang, & Ng, 2000). It can thus be understood as a dialogue technique where people step back from the way of thinking produced by fragmentation and incorporate another way of thinking: “Dialogue is an attempt to perceive the world with new eyes” (Isaacs, 1993, p. 30) and as the opposite of a mechanistic and unproductive debate between people seeking to defend their views against one another.

In the above I have argued that the development of knowledge can be understood as a potential utilized by transferring, translating and transforming knowledge between team members representing different communities of knowing through additive and adaptive learning processes. The development of knowledge is related to both eliminating error and enlarging its scope through respectively single-loop and double-loop processes of reflections and learning. As the quality of the strategic decisions in the virtual team is determined by the extent of their shared knowledge, the ability to intentionally act to create a desired outcome increases through the process of developing knowledge. When work becomes knowledge intensive, interaction must be supported by an interdependent relationship between team members that facilitates help, advice and the mutual exchange of ideas through the process of perspective making and perspective taking. In dealing with contingencies, perspective taking can support team member’s understanding of other team member’s personalities and skills, and facilitate empathic and trustful interact by acknowledging other team members (Hepsø, 2006).

## 4. Method

Methodology in social science refers to a transparent process of gathering data, analyzing and interpreting the findings in relation to a theoretical branch of research (Klev & Levin, 2009). In this section I will describe the process that has been undertaken in order to conduct this empirical case study and on what basis I have made qualitative and ethical considerations.

Based on the nature of my research question I chose a qualitative approach when conducting this empirical study, as qualitative research method seeks to understand how the informants perceive the world through their subjective experiences (Kvale, Brinkmann, Anderssen, & Rygge, 2009).

### Traits of qualitative research method

Qualitative research is about exploring human interaction in a natural setting (Postholm, 2010). The focus in qualitative research is thus on the *emic* perspective, trying to capture the way informants perceive their experiences (Creswell, 2009). Consequently, epistemological theory on how knowledge is constructed is in qualitative research related to the close relationship between researcher and informant and the interdependent relationship between the *emic* and the *etic* perspective. As in a hermeneutic circle the emic perspective can be understood by being open-minded and able to adjust one's assumptions (Gudmundsdóttir, 1998), whereas the etic perspective's strength is to discover what may be hidden from the informant's perspective, as theory can make the invisible become visible (Erickson, 1986).

Another central aspect in qualitative research methods is *context* as most qualitative research is conducted within a constructivist paradigm. Ontological theory within this paradigm claims that our perception of reality is constructed through social interaction and our understanding of reality is thus contextual and constantly evolving (Creswell, 2009). To be able to understand how the informants perceive their experiences, I have gained insight into their context by personally visiting, observing and conducting interviews in their specific work setting.

A third characteristic of qualitative research is related to such *thick descriptions* as Stake and Trumbull (1982) claim that this makes it possible for the reader to relate the informant's experiences to their own through *naturalistic generalization* (Postholm, 2010). In the chapter describing the empirical field, relevant information regarding the informants constituting the virtual team in this case study is given.

## **Case study**

There are many approaches to qualitative research methods. According to Postholm (2010) phenomenology, ethnography and case studies are the most common and will be most suitable for the size of a master thesis. This study falls within the area of case studies. Typical for a case study is that it is directed towards studying extensive information based on few units (Ringdal, 2007) and a widespread conception of a case study is that it deals with an empirically defined unit such as a group (Thagaard, 2010). In a case study the choice of informants are restricted by a predefined unit or group of people, existing independently of the research study being undertaken (Tjora, 2010). When conducting a qualitative case study we seek knowledge regarding a phenomenon related to the informants composing the case and the focus is upon understanding the current social phenomena based on the informant's perspectives (ibid.). In a case study the empirical findings from the interviews are subjective experiences, but will also provide an insight into the organization, as the findings are perceived to define the case (Tjora, 2010). As the case study can serve to illustrate how interaction in IO settings is experienced within the organization, my study can be defined as an *instrumental case study* (Ringdal, 2007). The case study can further be understood as *interpretive* as I will describe, interpret and theorize on the empirical findings presented by the informants (Postholm, 2010).

## **The choice of informants**

In this case study I have been observing and interviewing team members constituting a dispersed, multidisciplinary and virtual team in Statoil. I have made a *strategic sample* of informants as the team members are chosen on the basis of their experience with IO technology (Tjora, 2010). Statoil has taken a leading position in the development of Integrated Operations worldwide, and their employees have considerable experience in dealing with IO as a way of organizing, working and communicating. The choice of informants can also be considered a *convenience sample* as these informants were willing to openly share their work practice and experiences, by the use of both observations and interviews as data collecting methods (Berg, 2009). According to Kvale (2009) it is important not to choose too many informants when conducting qualitative interviews, as one needs to conduct thorough time-consuming analyses. Dukes (1984, cited by Postholm, 2010) states that a number of three to ten informants is optimal in a smaller qualitative study. In this case study the team is comprised of team members located on three different geographical locations, and I have chosen to interview one informant from each of these sites to get a holistic and comparative

perspective on the experiences entailed in the case. The three informants were chosen based on my observations as they all made what I found to be significant contributions and interesting remarks relevant to the phenomenon of interest. All three informants have been team members in this particular team for a prolonged period of time and were able to present their extensive experience with IO through both observation and interview as data collection methods.

### **Methods for data collection**

In this study I have used methods triangulation as I have conducted both observations and qualitative in-depth interviews as well as studied documents, relevant literature and prior research within the field of IO. I have also had conversations with researchers studying the concept of Integrated Operations from Statoil, SINTEF, IFE and Studio Apertura at NTNU. I find this triangulation to be an advantage as I have developed considerable knowledge in relation to the empirical field and this has hopefully contributed to make valid interpretations of the informant's experiences.

### **Observation**

In observations we study what people do, not just what they say they do. This is why observation of interactions is a good way to gather information on *theories in use*. The philosopher Michael Polanyi's (2000) concept *tacit knowledge* is related to the concept *knowing how* (Ryle, 2009) as it is used to describe knowledge that can be observed through a person's practical skills and not from verbal expressions. Through observations of interaction this tacit knowledge can become visible and available to others (Klev & Levin, 2009).

During fall 2010 and winter 2011 I attended and observed four meetings held by the team. Each meeting lasted for three hours and during these meetings team members used video conference facilities and shared applications. As an observer I was physically present in the same room as some of the team members and present to the remote located team members via video and sound. During the observations I made notes, as recordings were not an option due to the strategic decisions taken. These observations resulted in thirty handwritten pages of observations related to interaction that was found to be relevant to the research question and the topic for this study.

According to Postholm (2010) observation is most often used in combination with other methods for gathering data, which is also the case in my research design. The purpose with

the observations was first of all to develop a deeper understanding for the informant's context and to provide valid information before preparing the semi-structured interview guide. It also helped me build a relationship with the informants, which I found to be an advantage when making conversations in the subsequent interviews.

### **The qualitative interview**

Based on the nature of my research question I chose to conduct qualitative in-depth interviews. This is also the most commonly used method for gathering data in qualitative research (Tjora, 2010) and can be seen as a conversation focusing upon the topics found to be of relevance to the research question (Postholm, 2010). Through this conversation I can understand and interpret the informant's subjective experiences and study the phenomenon of interest (Wolf, 2010).

The qualitative interview is an intersubjective situation mediated through communication, where the interdependent relationship between the researcher and the informants are based on trust (Postholm, 2010). According to Kvale (2009), interviews must be conducted within a safe environment where the informants can feel at ease and where the conversation is not disturbed by others. All interviews in this study took place at the same location and in well suited offices made available to us by the organization. The informants scheduled the interviews themselves, as this was the best way to ensure that there would be sufficient time, and that the participation in the study would cause as little inconvenience as possible to the informants. During the interviews I focused on communicating in a respectful, understanding and interested manner as this makes it more likely the informants will share their thoughts, feelings and experiences (Kvale, et al., 2009). I also kept in mind that communication may be more than just words and oral speech, such as body language and silence (Kvalsund, 2006). During the interviews I thus paid attention to small cues such as silence, gestures and tone of voice and also included such observations in my transcriptions. I found this helpful in order to choose which topics to follow up and explore further, both when conducting the interviews and in the subsequent analysis.

In qualitative research method there are different types of interviews like structured, semistructured, unstructured and group interviews (Postholm, 2010). In my study I have conducted four semistructured in-depth interviews, including one pilot interview. The semistructured interview guide (Appendix 1) contained topics and questions found to be of relevance based upon the observations and my research question. This guide helped me

structure the conversations and ensured that it was relevant to the focus of interest. The semistructured interview guide provided great flexibility which made it possible to follow the informant's reflections and have a natural progression in the conversation by including follow-up questions and asking for elaborations where this was found to be important (Dalen, 2004). Still, the overall structure of the interview was important to establish trust. This implied opening questions that were safe and fairly easy in the beginning of the interview. Questions that required more reflection were then presented before the interview was terminated with more general topics (ibid.).

### **Data processing**

When conducting this case study I made a total of four interviews, three with the informants and one pilot interview. From the three interviews with the informants I had 195 minutes of audio taped which made an average of 65 minutes per interview. None of the interviews varied significantly from this average. These interviews were transcribed into 80 pages of written text. Together with 30 pages of written observations this was the basis for the analysis and the empirical findings.

### **Transcription**

I found the process of transcribing the interviews very useful, as it made me more aware of all the small variations and details in the empirical data. According to Repstad (2007) the process of transcription helps the researcher to build a close relationship to the empirical data, which corresponds well with my own experience. When transcribing the interviews I tried to stay true to the informant's vocabulary and chose to include pauses and hesitation in the transcriptions as I found this useful in order to make the subsequent interpretations.

All the interviews were conducted in Norwegian and they were also transcribed in this language as this made it easier for me to interpret the original meaning that they conveyed. In the section representing the empirical findings, the presented quotations have been translated into English for the sake of comprehension. The chapter representing the empirical findings has been member checked to verify my interpretations and to make sure that the informants felt that the translations were accurate.

### **Analysis**

Inspired by the field of hermeneutic, I find the process of analyzing and interpreting the empirical findings to be dependent on the researcher's subjective premises and theoretical foundation. Being aware that my pedagogical frame of reference and my subjectivity affects



the questions I am capable of asking and the patterns I find when analyzing the interviews, I have tried to have an open mind and to find the essence of what is *grounded* in the empirical data. Analyzing the empirical data will thus be a process of interaction between the empirical data and theory. To prevent my interpretations from being too narrowly focused I have tried to take on multiple perspectives when analyzing the interviews and I have conducted member checking.

When analyzing the interviews I was eclectic. Analyses were conducted based on the principles of the *hermeneutic circle* (Palmer, 1969) where the overall picture and meaning is conceived through the interpretation and segregation of the interviews in smaller parts with codes and categories. The process of coding was influenced by *the constant comparative method of analyses* (Glaser & Strauss, 1999) and conducted through three steps named *open*, *axial* and *selective coding*. The process of open coding was based on the informants' own words and experiences as is the tradition in *grounded theory* (Glaser, 1978; Glaser & Strauss, 1999). The labels of these codes were thus mostly *in vivo* (Glaser, 1978) as I found this to cover the meaning inherent in the quotations most precisely. This coding helped me part the different sentences and their distinct meanings from each other. During selective coding these *in vivo* codes were gradually developed into more general theoretical concepts which made the foundation for the empirical findings as they are presented in this thesis.

The process of categorizing was supported by the insight and knowledge I had previously gathered through extensive readings of literature, by studying previous research and by discussing the topic with researchers and people experienced with IO. Theory was systematically used throughout the study, initially as a basis for the observations and when structuring the interview guide, and subsequently in the process of analyzing and discussing the empirical findings. The final categories thus evolved through a dialectic relationship between the *emic* perspective, represented in the thesis by quotes from the informants, and the *etic* perspective.

### **Validating the quality of my empirical findings**

In qualitative research the empirical findings represent what the informants hold to be true. It is their subjective experience we are interested in (Postholm, 2010). Within the social constructivist paradigm our subjective understanding of reality is believed to depend upon context and is thus constantly changing as our mental models are ultimately learned social constructs of reality and thus arbitrary (Schein, 1993). As words gain sense only through

actual use in a social process, and meanings are seen as symbolic and inherently ambiguous (Boland & Tenkasi, 1995), the researcher's subjective experiences and theoretical frame of reference are also central to the interpretation of the empirical data. "What you perceive, in other words, is not determined by independent external properties of 'parts' of reality, but is a function of the ways in which you try to perceive that reality" (Isaacs, 1993, p. 29). In qualitative research conducted within this paradigm it makes no sense to test the empirical findings against an objective 'truth' in analogue to a more positivistic tradition. This subjectivity is an important characteristic of qualitative research (Creswell, 2009; Postholm, 2010; Tjora, 2010) and by some considered to be a methodical challenge, and even a basis for criticism towards qualitative research as vague or unscientific (Stephenson, 1953). This subjectivity requires consideration on how to enhance the accuracy and credibility of qualitative research (Creswell, 2009). I will counter these quality requirements by attending to trustworthiness, validity and the possibility for naturalistic generalization in this case study.

### **Trustworthiness**

Testing for *reliability* in qualitative research, as we do in quantitative research by assuming consistent results across different researchers and different research projects, will probably result in inconsistent empirical findings. In qualitative studies the word *trustworthiness* may be more suitable for this purpose (Creswell, 2009). By giving a detailed description of the research process, and stating clearly how the researcher's subjectivity may affect the interpretations of the empirical findings, trustworthiness increases (ibid.). When it comes to how we present qualitative research, *transparency* is thus an important requirement (Tjora, 2010).

### **Validity**

*Validity* is another central concept in relation to quality, meaning to check the accuracy of the empirical findings (Creswell, 2009). To make my empirical findings as accurate as possible, I conducted a pilot study by interviewing a person with relevant experiences from IO settings. Based upon my experiences with the pilot study, I was able to adjust the semistructured interview guide, hopefully enhancing the validity of my empirical findings. Kvale (2009) uses the concept *communicative validity* as a way to increase quality through dialogue within the researcher community. Testing my findings up against previous research and through *member checking* will help me verify my interpretations and support the validity of this study (Postholm, 2010).

### **Naturalistic generalization**

Whether the presentation of the study makes *naturalistic generalization* possible is also considered to be a criterion for quality in qualitative research (ibid). If the empirical findings are to be relevant in another context, Stake and Trumbull (1982, cited by Tjora, 2010) assert that they need to be presented through *thick description*, making it possible for readers to consider whether my findings correspond to their own experience. Even though virtual teams have become a widespread way of organizing people and recourses in a variety of organizations all over the world, each virtual team is comprised of different human beings and will naturally differ from other virtual teams in many important aspects. In this case study I present what the informants found to be most important from their subjective experience in relation to interdependent relationships and interaction in Integrated Operations in Statoil at this point. Hopefully these empirical findings will be found relevant to others comprising, leading or planning for virtual teams whether this is within the case company or in other contexts, even though direct generalisation from such a small sample of informants is not possible (Ringdal, 2007).

### **Ethical considerations**

In this study I needed to attend to guidelines for research ethics in the social sciences put forward by the National Committees for Research Ethics in Norway (2006). The study has also been approved by the Social Science Data Services, NSD (Appendix 4). In qualitative research there is a close relationship between researcher and informants based on trust, tolerance and respect. This had implications for the way this study was carried out. First of all the principle of informed consent was relevant. My contact person made the necessary clarifications regarding permission to conduct this case study within the organization and informed the possible informants that I would contact them with information in relation to the study I was hoping to conduct and to ask for their voluntary participation. When first initiating contact with the informants I gave information regarding the topic and purpose of the study, both verbally by visiting a team meeting and by electronic mail. When recruiting the final three informants for the interviews, an information letter (Appendix 2) and a consent form (Appendix 3) were attached in the request put forward. Written consent was based on participation upon free will and informants were informed that they could withdraw from the study at any point. Secondly, informants were ensured confidentiality and that the informants and their statements would be anonymous in the thesis. Informants were also made aware that, since this being a case study, there is a possibility that the informants might get

recognized within the organization due to contextual characteristics. Third, member checking was carried out in respect for human dignity and to check whether my understanding was in relation to how the informants perceived their experiences. I also found this important as I had translated the quotations into English.

Ethical considerations also relate to the researcher's role during observations (NESH, 2006). Prior to conducting the observations I communicated that my focus during observations would be on their interaction, and that I would not make judgment on team members' personal behaviour. Observations of work practice can be threatening because the way we behave is according to Bourdieu (1977) dependent on our *habitus*, or unintended strategies, and not applied theory. We may have an intention to interact in a certain way, but through observations we are sometimes made aware that we behave differently. This can be difficult, and when conducting the observations I wanted the informants to feel safe and not to worry about the possibility that the observations would not be comprehended in a respectful and sensible manner. The informants were also informed that my intention with the observations was primarily to get an insight into the empirical field where the study was to be conducted and that the empirical findings presented in the thesis would mainly be based on the subsequent interviews. I think this information helped the informants relax during observations and they stated that they soon forgot my presence, which was also my impression.

### **The researcher role**

The empirical findings and the informants' subjective experiences is the centre of attention in qualitative research. Still, qualitative research may offer another perspective, or focus of attention, through a dialogue representing both the *emic* and the *etic* perspective. It is the researcher's responsibility to facilitate this dialogue through a chosen focus of interest by presenting hypothesis or research questions that can be looked at from the informants' perspectives and interpreted by the use of a chosen frame of reference and theory. Research is thus conducted through the researcher's knowledge, understanding and interpretation and this is why the researcher is considered to be the most important instrument in qualitative research (Creswell, 2009). As a qualitative researcher I am aware that my interpretations cannot be separated from my own background, experiences, context and prior understanding (ibid.). The term *axiology* is used to describe this subjectivity and in this thesis I have explicitly stated my subjectivity, my theoretical frame of reference and within which paradigm this research is conducted in order to enhance the quality of the study (Allgood & Kvalsund, 2010). In order

to do so I needed to reexamine my own theories in use through a reflexive process which made me more consciously aware of my theoretical foundation as it moved from ground to figure. This reflexive process helped me approach the empirical field more inductively and in relation to Moustaka's (1994, cited by Postholm, 2010) principle of *epoche*, meaning to put aside one's subjective comprehension of the phenomenon to be studied, in an effort to understand the phenomenon through the informant's perspectives. Patton's (2002, cited by Postholm, 2010) concept *bracketing* describes the same effort in relation to analyzing the empirical data by discovering what is grounded in them.

In relation to the process a qualitative researcher must undertake in order to gain insight into the empirical field, I find that a metaphor presented by Aslaug Kristiansen (2005, p. 33) based on Buber's work illustrates this process well; "The researcher must leave the position on the beach, observing the ocean. She must leave a position of control and jump into the ocean and swim for her life!" I understand this metaphor as representing a central aspect when trying to capture reality, the recognition that reality is not present as perceived by any of the interacting subjects, but in the space *between* them (Buber & Simonsen, 2003). This implies an intersubjective philosophy where the interpersonal relationship is the only place to explore and understand human interaction. I find this metaphor to correspond well with my own experience when conducting this thesis. To understand and develop my knowledge in relation to the topic of this thesis I chose to do an empirical study. This implied leaving a position of control, studying the empirical field from 'outside', and rather to develop an understanding from 'inside' by conducting both observations and interviews within the empirical context where the case study was conducted. As a researcher I felt like jumping into something that was new and sometimes overwhelming. But there have been moments when I have felt that the ocean, represented by the empirical field and the informants, have carried me along, like riding a wave.

## 5. Empirical findings

In this chapter I will present the empirical findings from the case study. Through the course of analysis, as described in the methods chapter, I found a total of six categories labeled *Shared understanding*, *Trust*, *Awareness of involvement*, *Power*, *Technology as enabler* and *Complementary competence*. The six categories represent the informants' perspectives on how they perceive the interdependent relationship between the team members to affect their interaction and the development of knowledge in the virtual team. An illustration of the empirical findings and how they relate to each other is presented in Appendix 6.

The quotations representing the empirical findings are those found to be most relevant in relation to the research question and the objective of this thesis. This implies that the empirical findings presented here will not be exhaustive, and due to constraints in length, some subcategories will not be illustrated by the voice of every informant. In subcategories where I understand the empirical findings to present dissimilarities, or where the informants' perspectives are believed to complement each other, I have included quotations from all three informants. The informant's identities have been made anonymous and for the sake of comprehension they will be presented as Tove, Lars and Erik.

### Shared understanding

This represents a central category in the empirical findings and is related to the process of perceiving each other's understanding of the situation at hand and to develop a shared, holistic perspective among the team members constituting the virtual team. In the interviews with Tove, Lars and Erik the development of a shared understanding stood out as the most important aspect in order for interaction in Integrated Operations to occur according to its intention - to reach qualified decisions based on a well founded and holistic understanding. In this category the most relevant subcategories are sharing information, listening, taking the other's perspective and interdependency.

Tove describes the development of shared understanding as the team's biggest challenge:

*“Our biggest challenge is to develop shared understanding and to share information. I don't think we have sufficiently succeeded in this. If there is a situation offshore, we should first of all develop an understanding of the problem before we reach an agreement on how to solve it. We often jump directly to the conclusions instead of realizing our interdependency, and to listen to the information and the experiences of team members offshore, and the other way around”.*

From her statement we understand that she is concerned with the sharing of information and experiences between team members in the virtual team. In this specific quotation she illustrates this by referring to the sharing of information between team members located offshore and onshore. She further points to the importance of listening to other team member's perspectives in order to develop shared understanding and thus acknowledges the interdependent relationship between the team members. When talking of the need for a shared understanding in order to make interaction work, Erik underscores the importance of the interdependent relationship between the team members to an ever greater extent than Tove:

*“To make interaction work it is extremely important that we share the same situational understanding and that we are concerned with the same issues. It is no good if everybody shoots in opposite directions. We are interdependent, even though there are differences, but it is still the same thing”.*

Erik also emphasizes the importance of developing collective goals within the team and to acknowledge that they all work towards the same objective. This is elaborated further as he goes on reflecting on why it is difficult to develop shared understanding:

*“When we are interacting, you get so engaged in your own issue, your ‘own little thing’, that you really forget to pay attention to what the rest of the team members are engaged or concerned with. Then we miss the whole picture and the possibility to develop shared understanding”.*

As we can see, Erik acknowledges that the team members need to take the other's perspective in order to develop shared understanding and for the team to be able to pull in the same direction, to work jointly towards the team's objective. The importance of paying attention to what other team members are engaged or concerned with implies the need for sharing information. Like Tove and Erik, Lars also connects the development of a shared understanding to the sharing of information:

*“Today we have too little sharing of information. This could support our understanding in relation to other team members' tasks. To understand why they have different perspectives and priorities. Instead of being frustrated we could build a shared understanding. This is something we need to work on”.*

In the next quotation Lars points to the importance of sharing information through viewing the same data. He also makes the link between developing shared understanding and how this relates to the objective of the virtual team – decision-making. In his opinion shared understanding makes the team's work more efficient and less exposed to mistakes:

*“The biggest advantage [with Integrated Operations] is that we can view the same data. This is effective and makes it less likely to make mistakes. It supports the development of a shared situational understanding. We develop mutual grounds for decision-making. I believe this is extremely important”.*

To summarize, all three informants found development of a shared understanding as a fundamental premise for successful interaction and decision-making in the virtual team. They further mentioned how this development of a shared understanding required acknowledging their interdependent relationship and the ability to share information by listening to the other’s perspective. Lars elucidates the importance of developing a shared understanding in order to reach the team’s objective of making qualitative decisions which are effective and safe. As will appear in the next category, the development of a shared understanding within the team is perceived to be strongly correlated with the experience of trust among the team members.

## **Trust**

Trust is experienced as fundamental for the development of shared understanding and subsequently successful interaction in IO by the informants and is presented through the subcategories informal and spontaneous, time, vulnerability and presence. A metaphor by Erik illustrates the interdependent relationship between the team members and why it in his opinion needs to be based on trust: *“If you are driving a car, you would like to know for sure that you will reach your final destination. You need to trust that the car will not collapse on the way”.* When telling this metaphor he illustrated how interdependent the work in the virtual team is as all team members have their assigned tasks to fulfill in order to make the operation work. In the metaphor this is illustrated through the point that the one ‘driving the car’ is not responsible for fueling the car or carrying out the maintenance or the repairs. Trust can in this metaphor be seen as strongly related to safety, which is an important objective in the team. But the notion of *“reaching your final destination”* may also point to the need for trust between interdependent team members in an effort to move towards their goals in a broader perspective.

When talking of the importance of time in relation to developing trust Tove says:

*“Of course I do get to know people by telephone or videoconference, but it takes time to build trust. I think it is due to time. If we only communicate through videoconference, we may use one year to get to know each other. If we meet face to face we may use ten minutes, talking informally. I think building trust takes time”.*



Like Tove, Lars also mentioned how technologically mediated interaction was less suited for the development of trust as team members who are not collocated are prohibited from talking informally through more spontaneous interactions:

*“We miss the informal... that communication during lunch, in the corridor and up the stairs. That communication is perhaps more important for the development of trust than the communication that follows from a formal agenda during meetings. I don’t think it is easy to build a relationship by virtual interaction. You have to meet them and talk informally. I think this is a premise for interaction, that we know each other”.*

Erik also finds it easier to relate to team members he has met and talked informally with:

*“When you meet people you talk informally and get to know them better. This makes it easier to relate to them. This is an advantage compared to videoconference”.*

All informants mention how the development of trust is supported by informal communication and how this helps to build a relationship between the team members. Erik finds it easier to relate to team members he knows and Lars states that knowing each other is a premise for interaction. They find that it is easier to support this more spontaneous interaction when they are physically collocated and that building trust by virtual interaction takes more time as the technologically mediated communication is perceived more formal and strict.

Interaction in Integrated Operations is further considered to be related to vulnerability as we can see from the following statement by Tove:

*“I believe utilizing the potential in IO is a process of awareness. I think it is related to fear of getting too close. You cannot hide, close the door or pull the curtains”.*

This vulnerability implies the need for trust to be developed within the team for team members to be willing to share their information and to expose themselves to the others. Lars talked of vulnerability in relation to presence and how this in his opinion makes some conversations less suited for virtual communication:

*“When we have a topic that requires presence... if we are to work on our goals for personal improvement, we expect everyone to be physically present in the meeting. It gets so personal and intimate and it feels unnatural to bring this up in a videoconference... I believe you are vulnerable when you reveal yourself and then it is extremely important to be present and to make sure that you don’t miss anything”.*

In this quotation the presence which Lars talks about is related to being physically collocated. He claims that videoconference is less suited for more personal and intimate conversations as

the vulnerability related to such conversations requires a kind of presence which in his opinion is difficult to achieve when communication is technologically mediated. In another part of the interview Lars also talked about presence in relation to the development of trust. Here presence can be understood as related to the way technology in videoconference brings the team members 'closer' to each other, thereby *supporting* the development of trust:

*“By the use of videoconference team members on other locations are becoming a natural part [of the team]. They are recognizable. They are not so distant. That is a door opener. Just to be present ‘on the wall’, to be visible. It does not compensate for being close, but it helps. I think it builds trust that we are able to observe each other and to be more informed about what is going on. It is reassuring”.*

From the above statements we might understand videoconference as a good compensation if the alternative is communication without images, like e-mail or telephone conference. In comparison to face-to-face interaction videoconference is still perceived to be inferior, at least when the situation is experienced as vulnerable due to the personal content in the conversation. Lars explains this as related to a feeling of presence.

When talking of trust the informants related this to different characteristics within the relationship. All the informants found that trust was easier to develop when communication was more informal and spontaneous than what they usually could accomplish by the use of videoconference. The development of trust in the virtual team was also seen as dependent on repeatedly trustworthy interactions over a period of time. The informants also mentioned how trust could be related to vulnerability as the team's interaction could be seen as less than optimal due to an reluctance of 'getting too close' or being personal in technologically mediated interaction. Presence, either physical by being collocated, or as a technologically mediated 'virtual closeness' by images of other team members in videoconference, was further perceived as important in order to develop trust. The next category, *Awareness of involvement*, was found to be closely related to the development of trust by the informants.

### **Awareness of involvement**

This category contains the subcategories involvement, withdrawal and responsibility. All informants talked about how they experienced a lack of involvement, or withdrawal, to affect the quality of interaction. The word *awareness* is important as it underlines that none of the informants perceived a potential lack of involvement as reluctance. Rather, the informants communicated a belief in the importance of being consciously aware of the importance for

taking responsibility for involving oneself as well as to support the involvement of other team members. Involvement is thus seen as a collective responsibility.

The empirical findings in this category illustrates how it is experienced to affect interaction if team members chose to withdraw from taking active part in the discussions, mostly due to having a more distant relation to the team by being remote located, only present in the meeting through an image hanging 'on the wall'. Reflections on involvement were also related to the way team members behaved during meetings by their use of telephone, working on their PC or reading documents. This was perceived as being less involved in the interaction by Erik and to disturb the interaction in the team all together:

*"I think it is a bad habit [answering the telephone during meetings]. You are in an important meeting. It affects interaction as it takes focus away and it affects others being present. You are disturbed and this is annoying".*

All the informants stated that interaction is affected by team members not being fully engaged in the meeting's agenda. We may understand this in relation to their opinions on the importance of developing shared understanding and common goals as discussed above. If team members elude taking other team member's perspectives, they may not feel obliged to the same objectives, as they do not share the same situational understanding. This may reduce involvement and inhibit the team's interaction.

Lars talked about how a lack of involvement in the virtual team may be related to team members not feeling directly affected by, and thereby less concerned with, the topics being discussed in the team. He also elaborates why this in his opinion is connected to the technologically mediated communication in the virtual team:

*"Sometime it is hard to be noticed. And then you must make yourself known. This is not always easy. And this is exactly why you may allow yourself to be even more peripheral. You may not find the discussion engaging, so you move on to do other activities like sending SMS or e-mail. And you are kind of offline. You make yourself absent".*

Tove also points to how involvement is every team members own responsibility:

*"If I am alone on a location I feel less included. I do. This is why it may feel easier to not participate if I am alone. But if I am responsible, I will take on that responsibility, and engage in the interaction never the less".*

Tove reveals how she experiences interaction in the virtual team as less inclusive if not all team members take responsibility in order to involve both themselves and those team members being remotely located. She finds it to be a collective responsibility to include, and thus make involvement possible, from all team members:

*“If there are many team members located on one location and you are the only one ‘hanging on the wall’, and you try to make contact and you experience being ignored several times, you may eventually give up... You may not participate because they are having their own discussion, without taking responsibility for including all team members”.*

Also Lars highlights the importance of taking collective responsibility for involvement by all team members:

*“If you do not participate, watching others take decisions, this will not be viable in the long run. But all of us need to be aware that this team is not only comprised of those you are collocated with. You must engage to include those ‘hanging on the wall’ as well. In interaction all team members must participate. Interaction requires responsibility”.*

The empirical findings in this category point to the findings in the category *Shared understanding*. In order to develop a shared understanding, the informants find it necessary for team members to acknowledge their interdependent relationship and to take on a shared responsibility for involvement from all participants. Another aspect experienced as relevant to the interdependent relationship, besides those already mentioned, is related to power.

## **Power**

IO has brought along a change in the organizational structure in the case company. Due to more flexible and horizontal organizing the informants experience power and authority as current issues. When reflecting on how this has made an impact on interaction in the virtual team, Erik states:

*“It is of course a major change for someone who has worked for twenty years and who is used to having executive authority as well as authority to make all the decisions. Suddenly he is no longer entitled to make those decisions himself without involving others. I think some may find that bureaucratic”.*

Erik points to how power now is divided amongst the team members, giving personnel offshore more limited authority. This reflects the interdependent relationship and the need for involving others. Lars also talked about the changes imposed by IO and brings to light the way this may have affected the relationship between personnel onshore and offshore:

*“The work has changed. The work offshore is much more executing as planning is conducted onshore. Earlier people offshore did almost everything themselves. It is possible that people offshore feel incapacitated now. And they may even feel monitored. People offshore may experience this change not only as a deprivation of work tasks, but at the same time they may feel kept under surveillance”.*

This quotation gives an impression of some important experiences related to the sharing of power amongst interdependent team members. For team members offshore this may be contrary to what used to be practice, and as Lars indicates, team members offshore may feel like ‘loosing’ power, or that others have ‘power over’ them. The way power affects the relationship between onshore and offshore personnel is also reflected upon by Tove:

*“I think people offshore feel watched over, that they are kept under surveillance. Earlier they were ‘king of the castle’ so to speak. But with Integrated Operations things have changed and people onshore have more power”.*

The words “*monitored*” and “*kept under surveillance*” can be understood as a rather vulnerable position and give a direct link to the previous empirical findings pointing to the need for developing trust amongst the team members for interaction to succeed.

Overall, all informants viewed the change in power structures to affect the relationship between team members, especially between those located onshore and offshore. The informants onshore might feel empowered and more included in the operations as they have more authority than earlier due to experts onshore being more involved in the decisions and management of the installation. Team members offshore may on the contrary feel a deprivation of power as they need to involve team members onshore to a much larger extent and as a consequence they have less authority than they used to. As Lars points out, *interaction* is now perceived as most important in the interdependent relationship between the virtual team members: “*With Integrated Operations everything is dependent on interaction. The team is the most important success factor.*”

The experienced change in power structures and authority is understood as a result of new work processes accompanying the implementation of IO. This makes the implementation of new technology to affect the relational aspects and the interaction within the virtual team, even though technology is not so explicitly linked to the empirical findings presented in the above categories. The next category will account for the way the informants found technology to more directly affect their interaction.

## **Technology as enabler**

In relation to the technology in IO and how the informants experienced this to directly support or inhibit interaction in the virtual team, they mentioned several factors. Erik talked about the noise from the video equipment in the videoconference rooms and how this affected the work environment. Tove was concerned with the importance of training and mastering the equipment in order for interaction in the virtual team to succeed. They all mentioned time delay as one particularly important constraint in relation to technologically mediated communication in IO. Interaction mediated by technology, as in videoconference, is also considered more complex than when team members are collocated. To handle this complexity, the informants found the need for rules and structure by someone taking charge when communicating in videoconference. The most advantageous with technologically mediated interaction was related to saving time and resources, thus making interaction in the team more frequent and expert knowledge more available and in less time. Technology was further perceived as a boundary object, supporting interaction and the development of a shared understanding.

The experience of complexity can be illustrated by the following quote by Lars:

*“Videoconference is complex. You must be more considerate and forthcoming as you must pay attention, not only to those being present in the room, but to those ‘on the wall’ as well. You may easily forget to look at the wall as you focus on those more close to you. Suddenly you remember. It is a bit scary.”*

Lars points to the importance of having awareness towards developing an attentive attitude and to take responsibility for involvement as discussed above. This is experienced as a complex situation due to multiple centers of attention. All three informants find the technologically mediated interaction so complex that it prompts the need for structure and rules for how to interact in these meetings. This is illustrated by a quotation by Lars where he underscores the need for rules in order to structure communication and being prepared in advance to meet the challenge related to time-delay and thus complexity in videoconference:

*“IO works, but it takes discipline. Due to time-delay it requires manners, we must wait for our turn. You must find the right time to say what you plan to say, you must be prepared and have understood the agenda for the meeting in advance”.*

During the interviews all three informants emphasized that there is a need for ‘someone taking charge’ in virtual team meetings and that this is even more important in virtual

meetings than in collocated meetings. Management is thus experienced as an important means to achieve structure in the complex situation they experience during interaction in the virtual team by Lars:

*“Working together in IO is much more challenging than working together with team members who are collocated. It is more complex, and it is hard to relate to everybody. That is why it takes discipline when managing the meetings. It requires management”.*

Erik talks of what he experience as the need for someone to administer the communication in order to avoid chaos. This can be understood in relation to the complexity in the technologically mediated interaction as mentioned earlier and due to conflicting perspectives in the heterogeneous team:

*“We need someone to take ownership... Who administrates the conversation. When we all come up with different inputs based on what we regard as most important, it all becomes quite chaotic actually. It is extremely important that there is someone in charge, who administers the communication”.*

Tove talks of leadership in relation to handle complexity in virtual team meetings. A leader must involve all team members, which she finds decisive in order to reach collective decisions:

*“It is more important with leadership in IO than when we are collocated... in relation to involving everybody. It is more demanding to lead us towards a collective decision. A leader in a virtual team must be aware of the challenges related to the medium and take actions to include everybody”.*

All the informants talked of the need for structure but used different notions in relation to how this is to be complied: Lars calls for management, Erik for administration and Tove for leadership. The use of these terms may be more or less consciously chosen and it is not within the limits of this thesis to dwell upon the differences that they imply. What is important in connection to the objective of this thesis is to show that IO is experienced to imply a need for structure by ‘someone taking charge’.

When talking of how technology was found to support interaction in the team, they mentioned how the use of videoconference saved time that previously was spent travelling between locations. This was considered as an advantage both for the company that saved resources, and for the individual team member, as travelling was considered cumbersome and time-consuming. Tove also mentioned how videoconference is experience to reduce the distance

between offshore and onshore by making experts located on an offsite location available in less time:”*Team members are experienced as closer. It is a huge advantage in relation to making experts available in less time for instance*”. Technology is by the informants found to make team members more available and in less time, thus facilitating more frequent interaction between the team members.

In relation to how technology in IO may support the development of a shared understanding, the informants mentioned the sharing of real time data by the use of applications as a boundary object. They found that videoconference and the ability to share information by the use of applications made it easier to interpret the meaning that is conveyed in the communication and to develop shared understanding. Lars states:

*“Even though communicating in IO has its limitations, it helps me understand the situation at hand. It is like viewing a picture and a picture explains ten times more than just words. When I see a picture of an incident I get an immediate understanding of the situation. It is the same in videoconference, it helps me understand the context and the situation much better”.*

Erik also regards the sharing of documents by the use of applications as an important boundary object. Based on his statement, video facilities can also be understood as a boundary object reducing complexity due to many people being involved in the interaction:

*“In IO there are so many people involved and therefore I believe that it is a great advantage to have video facilities. Especially that we can view the same document”.*

To summarize, the informants experience technology both to make some constraints and to support interaction in the virtual team. First of all they perceive technologically mediated interaction in IO as complex due to many parallel centre of attention, time-delay, noise and lack of training in mastering the technical equipment. This prompts the need for structure and rules which must be governed by someone in charge. But technology in IO is also related to saving time and resources as well as being a boundary object, which is found to enable interactions that support the development of a shared understanding. This is considered a precondition for the development of complementary knowledge which will be looked into in the category presented next.

### **Complementary knowledge**

As could be seen in the empirical findings presented under the category Shared understanding, the development of a complementary and holistic perspective is considered decisive in order to make qualitative good decisions in the virtual team. In relation to this



objective, heterogeneity is viewed as a possibility, or even a premise, for developing complementary knowledge as a fundament for decision-making by the informants. How Erik comes to think of heterogeneity as a condition for possibilities can be seen in the following quotation:

*“We are different as persons. We come from different backgrounds. We are concerned with different things and the way of doing them. Some say it should be more homogeneous, but I say we should encourage diversity and appreciating the possibilities that follow from heterogeneity. I don’t think an organization strengthens from everybody being an exact copy of one another”.*

Here Erik points to the difference between the team members. The team is comprised of multidisciplinary team members with different personalities, making the team heterogeneous. He finds this to be a good thing and asserts that this diversity should be encouraged and appreciated as he believes this diversity will strengthen the organization. In the next quotation he goes more into depths on how this is to be achieved by reflecting on how this holistic perspective is associated to the development of complementary knowledge:

*“Our competence is different and I experience... that we cover more areas and that we develop a more holistic understanding. We are sharing information and people are giving the impression that they are more updated and that they have developed more knowledge. And knowledge is great. One might get the impression that a person doesn’t need much knowledge regarding processes that isn’t directly related to his own field of expertise. But I think it is important to understand the bigger picture”.*

Like Erik, Lars also finds heterogeneity to be positive as it postulates complementarities. He considers this an important premise for decision-making in IO:

*“It is natural, and even an expectation, that different team members complement each other. A complementary team is the best foundation for decisions. We think in different ways and have different approaches. I think that is positive. We complement each other. It gives us a holistic perspective. Who brings the information is less important, as long as we get the overall picture right”.*

The empirical findings in this category show that the informants view heterogeneity as a possibility for developing complementary knowledge. Through their interdependent relationship, the sharing of information and the development of a holistic perspective, makes the development of new knowledge and a shared understanding possible. This is believed to support the process of decision-making in the multidisciplinary virtual team.

## **6. Discussion**

The purpose of this study was to gain insight into how the interdependent relationship between virtual team members is perceived to affect interaction and the process of developing knowledge in the team. In this chapter the empirical findings from the case study will be discussed in relation to the theoretical perspectives presented earlier in this thesis. The structuring of this chapter can be seen as a natural progression in relation to the contents of the research question. And so I will first discuss how the informants experience the interdependent relationship between the virtual team members and how this is perceived to affect interaction. This includes empirical findings related to involvement, presence, vulnerability, power and responsibility. Technologically mediated and multidisciplinary interaction is experienced to represent both challenges and possibilities for interdependent interaction and the process of developing knowledge due to complexity, time-delay, structure and knowledge boundaries on one hand and boundary objects, heterogeneity and complementary knowledge on the other. Trust and shared understanding are perceived as critical success factors in order to overcome these challenges and to support interaction and knowledge creation in IO. I will bring the discussion to a conclusion by discussing how the dialogical principles of perspective making and perspective taking may support the team's interdependent interaction and their development of knowledge by relating to the empirical findings of sharing information, listening and taking the other's perspective.

### **Characteristics of interdependency and implications for interaction**

The organizational concept known as Integrated Operations in Statoil implies interaction between team members with different and complementary competence, resulting in larger contact surface and enhance information rate. Such organizing is most common when work tasks require multidisciplinary expertise and swift changes (Torgersen & Steiro, 2009). In his seminal book "The fifth discipline" Peter Senge (1992) argues that team members can learn from each other in a holistic manner, making the knowledge and competence in the team more than merely the sum of the individuals together. This is what characterizes interdependency. The empirical findings in this particular case study illustrates that the team members perceive their relationship as interdependent, and in the following I will present the different characteristics associated to their interdependent relationship, and discuss how it may affect interaction in the virtual team.

### **Involvement and presence**

One central characteristic with the interdependent relationship can be seen as related to involvement and the importance of team members taking active part in interaction. According to Buber (1995) an interdependent relationship requires active participation and a response in the encounter with the other. In the interviews the informants reflected upon how team members being remotely located may chose to be less involved or even to withdraw from interaction. This was experienced to inhibit interaction in the virtual team. All the informants acknowledged that it was natural and understandable if team members remotely located, especially if they were alone on the remote location, felt less involved. Nevertheless, they stated that if people chose to withdraw from interaction this might prevent the team in reaching their objective. Team members talking in the telephone or working on their PC was further experienced to interfere with the focus of attention and to interrupt interaction. The importance of being aware of how a lack of involvement could affect interaction was thus emphasized and the responsibility for involvement was further considered as collective.

Withdrawal was regarded as being less involved and this was not considered to support interaction or the team's possibility for fulfilling its objective. According to MacMurray (1999) actions are the basis for relational learning in an interdependent relationship, and withdrawal can be understood as a necessary phase in interactions supporting development and learning. Whether a withdrawal is to be considered positive or negative is dependent upon whether it is permanent or temporarily, involving a return (Kvalsund, 2003). It is thus important to note that being temporary in a withdrawn position does not necessarily affect the outcome of interaction negatively. As can be understood from the contact, withdrawal and return cycle by MacMurray (1999), a withdrawn position where a person is preoccupied with listening and understanding the other, is a natural consequence of interacting. This implies taking the other's perspective, which was perceived as a necessarily means to accomplish shared understanding and complementarity within the team by the informants. By listening to the other's perspective, team members can withdraw into reflection and consider this new information as may be experienced as a resistance in relation to his or hers own initial understanding. This may require team members to revise and alter their understanding, as in an adaptive learning process.

The informants further reflected upon how physical presence made involvement easier as interaction was found more personal, spontaneous, direct and unreserved. This is not to say that everything needs to be shared, it is rather dependent on the legitimacy, to be able and

willing to share what is needed in order to develop shared grounds and understanding. According to the informants, *presence* counteracts distrust and misunderstandings and can be understood as a need for awareness in relation to having an attentive attitude towards all team members comprising the virtual team. The way I comprehend presence in Buber's works it is related to such an *authentic* and *personal attitude* towards the other, and in accordance with MacMurray's (1999) concept 'persons-in-relation'. In this presence, and through the immediacy of the here and now, we put our self as subject aside and relate to others as agents. An interdependent relationship thus requires participation and involvement (Kvalsund, 2003) supported by an attentive attitude towards all team members.

### **Vulnerability and power**

According to Løgstrup (2000; 1987) an interdependent relationship involves a change between being vulnerable and being in power. In an interdependent relationship we are dependent on the other person's reactions and his, or hers, willingness to accept us as who we are. This makes us vulnerable. In the same time we are also in a position of power, as we are to accept the other and to respond to his or hers vulnerability. An interdependent relationship can thus be understood as implying a movement from self-sufficient independency into more insecure interdependency (Allgood & Kvalsund, 2003). Power is thus a central aspect within interdependent relationships and will affect the way we interact, as a potential that can be manifested in both positive and negative ways (ibid.; Løgstrup, 2000). A *negative* use of power involves imposing others our own intentions and attitudes whereas a *positive* use of power is to support what is authentically present in others. This is a pedagogical attitude that goes beyond teaching. It is a relational meeting between people that supports development as a process, by moving from where we are to where we want to be (Buber, 1995). Power as such is thus neither to be perceived as positive nor negative, but as a potential force or energy that can be used within the interdependent relationship, and that may have both positive and negative outcome (Allgood & Kvalsund, 2003).

When the informants talked about the power relationship between team members onshore and offshore, they reflected upon the possibility for team members offshore feeling that others had 'power over' them. The term 'power over' has a negative connotation, indicating a asymmetrical and controlling use of power over the other to use 'it' for his own purpose, thus objectifying the other (Allgood & Kvalsund, 2003). If there is such a feeling of power unbalance within the relationship, there may be established resistance against the other in fear of power being negatively motivated. This resistance can be understood as a manifestation of

power from team members located offshore and as a means to restore the power balance within the relation. If team members relate to each other as equal persons there will be a positive power in the relationship which implies that there is no need on either part to control or use ‘power over’ the other (Kvalsund, 2003). As such, resistance may be perceived as having a positive effect on making the relationship more equal. But a negative consequence of resistance, if team members offshore for instance chose to withdraw from interaction, is that the inner relationship between team members may suffer, as withdrawal can be understood as avoiding the other’s influence by an exclusive action. An interdependent relationship requires a symmetrical relationship where power is shared between team members and where interaction is inclusive rather than exclusive through keeping power for oneself (ibid.).

The informants in this case study stressed the need for specific and detailed rules for governing their interaction in IO, managed by ‘someone in charge’. This can be understood as a pragmatic means to ensure that team members act in accordance to some agreed upon principles which might provide a sense of security and remove the necessity for self-defense and withdrawal (Macmurray, 1999). As such, rules may be understood as supporting interaction in the virtual team by reducing the possibility for someone having ‘power over’ others and to consolidate an important principle in interdependent relationships. The way I comprehend the empirical findings from this case study, I find that they represent a view of power as a dynamic process in the relationship between the virtual team members. The overall principle is empowerment through involvement, which is perceived to require symmetry in the power relationship. At the same time there is also experienced a need for ‘someone in charge’: “*We need to know who has the last word to avoid chaos and endless discussions*” (Erik). It seems there needs to be a flexibility and a discernment in the power relationship, allowing for someone to have more authority, without deviating from the principle of equality.

### **Responsibility**

Due to the above mentioned characteristics of involvement and power, interdependent relationships involve responsibility (Buber & Simonsen, 2003; Løgstrup, 2000). By the informants in this case study this is experienced as a collective responsibility for including all team members in order to support involvement, which can be understood as involving responsibility for *responsiveness* (Allgood & Kvalsund, 2003). Responsiveness implies being actively involved in interaction – to respond. Such involvement is perceived to strengthen and unify the team, both by taking initiatives and by responding to other’s initiatives (Jarvenpaa &

Leidner, 1999). As technologically mediated interaction is found to entail greater uncertainty than face-to-face communication (Daft, et al., 1987) there tends to be an intense need for response in virtual teams (Hawisher & Moran, 1993). Responsibility in interdependent relationships is also related to the quality of this responsiveness, whether it is perceived as morally or ethically responsible (Buber & Simonsen, 2003; Løgstrup, 2000). This is due to the above mentioned characteristics of vulnerability and power within the interdependent relationship. When Lars talked of how clarifying what can be expected of each other through role documents, this can be understood as a means that secures the need for responsible and moral interaction in the team: *"In order to interact as a team we need to understand our role, to clarify what can be expected from each other. This creates safety and a possibility to challenge each other."* Role documents facilitate predictable and responsible interaction which is experienced to reduce uncertainty. This makes it possible to challenge each other, and one's own knowledge and beliefs, thus supporting an adaptive learning process within the team.

Taken together, the informants in this case study perceived the characteristics of involvement, presence, vulnerability, power and responsibility related to their interdependent relationship to have consequences for the way they interact in the team. First of all they experience that interaction needs to involve active participation and an attentive attitude towards all team members and a feeling of presence. Interaction also needs to be inclusive and to reflect an open and equal relationship between team members. Responsibility for taking initiatives and responding to other's initiatives was further perceived as an important implication of interdependence. Rules and role documents can be understood as pragmatic means to support interdependent interaction in the team and may counter some of the challenges related to technologically and multidisciplinary interaction presented below.

### **Challenges related to multidisciplinary and technologically mediated interaction**

In the empirical findings some challenges related to technologically mediated and multidisciplinary team work is expressed and it is thus relevant to look at how technology is perceived to affect interdependent interaction and knowledge creation in the virtual team.

#### **Complexity and structure**

In this case study I found that team members adapt to the restrictions of the medium even though technology is implemented to support and enable a desired work practice – not the other way around (Rindahl, et al., 2009). The development of structures to support interaction is an example of how this adaptation is being attended to in the virtual team. This need for

structure is caused by information overload with heightened complexity and interactivity, which makes it more difficult to maintain overview when making decisions, as a high number of factors need to be considered along with the evaluation of a high number of solutions. This correspond with prior research stating that virtual teams need more discipline and structure compared to collocated teams, and that agreeing upon a set of norms or ground rules may support interaction and enhance communication (Nemiro, 2008). The virtual team in this case study has already developed some procedures to support their interaction by sending out pre-read in advance, making them well prepared for meetings. Together with role documents and a responsible onsite facilitator, this facilitated a structured meeting agenda. Structure is perceived to make interaction less spontaneous and natural in the virtual team, causing communication to be more formal. This is perceived to inhibit interaction supporting the process of decision-making by Lars: *“The interaction needed in order to make decisions is a bit informal... it takes brainstorming, and communication must be spontaneous. If you have five persons taking simultaneously in videoconference, this will be a challenge...”* and Tove: *“I believe big discussions, where everybody is participating and presenting their point of view, and where we are to develop a consensus, is too complex for videoconference. It takes structure by initially presenting something in advance and then to subsequently follow this up in videoconference.”* This need for structure does not support interaction that is known to facilitate adaptive learning as it may inhibit the process of transferring and transforming knowledge between different communities of knowledge by reducing the number of questions asked, and inhibit the possibility for making more spontaneous reflections, that might reveal tacit knowledge and assumptions taken for granted. A reduced number of critical questions may reduce the possibility for reflection within the team, and cover up misunderstandings due to different situational understandings, giving the team members an impression of consensus, even though there is no such concurrent understanding (Grøtan & Albrechtsen, 2008). This *false consensus effect* (Ross, Greene, & House, 1977) is a bias particularly relevant to the process of taking other team member’s perspective into account through *perspective taking* (Boland & Tenkasi, 1995). In virtual teams, where team members are geographically dispersed and communication is mediated by technology, misunderstandings arise more easily and it is more difficult to reveal that a misunderstanding actually has occurred (Larsen, 2008). This is also reflected upon by Lars: *“Even though we are not that far apart, it is far enough to create, not distrustfulness or suspiciousness, but misunderstandings... There is a need for something... to remove possible grounds for misunderstandings due to geography”*. This may reduce the contextual understanding between team members located offshore and onshore, representing challenges

in relation to both HSE decisions and reduce the possibility for utilizing existing knowledge, as well as the potential for developing new knowledge through a process of adaptive learning.

### **Lean communication and trust**

Another consequence of structured and formal interaction is related to the development of trust, as more informal and spontaneous interaction, which is found to support the development of affective trust by the informants, is impaired. According to Jarvenpaa and Leidner (1999) interactions are the key to build relationships and subsequently trust between virtual team members. The development of trust and knowledge is thus impaired by the fact that technologically mediated interaction is perceived to have less communication cues, such as tone of voice, volume, eye movement, facial expressions and gestures, to convey tacit or cultural knowledge than face-to-face interaction: "*In videoconference it is not so easy to pick up body-language... it is two-dimensional. If we are communicating face-to-face it is easier to pick up on comments and cues, both the formal and informal*" (Lars). This can be understood in relation to Media Richness Theory (Daft, et al., 1987) as the empirical findings from this case study suggest that communication mediated through technology cannot achieve the same quality as communication conducted face-to-face, as turn-taking, feedback and conversation flow is impaired.

### **Knowledge boundaries**

In relation to the theory on knowledge boundaries (Brown & Duguid, 2001; Osterlund & Carlile, 2005) and how this may represent challenges to the process of developing a shared understanding and complementary knowledge within multidisciplinary virtual teams, this is not perceived as a substantial challenge in this case study: "*There are differences in competence and there is generally too little information, which can be frustrating for some. But people are engaged, competent and have a lot of opinions. They are not reserved. And this breath of competence is important.*"(Erik). It seems there is an environment for acknowledging diversity and that this may support the process of sharing and acquiring knowledge across different boundaries of knowledge within the team. Another reason why knowledge boundaries may not be experienced as a considerable challenge in the team is reflected upon by Lars: "*As part of a leader team I am not expected to be an expert. But I need to understand what is communicated. It is ok to ask questions because I have a different background. Perhaps this is not so easy if you are an engineer?*" This empirical finding is important as it points to the specifics of the process of developing knowledge within the team - they are concerned with strategic decisions based on an overall understanding of the situation at hand rather than technical negotiations. In other



virtual teams with other objectives, the challenges with knowledge boundaries may be more essential. It is also important to take into consideration that this virtual team has been working together for a prolonged period of time and that they have developed considerable competence and understanding in relation to the different contexts and communities of knowledge represented in the team. The fact that they get together twice a year may also support the level of trust developed in the virtual team. Together, this may facilitate a safe and generative environment that counter challenges related to knowledge boundaries.

### **Possibilities with multidisciplinary and technologically mediated interaction**

Multidisciplinary and technologically mediated interaction is also found to support interdependent interaction and knowledge creation in the virtual team. Possibilities are experienced in relation to boundary objects, complementarities and a generative environment.

### **Boundary objects**

As could be seen in the empirical findings, both Lars and Erik point to the sharing of applications as one important advantage in relation to supporting the development of a shared understanding in IO. As with applications, video images of other team members is further perceived to enhance communication and support interaction. This is in coherence with Media Richness Theory (Daft, et al., 1987) stating that videoconferencing is relatively high in media richness and synchronicity as team members can view and listen to each other during meetings (Maruping & Agarwal, 2004). The fact that team members are able to read other team member's body language, facial expressions and poses is in Media Richness Theory believed to enhance rich communication and support the interaction in virtual teams (Daft, et al., 1987). Videoconferencing can thus reduce the sense of both physical and psychological distance (Zornoza, Orengo, & Penarroja, 2009). This is known as *virtual copresence*, a psychological perception that others are present or physically collocated, giving a subjective feeling of being together with others in a virtual environment (Daft, et al., 1987; Ma & Agarwal, 2007). Increased feeling of a virtual copresence facilitates socialization of virtual team members, creating a sense of connection and closer ties between team members, and supports the development of affective trust (Altschuller & Benbunan-Fich, 2010). Such virtual copresence can give team members a feeling of community and thus improve the efficiency of learning. The technology in IO is thus perceived as a boundary object which facilitate knowledge sharing and bridge the gap between different locations and knowledge boundaries (Hepsø, 2009). If there are no boundary objects, this will limit the process of perspective taking and further the process of developing knowledge (Boland & Tenkasi, 1995).

### **Complementarities**

According to Nardi and O'Day (1999) a complex system of people, practices and technologies in a particular context can be described as an *information ecology*. In this ecologic perspective knowledge is understood as developed through complementary interaction as diversity is necessary for an ongoing development, adaption and creation of new knowledge. As an information ecology, interdependent virtual team members can complement each other by combining their resources, strengths and competencies through technologically mediated interaction, resulting in complementary knowledge and better grounds for decision making. This is in accordance with Torgersen and Steiro's (2009) definition of interaction, where complementarities are central as a prerequisite for sharing and assessing knowledge by multidisciplinary team members supplementing each other. According to Torgersen and Steiro (2009) these complementarities promote development and learning. Such an interdependent and complementary relationship can also be found between the team members in the virtual team in this case study. In this study the interdependent relationship between multidisciplinary team members is perceived to support the development of a generative environment which may enhance the development of complementary knowledge and high-quality decision-making in the virtual team as fragmented, specialized and distributed knowledge can be integrated into a more holistic understanding resulting in safer and more effective decisions - an important contribution in developing and sustaining a competitive and agile organization.

### **Critical success factors for interdependent interaction and knowledge creation**

Due to the above mentioned characteristics within the interdependent relationship, and the challenges related to technologically mediated and multidisciplinary interaction in the virtual team, the informants found that there need to be developed an experience of trust for interaction in the virtual team to succeed.

### **Trust**

For trust to develop in a relationship the actors need to be aware of the interdependency in the relationship and they must be willing to accept the responsibility that follows from it and to act accordingly (Kristiansen, 2005). In this case study trust is especially found to be fundamental in the interdependent relationship between team members working onshore and offshore.

According to Løgstrup (2000) the fact that there is power present in every interdependent relationship does not mean that there cannot be trust. What seems decisive in order for trust to develop, even though we are vulnerable as a consequence of the other person's position of power, is our experience of how this power is used. If it is used in accordance to the ethical demand, and as a responsibility to respond to the request put forward by the other, power may indeed support the development of trust. If power is used in contradiction to this, the power in the relationship will counter the development of trust (Løgstrup, 2000). If interaction between team members onshore and offshore is to promote the development of trust, team members onshore need to communicate clearly that their intent is to generate remote *support*, which has vastly different implications than having 'power over'. Team members offshore further need to trust that the team's effort is to act out of what is considered to support the team and the operation best overall, and not necessarily on the basis of what gives the highest profit. The statement: "*We are all in the same boat*", as was uttered during a meeting I observed, can be understood as a supportive statement that communicated that all team members are responsible for the team's actions and performance and that the perceived risk offshore is taken seriously and that they are listened to. This sharing of risk is found to promote the team's sense of community and the development of trust between team members located offshore and onshore (Skjerve & Rindahl, 2010).

According to Buber (1995, 2002; 2003), trust evolves on the basis of interaction and in the relationship between people that interact. Trust is by Buber (2003) believed to be accompanied by a feeling of connectedness between those who are interacting and may inspire to involvement by giving the courage to address and the courage to respond. If there is trust present in the relationship between the team members, this may prohibit withdrawal from interaction (Kristiansen, 2005), as trust creates a safe environment that gives team members greater latitude and may cause team members to be more open, participating and engaged (Spurkeland, 2005). Trust makes it possible to have disagreements and to learn from other's perspectives. As such, trust may be a liberating force that gives people courage to be curious and interested in realising their potential. Team members that trust each other, are more willing to change perception and understanding of the situation at hand and to share knowledge (McEvily, Perrone & Zaheer, 2003). Trust thus fosters receptivity to other team member's ideas, motivates the exchange of information and knowledge, and reflects the quality of team member's interaction (Zornoza, et al., 2009). In this way, trust may support the development of knowledge in virtual teams. If there on the other hand is a lack of trust

between members in the virtual team, this may prohibit team members from sharing opinions openly and informally, making it harder to develop shared understanding (Daft, et al., 1987). Low trust between team members thus causes teams to work harder to make qualitative good decisions compared to teams where team members have developed high levels of trust (Jarvenpaa, et al. 2004). This is why trust between team members is considered a prerequisite for successful interaction and knowledge creation in virtual teams (Cohen & Gibson, 2003).

According to Buber (2002; 2003) trust is perceived as the result of a dynamic process and cannot be defined as a static quantity. To claim that there is trust in a relationship, thus implies that there is a shared experience of trust among those who are interacting (Spurkeland, 2005). Trust in relations is thus not an individual feeling, rather an interpersonal experience (Buber & Simonsen, 2003). The empirical findings from this case study show that the informants perceived the development of trust as a process that takes time as it is associated to require repeatedly trustworthy interactions. This is in accordance with a traditional conceptualization of trust as strongly related to interpersonal relationships (Jarvenpaa & Leidner, 1999). Such affective based trust is based on an evaluation of a team member's personal assessments such as benevolence and integrity. The amount of time needed for affective based trust to develop may represent a challenge in virtual interaction as the tight deadlines and virtual interaction impedes relationships building.

But Tove also reflected upon how being accustomed to interaction mediated by technology might make it easier to develop trust in less time when interacting virtually: *"The amount of time required to develop trust may depend on how experienced one is with virtuality. If you are accustomed with interacting in a virtual team you may develop trust more easily"*. This is also reflected upon by Erik: *"(...) it is easier if you know people, but if there is a new team member, which I haven't seen before and which I will not see again before in three months time, I trust him just the same. In relation to his abilities, it makes no difference"*. These statement can be understood in relation to the concept known as *swift trust* (Meyerson, Weick, & Kramer, 1996). Swift trust is formed fast and represents an instant experience of trust based on team members propensity to trust by dispositional factors (Gargiulo & Ertug, 2006) and is closely related to Løgstrup's (2000) concept natural trust. Initial trust is built upon the assumption that team members are competent, committed and capable. Such cognitive trust is based on thinking rather than feeling and can therefore develop faster than affective trust (Baan & Maznevski, 2008). As virtual team members may be hindered from making firsthand personalized assessments, team

members import expectations related to role- and rule-based factors as well as third party information, forming a stereotypical impression of others (Jarvenpaa & Leidner, 1999). Lars reflected on how a virtual relationship can be based upon a fragmented and incorrect perception of others: “*When you interact with a virtual team member you may think that you know that person. But when you actually meet them [physically collocated] it is like you have never seen them before. We have no personal relationship*”. Swift trust is depersonalized, fragile and temporal and presupposes the development of cognitive or affective based trust through a history of interaction (Greenberg, Greenberg, & Antonucci, 2007). In this subsequent development of trust, the determinants of trust change as team members get to know each other and develop relationships, from initially cognitive assessments of other’s abilities and integrity, to increased emotional assessment of benevolence.

One might get the impression that the higher the level of trust in a relationship or within a team, the better. According to Gargiulo and Ertug (2006) this is not necessarily the case as *excessive trust* may have associated costs. Too much trust may result in implicit confidence where team members avoid making inquiries. This may prevent them from looking at a situation from different perspectives and prohibit the potential for unveiling a more holistic understanding. This may represent challenges in relations to safety as well as impede the possibility for a more general development of knowledge within the team.

As trust is perceived to enhance involvement by reducing withdrawal, and to support open communication where team members dare to take a naive stance and to open up to the knowledge within other communities of practice, the development of trust is a prerequisite for developing a shared understanding which is perceived as a second critical success factor for interdependent interaction and knowledge creation within the team.

### **Shared understanding**

The informants found the development of a shared understanding decisive in order to succeed with interaction in Integrated Operations. Such shared understanding can be understood as: “(...) the presence of active, mutual knowledge about data and experiences, meanings, assumptions, conclusions and beliefs” (Baan & Maznevski, 2008) and is based on insight into different connections in the context and a rich awareness, implying enhanced sensitivity to different team members and their competence, and in the extension of this, to the operations themselves. Shared understanding is thus the fundament for developing knowledge within the team.

A lack of shared situational understanding may result in conflicting goals as team members act on restricted understanding of the situation at hand. In order to avoid conflict and defensive behaviour, team members need to understand and reconcile different perspectives and to build a shared mental model that facilitates shared understanding. Shared understanding is thus considered one of the most important premises for virtual teams effectiveness and their ability to make safe and cost-effective decisions in IO (Nemiro, 2008).

Generating shared understanding can be more difficult in virtual teams compared to teams where members are collocated (Hinds & Weisband, 2003) and in multidisciplinary teams compared to heterogeneous teams (Torgersen & Steiro, 2009). In multidisciplinary virtual teams, team members bring with them a wide range of tacit differences in perspectives. Due to differences in contextual understanding and expertise, team members comprising the virtual team develop different focus of attention and additional frames of reference. Different assumptions and beliefs in a team are rooted in different *mental models* among team members (Tan, et al., 2000). Operations in IO thus represent a vast and complex field which makes the development of shared understanding more challenging. For a specialist, who is involved in a large operation, the development of a holistic understanding may require knowledge way beyond his field of expertise and this makes the development of a shared mental model crucial in order to develop shared understanding within the team. Olson and Olson (2000) concludes that the success of virtual teams depends on team members having *common ground*, or such shared understanding through shared knowledge among team members who are aware that they share this knowledge.

### **Supporting interdependent interaction and knowledge creation through dialogue**

From an overall perspective, the process of developing knowledge in the virtual team must be facilitated by interaction enforcing and supporting the perceived characteristics of interdependent relationships. This implies a dialogic way of thinking and acting in order to develop a shared understanding and to interacting in ways that make the most of the competence of team members and to develop it further (Torgersen & Steiro, 2009). According to Carl Rogers (Ivey, 2007) the first step towards developing a shared understanding is listening and learning how others construe events. By empathizing, we can understand other team member's perspectives, which requires team members to make inquiries into their own mental models and their taken for granted assumptions (Senge, 1992, 1999). This is understood as part of the contact-withdrawal-return cycle by MacMurray (1999) and as a

prerequisite for relational learning. As the informants pointed out, interaction supporting the development of a shared understanding and a holistic perspective, is perceived to involve listening and taking the other's perspectives. This was in fact considered the most fundamental premise for interaction in Integrated Operations to succeed. This is also supported by Schein (1993) who argues that the development of shared understanding among team members, in other words a shared mental model, can be supported by the use of dialogue techniques.

The principles of dialogue techniques can be understood by the concepts of *perspective making* and *perspective taking* by Boland and Tenkasi (1995) presented earlier in this thesis. Perspective making includes developing a strong perspective and being able to communicate the meanings inherent in this domain specific knowledge to other, more naive team members, in a comprehensible manner, thus supporting their process of perspective taking and the process of developing a shared understanding in the team as a whole. Virtual teams that use such dialogue techniques are more likely to interact in ways that support open communication and where team members help each other to overcome obstacles and to find solutions (Tan, et al., 2000). In relation to the interdependency paradigm, perspective making can be seen as related to building an independent individuality, whereas perspective taking makes it possible to at the same time include other's perspectives in a larger unity. Together the principles of perspective making and perspective taking make a synergy, representing a different and more holistic perspective. In one of the meetings I observed, one team member made an open inquiry regarding the meaning of the word "risk". She argued that she was engaged in uncovering what they really put into the word and to develop a mutual understanding of its connotations. This is an example of a reflexive analysis of *tacit knowledge* (Polanyi, 2000) in which words are "(...) considered as to their changing meanings and uses, their shifting context and connotation, and the implicit and tacit assumptions they reveal" (Boland & Tenkasi, 1995, p. 368). This was an inquiry into taken-for-granted ways of thinking and supported the process of perspective making and perspective taking within the team. In virtual teams, team members need to pay attention to the assumptions taken for granted in order to understand how much of the context and information is shared: "what do we need to say and what can we leave tacit?", as this supports the development of a shared understanding (Hepsø, 2006).

According to Løgstrup (2000; 1987), Buber (1995, 2002; 2003) and MacMurray (1999) the attention towards *the other* is an important characteristic in interdependent relationships. This implies putting the other's interest up front and to be engaged in other's concerns. To enter the other's perspective means to leave your own subjective perspective for a while: "It is losing self-consciousness to attend to the other" (Allgood, 2003, p. 70). This does not imply altruism, meaning to forget oneself in the relationship, but to be able to understand the other from his, or her, own perspective (Kristiansen, 2005). This attention towards the other can be achieved by listening and taking the other's perspective and requires an emphatic attitude. Løgstrup (2000) thus points to the dialectic relationship between individuals interacting in an interdependent relationship - interacting with others in interdependency involves a *silent* responsibility for responsiveness, which is to say that our response is not predefined by *my* needs, or even what the other asserts as *his* or *her* needs. Interacting with others in an interdependent relationship does not imply indulgence or altruism, it is rather a way of interacting that expands our perspectives and supports the development of a wider horizon (Løgstrup, 2000). According to Buber (2003) there exist great opportunities, unknown to us, in interdependent relationships as it is through this interaction we can develop new knowledge and understanding, and where the potential for what might be, is situated.

In the above I have discussed how the perceived characteristics within the interdependent relationship require active participation and an open and equal relationship where all team members are responsible. Due to complexity and leaner communication in technologically mediated interaction, the virtual team has developed a structured and formalized interaction. This is found to provide a means for facilitating interdependent interaction, but may also impede the development of affective trust and the possibility for developing knowledge through an adaptive learning process. On the other hand, technologically mediated interactions may work as boundary objects, supporting the development of a shared understanding and knowledge creation. Multidisciplinary interaction is primarily perceived as a possibility for developing a holistic understanding and complementary knowledge, providing better grounds for making safe and high-quality decisions. The development of trust and a shared understanding are further perceived as critical success factors for interaction in IO. Making a strong perspective, as well as having the capacity to take other's perspectives through dialogue in a social learning situation, seems decisive in order to develop shared understanding and eventually knowledge within the virtual team.



## **7. Conclusion**

This study sought to explore how the interdependent relationship between virtual team members is perceived to affect their interaction and the team's process of developing knowledge. This was done through an empirical case study by exploring virtual team member's experiences on how technologically mediated and multidisciplinary interaction was perceived to represent challenges and possibilities related to interdependent interaction and knowledge creation in Integrated Operations.

The empirical findings from this particular case study suggest that the virtual team members perceive their relationship as interdependent and that this has implications for interaction and the process of developing knowledge within the virtual team.

Firstly, for knowledge sharing and creation to take place, team members must acknowledge their interdependent relationship and act in accordance to the perceived characteristics within this relationship. This implies an active, open, equal and responsible participation from all team members.

Secondly, the challenges related to virtual interaction must be complied by facilitating the development of trust and a shared understanding between virtual team members as this is perceived as critical success factors for knowledge transfer and transformation. In this case study rules and structures provide the team with a pragmatic and efficient means to support interaction but to a less extent by reference to the intentions to be realized through them. An additional awareness of the importance of trust and power between team members could strengthen the experience of an open and equal relationship within the virtual team.

Finally, knowledge creation and sharing must be supported by a willingness to listen to other voices and experiences through the dialogical principles of perspective making and perspective taking. This implies developing a generative environment where knowledge sharing and complementarities are valued. Successful knowledge creation is not triggered only by adopting to innovative technology, like videoconference and applications for real time data sharing, but by team members moving towards altruism and interdependent interaction.

### **Limitations of the study**

This thesis does have its limitations. First of all it is a case study and the research sample is restricted due to the extent of this thesis and the choice of qualitative in-depth interviews. This requires caution in generalizing the empirical findings and may require more research to

substantiate the findings. This study does however represent valid information on how these virtual team members perceive the possibilities and challenges related to interdependent interaction in Integrated Operations and how this is experienced to support or inhibit the development of knowledge within the team at this point.

Secondly, this case study was conducted within a Norwegian context, representing a Western, individualistic culture. It has been suggested that individuals from individualistic cultures are more ready to trust other team members and engage in more open and precise communication than individuals from collectivist cultures (Gudykunst, 1997). In other virtual teams, and especially in virtual teams where team members represent greater cultural diversity, the effects of trust on interaction and the process of learning may be quite different.

It is not within the frames of this study to discuss the social, political, economic and cultural forces that has led to the implementation of Integrated Operations. To avoid technological determinism it is thus important to remember that IO operates within a larger historic context (Yates & Van Maanen, 2001). The empirical findings in this case study are further interpreted from a pedagogical and relational point of view and within a social constructivist perspective. This implies stressing some perspectives while others are simplified. This thesis does not offer normative knowledge on how to support interaction and the process of developing knowledge in the virtual team. The intention is to offer a perspective from a pedagogical and relational view by pointing at the subjective experiences to those involved in this case study. By calling attention to these experiences I hope to support an ongoing process of reflection and learning. Eventually it is up to the reader to decide whether this is experienced as relevant.

### **Implications for further research**

Upon completing this thesis I find that there are still many questions that I would like to explore, but this time it was only possible to go this far. Based on the empirical findings it would have been interesting to explore whether the principles of dialogue, like the one's of perspective making and perspective taking by Boland & Tenkasi (1995), could be integrated in a way that support the development of knowledge and decision-making in virtual teams.

The empirical findings in this case study show that the informants experienced the need for structure through management within IO settings. This complies with other research (Nemiro, 2008; Torgersen & Steiro, 2009) and it would be interesting to study what kind of leadership

would be preferred in order to support this need as well as the objective of facilitating processes for development and learning.

It would also have been interesting to look into whether an enhanced awareness of power and trust in the interdependent relationship between team members onshore and offshore would strengthen an inclusive interaction and how this could affect the possibility to develop Integrated Operations further.



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## **Appendices**

Appendix 1 – Interview guide

Appendix 2 – Letter to informants

Appendix 3 – Participant consent form

Appendix 4 – Receipt from NSD

Appendix 5 – Narrative illustrating interdependence in the case

Appendix 6 – Illustration of empirical findings



## **Appendix 1 – Interview guide**

Takke for at hun/han stiller opp og informere kort om formålet med studien

Informere om varighet, konfidensialitet og anonymitet

### **Innledende spørsmål**

Hvor lenge har du vært en del av det virtuelle teamet som utgjør caset i studien?

Hva legger du i begrepet Integrerte operasjoner?

Kan du beskrive din første opplevelse med bruk av IO?

### **Samhandling**

Hva legger du i ordet samhandling?

Hvordan opplever du at IO påvirker teamets samhandling?

### **Relasjoner og tillit**

Hvilken betydning tror du relasjoner mellom teammedlemmene har for samhandlingen i IO?

Hvordan opplever du utviklingen av relasjonene mellom teammedlemmene?

Opplever du forskjell mellom hvordan tillit utvikles i virtuelle team sammenlignet med samlokaliserte team?

Kan du se for deg en situasjon i IO der grensene for din tillit blir utfordret?

### **Beslutninger som læringsprosesser**

Hva opplever du som avgjørende for å få til gode beslutningsprosesser i IO?

Opplever du noen utfordringer i forbindelse med beslutningstaking i IO og hvordan møter du i så fall disse utfordringene?

I hvor stor grad føler du at det er rom for uenighet og ulike synspunkter når beslutninger fattes?

Hender det at du innrømmer feil eller åpent erkjenner tvil?

Hvilken sammenheng er det mellom læring gjennom deling av kunnskap og beslutningsprosessen i IO slik du opplever det i dag?

### **Avslutningsspørsmål**

Noe annet du har lyst å nevne?

Vil det være mulig å kontakte deg igjen dersom jeg skulle ha behov for å avklare noe, eller eventuelt stille noen flere spørsmål?



## Appendix 2 – Letter to Informants

[fjernet]

**Anne- Marte Furmyr Johansen**  
**Institutt for voksnes læring og rådgivningsvitenskap**  
**NTNU**  
**7491 Trondheim**

**Trondheim, 23.02.2011**

### **Forespørsel om å delta i intervju i forbindelse med masteroppgave**

Takk for velvillig deltakelse i observasjoner i tilknytning til min masteroppgave i pedagogisk rådgivning ved NTNU. Som tidligere informert ønsker jeg å studere samhandling mediert ved bruk av teknologi i Integreerte operasjoner. Utgangspunktet for studien er å se hvordan relasjoner påvirker denne samhandlingsprosessen og utvikling av kunnskap knyttet opp mot beslutningsprosesser. Jeg ønsker nå å undersøke deres subjektive opplevelser av samhandlingsprosesser i IO og jeg er interessert i å finne ut hvilke likheter og forskjeller det er mellom disse opplevelsene, eventuelt om det finnes forskjeller og likheter knyttet til lokasjon.

For å finne ut av dette, ønsker jeg å intervju tre personer med erfaring fra Integreerte operasjoner og det er ønskelig med en person fra hver lokasjon for å ivareta mangfoldet i casestudien. Spørsmålene vil dreie seg om meninger og opplevelser knyttet til egne erfaringer med samhandling i Integreerte operasjoner. Jeg vil bruke båndopptaker og ta notater mens vi snakker sammen. Intervjuet vil ta omtrent en time, og vi blir sammen enige om tid og sted.

Det er frivillig å være med og du har mulighet til å trekke deg når som helst underveis, uten å måtte begrunne dette nærmere. Dersom du trekker deg vil alle innsamlede data om deg bli slettet. Opplysningene vil bli behandlet konfidensielt, og enkeltpersoner vil anonymiseres i den ferdige oppgaven. Selv om alle informanter anonymiseres, finnes det en mulighet for at deltakere i studien vil kunne gjenkjennes indirekte av andre med inngående kjennskap til teamet som utgjør caset. Opptakene slettes når oppgaven er ferdig, innen utgangen av august 2011. Studien er godkjent av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste A/S.

Hvis det er noe du lurer på, kan du kontakte meg eller min veileder Jonathan Reams.

Dersom du har anledning til å la deg intervju, ber jeg om at du fyller ut vedlagte samtykkeerklæring og tar den med når vi møtes for intervju.

Med vennlig hilsen

Anne-Marte Furmyr Johansen  
E-post: [fjernet]  
Mobil: [fjernet]

Førsteamanuensis Jonathan Reams  
E-post: [fjernet]  
Mobil: [fjernet]





## Appendix 3 – Participant consent form

### Samtykkeerklæring

Jeg har mottatt informasjon om studien: *Interaction in Integrated Operations – from a Relational and Learning Perspective* og ønsker å stille til intervju.

Jeg har blitt informert om hensikten med studien og hvordan opplysningene jeg gir vil bli brukt. Jeg har blitt opplyst at jeg når som helst kan trekke meg fra studien dersom jeg skulle ønske det og at dette ikke vil ha noen konsekvenser for meg.

Signatur ..... Telefonnummer .....

E-post: .....



## Appendix 4 – Receipt from NSD

Norsk samfunnsvitenskapelig datatjeneste AS  
NORWEGIAN SOCIAL SCIENCE DATA SERVICES



Harald Hårfages gate 29  
N-5007 Bergen  
Norway  
Tel: +47-55 58 21 17  
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Org.nr. 985 321 884

Jonathan Reams  
Institutt for voksnes læring og rådgivningsvitenskap  
NTNU  
Loholt allé 85  
7491 TRONDHEIM

Vår dato: 23.12.2010

Vår ref: 25594 / 3 / KH

Deres dato:

Deres ref:

### KVITTERING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 24.11.2010. All nødvendig informasjon om prosjektet forelå i sin helhet 22.12.2010. Meldingen gjelder prosjektet:

25594	<i>Learning through Interaction in Integrated Operations</i>
Behandlingsansvarlig	NTNU, ved institusjonens overste leder
Daglig ansvarlig	Jonathan Reams
Student	Anne-Marie Johansen

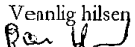
Personvernombudet har vurdert prosjektet og finner at behandlingen av personopplysninger er meldepliktig i henhold til personopplysningsloven § 31. Behandlingen tilfredsstiller kravene i personopplysningsloven.

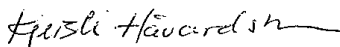
Personvernombudets vurdering forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, eventuelle kommentarer samt personopplysningsloven/helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, [http://www.nsd.uib.no/personvern/forsk\\_stud/skjema.html](http://www.nsd.uib.no/personvern/forsk_stud/skjema.html). Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, <http://www.nsd.uib.no/personvern/prosjektoversikt.jsp>.

Personvernombudet vil ved prosjektets avslutning, 01.08.2011, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen  
  
Bjørn Henrichsen

  
Kjersti Håvardstun

Kontaktperson: Kjersti Håvardstun tlf: 55 58 29 53  
Vedlegg: Prosjektvurdering  
Kopi: Anne-Marte Johansen, Tungaveien 61 A, 7047 TRONDHEIM

Avdelingskontorer / District Offices:

OSLO: NSD, Universitetet i Oslo, Postboks 1055 Blindern, 0316 Oslo. Tel: +47-22 85 52 11. [nsd@uio.no](mailto:nsd@uio.no)  
TRONDHEIM: NSD, Norges teknisk-naturvitenskapelige universitet, 7491 Trondheim. Tel: +47-73 59 19 07. [kyrre.svara@svt.ntnu.no](mailto:kyrre.svara@svt.ntnu.no)  
TROMSØ: NSD, SVF, Universitetet i Tromsø, 9037 Tromsø. Tel: +47-77 64 43 36. [nsdmaa@sv.uit.no](mailto:nsdmaa@sv.uit.no)

## Personvernombudet for forskning



### Prosjektvurdering - Kommentar

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Prosjektnr: 25594

Personvernombudet finner informasjonsskrivet til utvalget tilfredsstillende, men forutsetter at det tilføyes at deltakerne i studien vil kunne identifiseres internt.

Prosjektlutt er 01.08.2011. Datamaterialet anonymiseres ved at verken direkte eller indirekte personidentifiserbare opplysninger fremgår. Koblingsnøkkel og lydopptak slettes, indirekte personidentifiserbare opplysninger fjernes, omskrives eller grovkategoriseres.

## **Appendix 5 – A narrative illustrating perceived interdependence in the case**

A narrative illustrating how work in the virtual team is perceived as interdependent is offered by reference to a conversation I had with a team member during the period of conducting observations. In this conversation the team member emphasized how important it was for the team to think as a whole as making the right strategic decisions would imply taking each other's perspectives and to develop a holistic understanding of the situation at hand. This was perceived as important in order to be ahead of things and to avoid costly drop or halt in production offshore. When for instance drilling or well operations are performed offshore, this could imply a drop in the production of oil and gas, as personnel executing the drilling and well operations occupy equipment and provisions. Due to safety precautions and limitations in provisions capacity offshore, this implies a reduced capacity for production and less income for a restricted period of time. This is the same for operations concerning maintenance or repairs for that matter. All team members wish to reduce the period of interference as the objective of the team is to maximize the production volume and the income of the installation. At the same time drilling operations are a necessary investment for securing future production, and the same goes for operations related to maintenance and repairs, as those are of vital importance to the operation as a whole, both in short and long terms. The challenge for the team is to decide what is the most urgent operation and what is the right prioritizing at every moment as well as having the capacity to plan ahead - to make efficient and agile decisions. Even though team members in the leader team represent different branches, and thus may have different priorities, they all share the same goal. And in order to reach this objective they are dependent on each other's competence, knowledge and resources. They cannot do it by themselves as the success of the operation depends on their capacity to interact as a team. In order to accomplish this management task the team members in the virtual team experience a need for sharing their knowledge of the situation at hand and to develop a shared understanding. The work performed in the team is thus experienced as complex as it involves parallel, multidisciplinary and interdependent processes.



### Appendix 6 – Illustration of empirical findings

This illustration is developed to visualize how the six categories are understood as related to each other and to the empirical data represented by subcategories. The category *Shared understanding* is placed in center of the circle as this is found to connect the empirical findings. *Trust* is also considered a key category and is thus surrounding the other categories as a fundamental premise for the development of shared understanding. Through interdependent interaction the six categories are related to each other. The design is inspired by Postholm (2010, p. 97).

