Working Together when Being Apart

An Analysis of Distributed Collaborative Work through ICT from an Organizational and Psychosocial Perspective

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Doctoral Thesis
Stockholm, Sweden 2005
The voyage of discovery is not in seeking new landscapes
but in having new eyes

Marcel Proust
Abstract

The purpose of the research is to analyze collaboration and communication in distributed teams working together through ICT (Information and Communication Technology), to provide an overview and a broader understanding of important areas that require consideration. The analysis is from an organizational, psychosocial and managerial perspective, with the aim to support the development of strategies and the creation of more efficient and pleasant distributed work environments. Research questions concern the psychosocial work environment; differences, problems and opportunities for distributed teams, with deeper analysis of areas that was demonstrated particularly difficult. The analysis is concretized into advice to guide distributed teams; common problem areas are pointed out and an attempt on a theoretical model of distributed project work is made. A solid ground for continued research in the area as well as possibilities to support distributed teams is provided.

The research was mainly conducted in globally distributed project courses at a university level, where students communicated and collaborated through ICT. The results apply on distributed projects, but can also be relevant for other areas in the new ICT facilitated work environment. The research has been conducted by investigating how team members behave in and perceive distributed work environments; analyzing how i.e. variations in organization, work, social activities and behavior affect how well the collaboration and communication work.

Teams working in distributed projects go through the same stages and encounter the same problems as any other team. Some problems become harder to overcome, there are new obstacles, at the same time as other problems become less noticeable and new opportunities arise. The base for collaboration and communication changes when team members don’t see each other regularly.

Teams are entailed to use ICT for basically all communication and various media demands alterations in behavior, as well as it alters the relation between senses and how people perceive things. Distributed team members don’t have the same awareness of each other and get fewer cues to interpret situations and handle teambuilding, motivational problems and conflicts. Several of the regular ways to start socializing, build trust and get a common base for understanding and collaboration are not present in a distributed environment. There is no physical team space to meet in and team members don’t “see” each other on a regular basis.

It is possible to successfully work in distributed teams without regular face-to-face meetings even if it is more intricate. It will always be different, and the big danger is believing that it won’t. Working in distributed teams is not necessarily worse, but there are no effortless solutions for replacing face-to-face encounters. Distributed projects require effort, but conducted right it can be a rewarding experience that brings an extra dimension to the project work. To make distributed projects work well it is necessary to consider technological issues as well as their effects on individuals. It is essential to understand the new issues people encounter when moving to a distributed work environment and the interrelations between different areas and variables.
Acknowledgements

I want to thank both my supervisors, without whom I would not have had the opportunity to finish this dissertation, and who have really supported me, in their own ways. Prof. Carl Gustav Jansson inspired me to continue when he was the external reviewer of my licentiate thesis. He gave me feedback which made me realize that I have to be clearer, more concrete, and more stringent and helped me see a continuation of my work. Carl Gustav Jansson also introduced me to my other supervisor, Prof. Gunilla Bradley, who made me see what I have actually contributed with and by doing so helped me believe in the value of my work again. She facilitated structuring my data from a new perspective that correlated with what I wanted to mediate, and gave me tools, support and energy to clarify my thoughts and work. Gunilla has not only been a mentor to me, she has also become a dear friend, a soul mate that I hope to have many more rewarding conversations with, even after the official supervision is finished.

I have a huge dept to lindy hop, tango, Mr. Peeps and Conrad (the horses) and my family and friends, who have helped me maintain balance in life and kept me from becoming unified with my lap top. The dancing helped me stop thinking about my work, Conrad and Mr. Peeps helped me clear my mind and some of my best ideas came when being out in the fresh air, riding bareback through the fantastic nature in Silicon Valley and Stockholm’s surroundings. I especially want to thank my father, Nils, who has been an immense inspiration all my life, by always being curious, constantly wanting to learn more, and never stopped in his quest for knowledge and experiences. I also want to express my gratitude to the rest of my family and to my friends for giving me love and support, and for standing my stubbornness, because without it and my unwillingness to give up, I would not have reached this stage. I furthermore want to thank my niece and nephew, Kajsa and Erik, who keep reminding me of what is important in life.

I am grateful to Ph.D. Carolyn Ybarra at the Stanford Learning Lab for guiding me in my concrete research, introducing me to methods of anthropological studies, but most of all for being a good discussion and work partner, helping me develop ideas and move further in my thinking when collecting my data. I want to thank Heidi, who helped me with final adjustments to the text, and Arvid and Henrik, who assisted me when designing the cover. I also want to show appreciation to all enthusiastic and devoted people at Uppsala University who encouraged me when I needed it the most. I thank Prof. Björn Pehrson who found funding and made it possible for me to go to Stanford, and to members of the Wallenberg Global Learning Network that provided funds from the Wallenberg Foundation and encouraged research in this area and gave me the opportunity to spend time and taking part of knowledge at Stanford. I also want to express thanks to everybody at the Stanford Learning Lab for making my visit enjoyable and productive. Last, but not least, I want to express my immense gratitude to all students and other participants in the case studies, who have answered my questions, bore being observed, and helped me actually collect the data I needed. Without their cooperation and their time, this would not have been possible.
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1. Introduction

Life is complex and it is often intricate to understand what makes people act the way they do. Some of us spend a lifetime trying to comprehend how people work and what affects us in various situations, merely to be able to handle everyday life better, and to actually become wiser when we get older. Analyzing people and real life situations is a messy business and can also make one wish for clear cut formulas and structured experiments. Since my aim has been to come closer to understanding what really affects distributed project work environments and how to help people in those environments, I decided to live with the mess, embrace it, and do my best to structure it and come at least a little step closer to helping people working in distributed teams.

I have never chosen things in life because they are easy. I choose things that I find interesting, important and challenging. I know I have embraced a difficult and complex area, where it is hard to find unambiguous answers and solutions. My ambition has never been to find “The Solution” for distributed project work, even if people have kept asking me for that. The purpose has been to clarify what difficulties and opportunities come with the situation, and help people working in teams and collaborating at a distance dealing with the multifaceted situation that is the reality for them, whether they are students or professionals. By always keeping my focus, attempting to get an overview of the situation, I managed to avoid letting the research become too sprawling. Even if there are an abundance of variables involved that are worth spending years of study on, I managed to keep a more general perspective, and didn’t get stuck in all the interesting details.

One of the difficulties is, besides analyzing a very complex situation populated with non-rational people, the feeling that relying on people’s common sense should be enough to handle the situation. My experience tells me it is not enough, and I could not agree more with McGuire (1997) when he states that “one of the distinctive features of social psychology is that it deals with processes that are frequently experienced in daily life. Such familiarity has the attraction that our discipline grapples with universally relevant questions but presents the danger that our answers tend to be trite.” (p.221). I therefore pursue extraordinary answers to ordinary questions, attempt to make assumptions and problems visible and hope my research can contribute to making common sense more common amongst distributed teams.

Often the aim shouldn’t be to give an all set solution, but to help people (and especially people in managing situations) become more aware of problems and advantages that come with the distributed work environment; to be able to handle them, take advantage of them or avoid them. My research is definitely not the end station, but a starting point for further investigations and will hopefully also give insights that make distributed life and work easier for people. And if that has been reached, I am pretty content. At least for now.
1.1 Background

There is a growing interest in the world to learn more about how to manage work at a distance. Teams in corporate environments often receive funding for physical meetings, but in educational environments there is most of the time a very limited amount of time and money available for traveling, and there is a wish to improve the virtual collaboration and reduce traveling even in the corporate world.

There have been discussions whether or not it is possible to work at a distance without seeing each other face-to-face regularly, or at least once in a while. Opinions diverge, and a lot of the debate has been about emphasizing either the advantages or the disadvantages. This while people keep working at a distance, with better or worse outcomes. Before managing a successful change to communication and collaboration through ICT, and before stating if collaboration without face-to-face meetings is feasible or not, it is imperative to address the following questions; What are the main differences between face-to-face and virtual interactions; What are the main advantages and disadvantages?

My starting point has been the fact that people actually are working in distributed teams and that they are struggling with getting to know each other, trying to collaborate in this new virtual work environment, having to use ICT for essentially all team communication, etc. Since people are working more and more from and by their computers, we have to remember that the “computerization of the work environment places greater demands upon the social and emotional components of communication.” (Bradley et al. 1993, p.157). The main problem is most of the time not the ICT in itself; but learning how to make use of it to reach the best results, learning how to feel comfortable in the new work environment, and learning how to be social and get to know others through ICT.

When working in a distributed setting it is considered obvious that at least somebody knows how to start and use the ICT, e.g. the videoconferencing equipment. It should be obvious that at least somebody knows how to handle leadership, organization, teambuilding, and the psychosocial side of the new environment created, but that doesn’t always appear to be the case. Already in the early 1970’s the importance of the psychosocial part of work environments was emphasized (Bradley et. al. 1974). The focus of research in the area of ICT facilitated work has often been on making the technology work. This might be a natural first step, but the social, organizational and psychosocial aspects of ICT has received too little attention and not attained an adequate amount of consideration, especially since these aspects should be integrated in the design of the ICT. This focus is needed in research in the area of distributed work through ICT.

My experiences from distributed work do not only derive from my research. I have worked in distributed settings, conducted research with people in other continents, taken distributed lectures and seminar courses, been part of distributed project courses, tried to write articles with researchers spread over the world, worked a lot from home, established friendships across continents, and also developed web based distance education and teambuilding activities for distributed teams. I have observed the area from multiple angles, and have experienced a lot of both the predicaments and the rewards first hand.

The path towards this dissertation has been far from effortless and straight,
and the topics of trust and encouraging work environments have been issues I have dealt with continuously. I have during long periods of time been without supervising, funding and support. Because of my short and fragmented employments as a Ph.D. student (half a year located at Stanford, one year at IMIT (KTH), and one year at DSV (KTH)), I never had the opportunity to publish my work continuously at conferences, or simply relax and enjoy the opportunities to constantly learn, investigate and develop myself, which should be a natural part of being a Ph.D. student.

The research situation naturally affected the possibilities for my research and what has been achievable to accomplish and perform. If I had received guidance on how to structure my work at an earlier stage, I would have been able to accomplish more, and make the results both clearer and more strongly validated. But on the other hand the situation provided me with a kind of freedom; to exist outside of the regular structures, not being influenced by the thinking of a specific school or research group. My focus has always been the same, since it started with what I had seen and experienced myself, and I always managed to convince people of its importance.

My interest in the area started in 1997, when developing web based contract education for professionals working in IT-related businesses. The main problem with the courses was getting the participants to interact, use each others knowledge, and discuss the topics they had as assignments. This in combination with problems concerning time management, community building, trust and motivation had truly negative effects on participation. The participants didn’t communicate partly because of perceived lack of time, because they felt they didn’t know each other, that they were shy, that the assignments didn’t encourage collaboration, and that the web forum wasn’t a good enough tool to make people want to communicate, etc. This was how the preliminary research questions started to develop:

- What are the differences between on-line and on-site communication?
- What kind of behavior is productive when being part of a virtual group?
- How can trust be built when people don’t see each other or meet?
- How can people get to know each other when they don’t see each other or meet?
- What ICT supports what kind of communication?
- What problems do people encounter and is it possible to help them get passed them?
- How does the actual work and work phase affect the communication and collaboration?
- What motivates people to communicate?

I naturally also faced the fundamental human questions; what happens when we meet other people? Why do we get attracted to some, and don’t like others at all? Why do we communicate easily with some, and don’t understand others? These are not questions that I believe will be answered any time soon, if ever, even if some aspects of it can be partly explained. The effects are so complex and would
include everything from biological answers like scent and hormones levels, to what our background is, our memories, what we are used to, our personality, current fashion, our free will, etc. I don’t think it is possible to answer these questions completely. I don’t even think that people in general want to know what happens, because we want to keep some of the mysteries of life. By trying to figure out at least some components of what happens and what affects us when we talk to, meet and collaborate with other people, we can at least get closer to reaching a point where we know some of the components that affect communication, collaboration and trust, and be aware of some of the important changes that occur when we move to a distributed environment, and how to deal with the changes.

In 1998 I started collaborating with a research team at Stanford University, which consequently lead to that I moved there in the fall of 1999 to continue my work, and as a result got an opportunity to look deeper into the questions I was interested in, both by conducting research, developing distributed teambuilding tools and by working in distributed teams. My research has been conducted primarily on distributed project courses at a university level. A lot of the findings are applicable on distributed project work in general, but the main research has been done in an educational setting and the dissertation is developed with that as the main empirical material. The projects have been very similar to corporate projects and I have not focused on the learning aspects, but my findings have to be tested and analyzed in corporate environments before it is possible to state if they are applicable also on corporate distributed project. My belief is that the findings are mostly of a general character, though. But that remains to be verified.

1.2 Purpose

The purpose of the research has been to analyze collaboration and communication in distributed teams that work together with support of ICT, to provide an overview and a broader understanding of the situation for distributed teams, and to clarify and illuminate important areas that require consideration. The analysis has been from a organizational, psychosocial and managerial perspective. This has been accomplished by studying how team members behave in and perceive distributed work environments; analyzing and trying to understand how variations in setting, work, social activities and behavior affect how well the collaboration and communication work; as well as analyzing the interplay between the physical, social and psychological factors that affect distributed teams. I have described and analyzed the subject of distributed project work from multiple angles, investigated differences between working locally and at a distance, and examined problems and opportunities that appear in distributed work environments. From these descriptions and analyzes concrete advice is provided to guide people working at a distance, common problems are pointed out, a first attempt on a theoretical model of distributed project work is formulated, and the ground for continued research in the area is thereby given.
1.3 Problem Statement
I have focused on teams in distributed project work environments; described, analyzed and tried to understand how variations in organization, management, social interaction, work activities, behavior, etc. affect how well the collaboration and communication work. The research questions I have focused on are:

Effects of Distribution
- What are main differences between on-site and distributed teamwork?
- What problems and disadvantages do people encounter when separated from their teammates in time and space?
- What are important advantages of having distributed teams?

Communication and Collaboration through ICT
- What changes occur regarding communication when ICT is used in distributed project work?
- How should ICT be utilized to create a good work and social environment?
- What ICT is actually used in distributed teams and what are opinions regarding usefulness?

The Psychosocial Work Environment, Teambuilding and Trust
- Which factors in the psychosocial work environment are vital for the outcome and satisfaction in distributed projects?
- How can trust be built when people don’t see each other or meet on a regular basis?
- What affects teambuilding in distributed teams?
- What effects do teambuilding and trust have on distributed communication and collaboration?
- What kind of demeanor, skills and behavior are productive when communicating and collaborating at a distance?
- How does the project stage affect collaboration?
- What organizational and managerial aspects are important to consider supporting distributed teams?
- Is it possible to help distributed teams prevent and get passed problems?

My research deals with the distributed psychosocial project work environment, with special focus on communication and collaboration through ICT. That means my area of interest is in the intersection of the above areas; i.e. how collaboration is affected by communication being filtered through ICT and by a team being distributed; how trust is affected by the distribution; how socializing is done through ICT; how teambuilding and trust can help decrease the distance, improve the communication, and decrease the filter created by ICT; etc. It is the situation for distributed teams that is the focus, to illuminate what variables affect distributed project work environments the most, and how are they related.
1.4 Delimitation of Problem Statement

The research is not focused on on-site teambuilding or on-site communication through ICT, since the center of attention is the distributed project work environment. The observed teams have not been influenced regarding what ICT to use, but the analysis is focused on what teams have actually used.

The purpose is to provide an overview and a broader understanding of the situation for distributed teams to clarify and illuminate important areas that require consideration. Entire dissertations can be written about every single variable extracted, but that has not been the purpose. I am not focusing on more detailed issues, like e.g. distinctions between asynchronous and synchronous communication forms, specific technical solutions, time management in distributed teams, the content of projects, team composition, leadership styles, etc., even if these are all aspects that have shown to be important variables in my investigations. I am also not focusing on the time aspect of project work, but have only studied rather long projects.

I have not focused on the fact that the teams I have been investigating have been student teams, even if this is an important factor for the work environment. It has been treated as an aspect as any other that affects the work environment and I have not paid attention to the learning aspect at all; what or if the students learned anything. Because the participants have been students they naturally had limited experience of distributed projects (or teamwork in general), even if they were experienced users of ICT and different forms of communication through ICT. Studies have to be conducted to investigate if the results are applicable on teams working in corporate environments and experienced team workers, and what the differences are, to be able to draw any definite general conclusions about distributed projects.

Various issues have been regarded as background variables; I have e.g. not focused on the organizational structure of the universities or departments, or the culture and social structures in the countries, if it wasn’t observed in direct relation to the teamwork, since I have focused on observing teams and the environment directly surrounding them. I am not going deeply into psychological factors or background variables that might have affected the team members’ attitudes or perception, or studied variations regarding that.

The purpose of giving concrete advice is not to present a definite answer on how to work at a distance, since I don’t believe in providing such answer. The advice would be to adjust the work, ICT and activities to the specific situation and the people involved, and to be aware of common problems and opportunities, to be able to handle the problems when they come and really take advantage of the opportunities.
1.5 Brief Summary of Results

It is possible to successfully work in distributed teams without regular face-to-face meetings, even if it is more intricate. **It will always be different, and the big danger is believing that it won’t.** Working at a distance is not necessarily worse, but there are no effortless solutions for replacing face-to-face encounters. A lot of problems distributed teams encounter are the same as on-site teams, some become worse, there are some problems added, while other decrease in magnitude and new opportunities arise. Since some problems are more common than others, teams benefit from simple guidelines, teambuilding activities, and receiving information about frequent tribulations. Receiving information and support won’t diminish all problems, but it can create awareness, some problems might disappear and others might be detected earlier, and will hence be more easily handled.

To be able to overcome problems and promote a successful collaboration in distributed work environments there are several important issues that need to be considered; e.g. organizational design, leadership, team composition, the organizational design of the project, team management, distance, the physical environment and choice of ICT, as well as preparing for common problems in various areas that are especially prevalent in different stages of a team’s lifecycle.

The use of ICT affects communication and collaboration, and it is important to carefully consider what ICT to choose in distributed teams. One predicament is that distributed teams have to use ICT for basically all team communication. The choice of ICT has to be adjusted to the situation, the activity, the project, the participants, the budget, etc. Even more imperative is how the team uses the chosen ICT, though. To select the right ICT for a specific purpose, making sure it works well enough, knowing how to behave in different ICT, and learning how to feel comfortable using the chosen ICT.

An area that becomes much more intricate and even more vital in a distributed work environment is trust and teambuilding. There is less awareness, and hence more difficult and less motivation to get to know each other and acquire a team feeling. When people don’t know each other and don’t interact face-to-face, it is more intricate to get a sense for who they are interacting with. Social interaction makes the work more fun, and it generally improves the actual project work since it can motivate teams to get passed difficulties and it creates an open environment where people have more awareness of each other and a greater sense of presence. With a high level of team feeling and trust, there is an immense probability that the motivation will increase, the feeling of isolation will decrease and the collaboration and communication will improve. Being open towards each other can happen both faster and slower in a distributed setting, but real trust will be harder to reach. Because of the imperative effects all these issues have on individuals and the success of projects, distributed teams require more active team- and trust building.

If a distributed project will be successful or not depends on if people are willing and capable to learn how to communicate with the available ICT, learn how to deal with the new set of problems that might arise, and on if somebody (outside or within the team) is giving the participants enough guidance and support to keep them on track, keep them motivated, help them avoid preventable conflicts and misunderstandings, and clearing out the problems that couldn’t be
avoided. To make distributed projects work well it is necessary to look beyond technological issues and also take humans into consideration. To do that, it is essential to understand the new issues people encounter when moving to a distributed work environment and the interrelations between different areas and variables. For more comprehensive summaries and discussions of the results, see Chapter 5.1 and 5.4.

1.6 Definitions

A number of brief definitions of key words used in the dissertation are presented in the following section, to assist in the understanding of what is meant when a word is used or a topic discussed.

The teams and team members observed in the case studies are Distributed. According to the Concise English Dictionary, distribute means to spread or dispose at intervals. Merriam-Webster Online Dictionary defines distribute as to divide among several or many; to spread out so as to cover something; to place or position so as to be properly apportioned over or throughout an area. Distribute implies an apportioning by separation of something into parts, units, or amounts. In this case it means that teams have been spread out on different locations.

Distance on the other hand is defined in the Concise English Dictionary as the amount of space between two things; aloofness; remoteness, and in Merriam-Webster Online Dictionary as a separation in time; the degree or amount of separation between two objects; the quality or state of being distant: e.g. spatial remoteness, personal and especially emotional separation. The teams I have observed have had local team member, and were therefore not only working at a distance, so I have chosen to classify the teams as distributed, and not distant. Distance is one important variable that affect distributed teams, which means it will be discussed frequently in the dissertation. A team can also be distributed but feel very close, or be co-located, and feel very distant, which would make distance a more confusing choice of vocabulary.

IT normally stands for information technology, but what people actually mean when they use the abbreviation differs. The term ICT is more and more used and has started to replace the term IT. It refers to the fact that media, computer and telecommunication technologies have converged, and is preferred also because it draws attention to the fact that technology is used also for communication, and not only to transfer or display information. CMC stands for computer mediated communication and is a common term often used in the literature referred to in the dissertation, and is consequently used occasionally. CSCW stands for computer supported collaborative work and CSCL stands for computer supported collaborative learning.

A Team is a number of persons associated together in work or in an activity (Merriam-Webster Online Dictionary), and in my case, working in a project together. There seem to be almost as many definitions of Collaboration as there are people using the word. Merriam-Webster Online Dictionary defines collaboration as to work jointly with others, especially in intellectual endeavors. This is a fairly good, but very open definition. I define collaboration as two or more persons working actively together, and to collaborate implies interacting,
using each other’s knowledge, and affecting each others thinking, behavior, and how the work is conducted.

**Trust** is a central word in this dissertation. Shaw (1997) suggests as a working definition of trust: *belief that those on whom we depend will meet our expectations of them*, which is a appropriate starting point for the discussion. For a more thorough investigation of a suitable definition and importance of trust, please see Chapter 3.4.5.

*Merriam-Webster Online Dictionary* defines **Communication** as a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior; or exchange of information; a technique for expressing ideas effectively (as in speech). Griffin (1997) emphasized how hard it is to define communication. The definition he suggests is that “Communicating is the management of messages for the purpose of creating meaning.” (p.19). According to him this definition covers communication as an intentional activity, but doesn’t rule out accidental outcomes. It gives equal weight to message and meaning, covers both content and relationships, and includes both verbal and nonverbal symbols. I am not sure I agree the definition actually covers all of this, but the explanation covers a definition I could agree on.

Schirato and Yell (1997) says that communication can be understood as the practice of producing meanings, and the ways in which systems of meaning are negotiated by participants in a **Culture**. They state that culture can be understood as the totality of communication practices and systems of meaning and cultural literacy can be defined as both knowledge of meaning systems and abilities to negotiate those systems within different cultural contexts. “It is virtually impossible to describe and analyse what is happening in any communication context or practice without using the concept of cultural literacy.” (p.1). Latané (1997) describes cultures “as regionally clustered, historically evolving bundles or correlated sets of beliefs, values and practices.” (p.204).

**Disinhibition** is a possible effect on communication sometimes occurring when people are interacting through the Internet. If inhibition is when behavior is constrained or restrained through self-consciousness, anxiety about social situations, worries about public evaluation, and so on, then disinhibition can be characterized by an absence or reversal of these same factors (Joinson 1998). Disinhibition on the Internet is *not* flaming or hostile communication, but should rather be seen as any behavior that is characterized by an apparent reduction in concerns for self-presentation and judgment of others, behavior that is less inhibited than comparative behavior on-site, and can have both positive and negative effects on communication.

**Cues** are clues we constantly get and interpret (often unconsciously) that improve our understanding and interpretation of others and situations. Cues can be e.g. eye contact, facial expressions, scent, body languages and small gestures, which carry plenty of communication information in a co-located setting.

*Merriam-Webster Online Dictionary* defines **Psychosocial** as something that involves both psychological and social aspects or something that relate social conditions to mental health. Bradley (1993) defines psychosocial work environments as the process involving the interaction between the objective environment and the subjective one. “The term psychosocial work environment is
used to signify the course of events or the process that occurs when objective factors in the environment are reflected in the individual’s perception (either positive or negative) of work and conditions of work. Its essence is the interaction between the environment and the individual.” (Bradley 1993, p.28-29). I have used the term as the interplay between the environment, physical and social, and the individual.

Virtual is often defined as the opposite of real (real in the meaning not artificial). Merriam-Webster Online Dictionary defines it as being such in essence or effect though not formally recognized or admitted; or of, or relating to, being a hypothetical particle whose existence is inferred from indirect evidence, and compare it with the word “real”. I have used the term as the opposite of real in the meaning of not face-to-face, but mediated or transferred by some electronic media. Virtual is in this dissertation for example a team that is not located in the same space but works at a distance and uses ICT to communicate, an environment that is electronically mediated where people don’t meet face-to-face, but communicate via media, etc.

To meet somebody Face-to-face is in this thesis defined as meeting them physically, in person. Even if you see each other and each other’s faces in a videoconference or virtual environment, this does not fit under my more narrow definition, even if it could be interpreted to fit under Merriam-Webster’s definition to be within each other’s sight or presence or into direct contact or confrontation.

I use the term Video in the wide definition of video as pictures (moving frames) with audio. It is therefore not just the flow of pictures I talk about when I discuss video, but streaming audio is also a part of the video. Videoconferencing is the specific kind of video where there is a possibility for two way communication, and not only a one way broadcast flow of video.

IM stands for Instant Messaging and is a synchronous text-based communications system used for “chatting”. For further explanations, please see introduction to Chapter 4.9. FTP stands for File Transport Protocol and is a way of transferring files over the Internet from one computer to another.

Norms, Rules, Communication skills and Personality are examples of other concepts used; but I limit myself to refer to dictionaries, since these concepts are common in behavioral science and they are not the focus of my investigations.
1.7 Overview of the Dissertation

The dissertation is divided into six main parts. Here follows a brief overview of the division and the topics covered.

1. The first part is the introduction found in Chapter 1. It encloses the background for the research; the purpose, problem statement, delimitations, a brief summary of the results, as well as definitions of central words and topics used in the dissertation. The aim of this part is to provide a foundation to better understand the research; the point of view taken, the focus, and the area of study.

2. In the second part, Chapter 2 and 3, the theoretical background is established. In Chapter 2 the theoretical background for the research and concrete methodology is covered; the general research approach, the focus of investigations, methods of collecting and analyzing data, as well as delimitations. In Chapter 3 a literature review is presented; research results and theories related to the research area have been summarized, and different aspects of distributed collaborative work are illuminated. The literature review partly works as a background to the research, and it is organized in similar categories as the problem statement to more easily relate previous work to findings in the case studies and to the discussion. The intention is furthermore that this chapter should function as a complement to the research, as an aid to understand the research area better, to appreciate what factors influence the distributed project work environment and how it is affected by various variables.

3. The third part, Chapter 4, is a review of the eight case studies on which the research is based; to clarify what research activities that have actually been done and how the research was conducted; in addition to conveying preconditions for and results from the research. The chapter is started with a brief overview of context and background for the research, to provide a foundation for the analysis of the validity and generalizability of the results.

4. In the fourth part follows an analysis and discussion of the research results. The part starts with Chapter 5 where the research findings are discussed, starting with a summary of the results, directly related to the research questions. A discussion around particularly imperative research results follows the summary; effects of distribution and using ICT on collaboration, organization, management and the psychosocial work environment, as well as effects on individuals working in this environment, discussing the issues of motivation, awareness, openness, teambuilding, social interactions and trust. Conclusions from the discussion end the chapter and essential findings are summarized. In Chapter 6 the discussion continues with an attempt on developing a theoretical model of ICT and distributed project work. The model aims to illustrate what variables and areas affect the distributed project work environment the most and how variables are associated. In Chapter 7 problems
teams had during different stages as well as more concrete recommendations and guidelines for distributed teams based on the research are presented and in Chapter 8 a closing comment is made, providing a base for future discussions and research.

5. The fifth part covers some of the background material for the dissertation; the references used as well as appendices covering a list of previous publications, instructions handed out to students, and a summary of usefulness of different tools. The last appendix contains end notes in the form of quotes from the case studies to illustrate the results.
2. Theoretical Perspective and Methodology

2.1 General Research Approach
The research attempt has been to describe and analyze the real and very complex work environment that distributed workers exist in. It is not an undemanding task, but an interesting one. To guide me I have had Ethnomethodology as the foundation for gathering the data, Phenomenography as a way to analyze and move further with the data, and a Psychosocial and Organizational perspective when organizing, analyzing, and clarifying the focus in the end stages of the analysis and when placing the results in a theoretical framework. This overview is started with the more theoretical background and move towards the specifics, the actual methodology.

2.1.1 Focus on the Psychosocial Work Environment
According to Pepitone (1997) the field of social psychology has been too focused on experiments and has neglected social structures and culture in its theories and research. The failure to conceive individuals as embedded in environments, as players in organizational structures, as positioned in multiple communication channels and networks, and as members of cultural groups, has discouraged theoretical accounts and representations of human social behavior that accurately map what is observed in the real world as people know it.

Stryker (1997) says that the predilection of psychologists is to approach social psychology from the standpoint of the individual; the predilection of sociologists is to approach psychology from the standpoint of units of interaction comprised of multiple persons, i.e. society. My predilection is to approach distributed project work from the standpoint of the situation (of distributed collaborative work), which includes individuals, their interactions with each other and with the environment. This perspective has a long tradition in Swedish social psychology (Bradley 1979; 1989; 1993; 2001).

Significant from this viewpoint is Bradley’s model of the psychosocial work environment and the distinction between the objective and subjective aspects of work environments (1989). She defines the psychosocial work environment as the process created when objective factors in the environment are reflected in the experiences (positive or negative) of individuals. The focus of the concept is the interactions and interplay between individuals and the environment they are in (1979). See further Chapter 6.
The term “objective” shouldn’t be interpreted as independent of the influence of people, but should be viewed as factors that are more easily influenced from a managerial point of view. The subjective side is how people perceive the work environment and their attitudes towards it. As Manstead (1997) points out, attitudes have an impact on perceptions and behaviors and play a key role in human social cognition and behavior; helping individuals achieve a sense of personal coherence and identity, shaping the way in which they perceive, interpret, and remember social information, and guiding the way in which they behave.

People’s attitudes and psychological state of mind can determine the outcome and success of a project, and are often not easily altered, at least not by trying to change e.g. the attitudes directly. Relationships and what depends on what is complex. People’s experiences can to a large extent be explained by what actually happens in the objective environment, which is often the cause of problems and negative attitudes, and more easily influenced and adjusted. But people’s psychological state of mind is not directly dependant on the objective variables, and shouldn’t be forgotten or neglected. People’s background and basic values, and changes in these affect how they experience the environment. When people are not satisfied with the work environment it is a lot of the time hard to tell if the reason is physical, psychological or social, and variables might concur (Bradley 1979).

Various influences on the work environment are visualized in Bradley’s graphical representation The Communication Circle (see figure 2). The circle elucidates factors in the psychosocial work environment that affect and interrelate with communication and collaboration through ICT, both qualitatively and quantitatively (Bradley 1977; 1993).
The work environment can also be analyzed within a wider perspective. Variables from diverse areas and levels of analysis affect the life environment people are in, and that in turn influence the work environment. Bradley illustrates this in the convergence model (see figure 3) and visualizes factors that affect individuals and the environment.

Figure 3: The Convergence Model (Bradley 2001)
2.1.2 A Phenomenographic Research Approach

The aim of phenomenography is to understand a phenomenon, or rather the relation between humans and this phenomenon. The main methods are qualitative and the ambition is to illuminate a phenomenon or a particular question in a specific situation; analyze it (view the problem from different angles, analyze what parts constitutes it, create categories and study different aspects of how the phenomenon is experienced), reflect on it and discuss it to be able to draw more general conclusions.

Phenomenography aims to reveal the qualitatively different ways of experiencing a phenomenon. “There are two potential questions to figure out: first, which these ways are, and second, whether or not they appear in a certain case at a certain point in time. The question of phenomenography is the first one.” (Marton & Booth 1997, p.136). Phenomenographic research aims to look passed a specific situation, the context, time, and place, and observe the phenomenon as abstracted from or transcending such anchorage. But this is done by analyzing specific situations, i.e. “the general can only be revealed through the specific.” (Marton & Booth 1997, p.115).

Phenomenography is focused on ways of experiencing different phenomena, ways of seeing them, knowing about them, and having skills related to them. The aim is, however, not to find the singular essence, but the variation and the architecture of this variation in terms of the different aspects that define the phenomena. In order to make sense of how people handle problems, situations, and the world, we have to understand the way in which they experience the problems, the situation, and the world that they are handling, in relation to which they are acting. The objective of studies is to reveal variations, captured in qualitatively distinct categories, of ways of experiencing the phenomenon in question regardless of whether the differences are differences between individuals or within individuals (Marton & Booth 1997).

The question a phenomenographer would ask could be something like “What are the critical aspects of ways of experiencing the world that make people able to handle it in more or less efficient ways?” (Marton & Booth 1997, p.117). The aim is to enlighten a subject from different perspectives, see different facets of a phenomenon, find difficulties, opportunities, different aspects and categories within the subject “so that each category tells us something distinct about a particular way of experiencing the phenomenon” (Marton & Booth 1997, p.125).

“We cannot describe a world that is independent of our descriptions or of us as describers. We cannot separate out the describer from the description. Our world is a real world, but it is a described world, a world experienced by humans.” (Marton & Booth 1997, p.113). Marton and Booth states that phenomenographic research is an iterative process and during the collection of data, whether through interviews or in some other form, analysis is taken place, and early phases of analysis can influence later data collection. Describing experiences and ways of experiencing phenomena is entirely different from describing such things as mental representations, short-or long-term memory, retrieval processes. Phenomenographers try to adopt an empirical orientation and study the experience of others (Marton & Booth 1997).

Even if it is not possible to say that everybody experiences a phenomenon the
same way, at least it is possible to show variations and learn how people in general experience a phenomenon. As Marton and Booth (1997) phrase it “the very identification of the different ways of experiencing a phenomenon and the variation thereby constituted are a legitimate and worthwhile outcome of a research undertaking.” (p.128). Phenomenography is not a method according to Marton and Booth. Hence it is more a methodology, a general research approach. “Phenomenography is rather a way of- an approach to- identifying, formulating, and tackling certain sorts of research questions” (p.111). The unit of phenomenographic research is a way of experiencing something.

2.1.3 Ethnomethodology

According to Shapiro (1994) the ethnomethodological program proceeds by making certain strategic choices about how to do research. In the relationships between theory, research, and phenomenon, ethnomethodology follows the phenomena (pursuing the data) wherever they may lead. Hence, one of the most distinctive claims of ethnomethodology is that it is not driven by theory or explanation but by the stringent discipline of observation and description.

Myers (1999) says that ethnographic research comes from the discipline of social and cultural anthropology and ethnographers are required to spend a significant amount of time in the field. Ethnographers immerse themselves in the life of people they study and seek to place the phenomena observed in its context. It is based on very detailed recordings of interactions between people and between people and their environment. Even if controlled experiments are occasionally convenient, anthropology has long recognized that one cannot study people divorced from their social and cultural context. Myers (1999) states that ethnographic research therefore is well suited to provide researchers with rich insights of the human, social, and organizational aspects of ICT and Dix et al. (1997) emphasize the influence ethnography has obtained in the area of CSCW.

Myers (1999) affirms that one of the most valuable aspects of ethnographic research is its depth. Because a researcher is present for an extended period of time, it is possible to observe what people are doing as well as what they say they are doing. This gives researchers the possibility to gain an in-depth understanding of people, the organization, and the broader context within which they work. By actually being there, the field researcher can develop an intimate acquaintance with the dilemmas, frustrations, routines, relationships, and risks that are part of everyday life.

2.2 Methods of Collection and Analysis of Data

Research was undertaken using multiple methods according to ethnomethodological ways of collecting data, following teams for longer periods of time, observing what happened in real life situations, principally without intervening. Data gathering and analysis methods included; observation and reporting of face-to-face meetings, observations of team meetings that were held using a variety of ICT, observation and analysis of course lectures; analysis of use of the course and team web pages, analysis of student papers; focus groups and
individual interviews of distributed teams, teaching assistants and faculty; interviews of users of IM for work related tasks; as well as using an online questionnaire with multiple choice and open-ended questions. The research also included developing and testing of virtual teambuilding activities and guidelines, both in trial sessions and in actual distributed teams.

Observations consisted of attending formal and informal class and team meetings, lectures, and everyday work, while taking ethnographic field notes on behavior, activities, and social dynamics. Students and teaching staff were asked questions informally as they arose, as well as interviewing them more formally. Course web pages and group email lists were monitored informally, and information from those interchanges was added to the data. Focus group interviews were videotaped and transcribed by an outside transcription agency, with a second pass done to correct errors and code for analysis. Observations were written up in field notes, field notes were coded for analysis, and data from the survey was analyzed.

The concrete guidance I received when collecting data was mainly from an anthropologist, which naturally affected the way the data was collected and the direction of the investigations. But it didn’t affect the approach extensively; it rather helped the thinking and structuring already present. The wish to observe the situation at hand and collect data from multiple sources to support or contradict the initial hypothesis and problem statements based on intuitive feelings. There was an opportunity to follow distributed teams for longer periods of time, and even if the teams weren’t observed every day, their paths were followed and there was always an opportunity to observe or talk to them.

2.2.1 Case Studies

Data was gathered by conducting case studies. The data was analyzed first within case studies and then across case studies using mainly inductive methods. According to Yin (1994) a case study approach is favorable when the focus is phenomena in real life settings where researchers naturally have limited control. It is suitable for understanding phenomena in a qualitative way rather than examine quantitative occurrences, and when the aim is to build theoretical constructs rather than simply testing them. Arguments have been made that pre-designed and structured instruments blind researchers, leading to that the most important phenomena become overlooked or misrepresented. Furthermore phenomena are often removed from the context in order to be universal (Miles & Huberman 1994). Voss, Tsikritkis and Frohlich (2002) state that case studies contribute particularly to theory building research. Since it is unconstrained by the rigid limits of questionnaires and models, it can lead to new and creative insights, and hence the development of new theory. They argue that research aiming to build theory is best conducted in focused case studies.

Yin (1994) characterizes case studies as “an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between context and phenomenon are not clearly evident” (p.13). Eisenhardt (1989) describes case studies as “a research strategy, which focuses on understanding the dynamics present within single settings” (p.534). The case study research strategy is therefore used in order to intentionally
investigate also contextual conditions, even if more general conclusions might be drawn outside of the specific context.

The research in the case studies presented in this dissertation was conducted with qualitative open-ended data gathering methods, to become better acquainted with the actual situation for the distributed teams, to study experiences as well as examine processes and analyze the environmental influences on the distributed project work, and with the aim to discover subjective experiences as well as elements in the objective environment. Eisenhardt (1989) assert that theory-building research is characterized by a frequent overlap of data collection and data analysis (see Chapter 2.1.2 about the phenomenographic perspective), which implies several different analysis at different times of the collected data. The aim has not been to objectively define or measure exact work conditions. Qualitative methods enabled the inference of relationships between the perceived work conditions and experiences and the objective work environment. They supplied an opportunity to obtain rich data of interactive human behavior in real, complex situations. For more details about methods of data collection go to Chapter 4 and the specific case studies.

### 2.2.2 Data Analysis

Conclusions from the data are based on triangulation of results from the multiple sources and case studies. It is worth noting that the work was done in close collaboration with course faculty, and they were continually informed regarding findings and interests, as well as they pointed out problems teams had.

The data was analyzed through a phenomenographical approach; i.e. by following the data, gathering a qualitative collection of material, and relating research findings with literature. The material was analyzed throughout the process, to help choosing the direction for further investigations. The phenomenographical method is an iterative process which aims to pursue phenomena, decide what the characteristic variables are, analyze them further, and then continue the research.

The findings from the research were examined within an existing theoretical framework, Bradley’s models covered in Chapter 2.1.1. Variables were abstracted from the data and organized by applying research findings according to the models, to create a new model, adjusted to the distributed work environment (for the concrete results, see Chapter 6). For more details about the specifics of these theories and ways of analyzing and viewing the world, see Chapter 2.1.1 and 2.1.2. The next step would be more formalized investigations with the base in my findings, using studies with quantitative measurements in order to perform statistical analysis of the data.
2.3 Delimitation of Methodology

The teams participating in the case studies were all *globally distributed student teams*, and this naturally affects the results and the problems and opportunities discussed. Even though this is the case, learning or pedagogy is not discussed in any traditional sense and the focus is not on cultural differences between the participating countries. My focus has been on the fact that they are *distributed teams*. The purpose has not been to examine if students learn more while working collaboratively and in a distributed setting, or exactly what they learn. The aspiration has rather been to observe what problems and opportunities come with this kind of work and how to be able to improve the circumstances for distributed collaborators.

The research is mainly of qualitative nature and the studies are case studies. Even if this is the case, an attempt to draw more general conclusions has been made, since plenty of the problems and advantages observed reoccurred in the different cases. More studies have to be conducted to verify the conclusions, especially since no statistical analysis of variables has been done.

When conducting research on perceptions and attitudes of human beings and complex issues like teambuilding and trust, it will always be intricate to find “proof”. Tests can never be repeated with the same participants (that have stayed at the same level of knowledge and state of mind), the exact same conditions, and with the same problems and projects. This doesn’t mean it is impossible to draw conclusions and it hasn’t hindered me from trying to verify my suppositions. One rather surprising finding was actually the similarities between the teams observed, when it came to the problems they encountered.

I decided to not discuss the issues of specific technical solutions, for example exactly what videoconference system was used or what the advantages were for specific IM programs and virtual communities. This is not because it is insignificant information, but since my research focus is on a more general level. The ICT and applications available has also improved since the investigations started, so data would have been outdated and not valid for the new versions or new ICT that exist today. The basic human problems connected with using them have basically stayed the same, though, even if there have been changes because people have gotten used to working with different media and some have learned to avoid some of the pitfalls. CVE’s (collaborative virtual environments) have not been analyzed at all, since they have not been used by the participants in the studies. There has also not been done any detailed study of tangible breakdown points in conversations and discussions and no conversation analysis, since my research focus is on a different level.
3. Literature Review – Aspects of Distributed Collaborative Work

In this chapter both theories and empirical research in the area of distributed work, or from adjacent areas relevant for the discussion, are presented. The literature works somewhat as a background to my research, but it also works as a complement, as an aid to understand the situation for distributed teams better and illuminate what factors influence the distributed project work environment. The research and theories found here are therefore on different levels, and aims to assist in the understanding of diverse topics imperative for the distributed work environment. The literature covers studies from engineering, pedagogy, anthropology, sociology, HCI, CSCW, CSCL, human work science, management, psychology, cognitive psychology, etc., since the investigated area is of a very cross-disciplinary nature.

3.1 Teamwork

Before entering the areas of focus in this dissertation, some general theories and research about teamwork and team stages will be covered.

3.1.1 Definition of Team

The definition of what a group or a team is differs between contexts and theories. Bannon and Schmidt (1991) claim that generally a group is defined as a relatively closed and fixed ensemble of people sharing the same goal, engaged in incessant and direct communication. They state that the notion of a shared goal is dubious and suggest an informal definition previously stated by Bahrdt (1984): the term “group” can be used if its members perceive themselves as a “we”. They also distinguish being a group from working in a collaborative way, that the term “cooperative work” is a general and neutral designation of multiple persons working together to produce a product or service, and that it does not imply specific forms of interaction or organization such as comradely feelings, equality of status, formation of a distinct group identity (Bannon & Schmidt 1991). A central factor for teams is communication. McGrath (1993) state that the central feature, the “essence”, of a team lies in the interaction of its members, the behaving together, or as Bradley et al. formulate it “Communication, like language, is a basic factor of group structure” (1993, p.157).

It is common to hear that a good group is more that its individual parts. McGarty and Haslam (1997) go even further and state that “groups could have real consequences for social life – in ways that are not explainable in terms of the properties of the individuals.” (p.10-11). Regardless of if this is true or not, people have to work more and more in teams because of the complexity of tasks and the globalization of the world. Groups are very influenced by their participants and
McGrath (1993) mention that this affects the group process. Participants come to group interactions with all their traits, characteristics, beliefs, habits, etc. A member may be strong, or extroverted, or intelligent, or old, or male, or clumsy, or many other things and some of these properties may affect group interaction. So, if one wants to understand and perhaps predict aspects of group interaction processes, one must take these group member characteristics into account.

Groups are also affected by the context they are in “Group interaction takes place somewhere, in some environment.” (McGrath 1993, p.114). As McGrath state, the group interaction is taking place in an environment that includes both physical and social aspects. Many of these aspects affect how members behave, and can alter the group interaction process. Group interaction not only takes place somewhere, it involves the group doing something. The effects of group interaction can have negative implications on group work as well. Conformity is one possible negative effect; the process through which individuals change their opinions or behavior and adjust them to what other people do or think (McGarty & Haslam 1997). People seem to have a tendency to exert less energy if their efforts are unidentifiable than if they work alone. Latané (1977) noticed this so called “free-rider” effect in his research. That when people participated in groups it seemed to lead to less than optimal efforts.

3.1.2 Team Formation

The first step of shaping and building a team is the team formation and team composition. How are teams formed? Will participants be assigned to a team or will they choose team members by themselves? How is the formation process going to work? Are the right competencies available? What personalities do people have? If people do not understand why they are working in a team together and how they can benefit from each other, the team is off to a bad start. If the team formation process is thought through, it is much more likely that unnecessary conflicts can be avoided.

An important issue to discuss before a team is formed is group size. Brown Fiechter and Actis Davis poses that group size was mentioned by several team members as a problem due to the logistics of arranging outside meeting times. According to them four to seven member groups function very well; while smaller groups often lack resources and larger groups have difficulty maintaining cohesiveness.

Bruffee has a different opinion on what the optimal team size is, even if that is for decision-making groups. He says that the optimum size for decision-making groups is five. More than five won’t change the social dynamics much, but will dilute the experience, negligibly in groups of six but significantly in groups of seven and eight and almost totally in groups of nine, ten, and more. Fewer than five in a group changes the dynamics in fairly obvious ways. Groups of four tend to subdivide into two pairs; groups of three tend to subdivide into a pair and an “other”; and groups of two tend to sustain levels of anxiety, hostility, and stress sharply higher that those of any other group size. In contrast to consensus or decision-making groups, however, projects teams working together for longer periods of time, seem to be most successful with three members. Long-term working groups larger than three often become logistically cumbersome (Bruffee
Team formation has been researched by Brown Fiechtner and Actis Davis (1992), and they concluded that students are more likely to have positive experiences when groups are either formed by the instructor or by a combination of methods. In their study students that formed their own groups were likely to list the group as being a worst group experience.

Once a team is formed it is important to keep it stable, because it needs to remain stable enough for group cohesiveness to develop so that team members can work effectively on their tasks (Brown Fiechtner & Actis Davis 1992). Having stable groups gives a team a chance to work, since it takes time to get to know one another and get the work started and running smoothly, and adjusting the team should be avoided (Miller, Trimbur & Wilkes 1994). Dealing with problems is part of the work experience and Miller, Trimbur and Wilkes recommend keeping groups together even when they have problems, because then they can develop their skills in negotiating differences. Participants also have to learn to take responsibility. “It never ceases to amaze us that, in 99 percent of the cases in which a student complains to us about a group dynamics problem, he or she has not seriously discussed the issue with the other members of the group.” (p.43).

A problem for classes at a university level is that people in a class are likely to be more similar. When people choose a particular line of study they tend to have certain interests, and after taking classes in a specific school they tend to start thinking even more alike. Miller, Trimbur and Wilkes (1994) point out that the Myers-Briggs Type Inventory (MBTI) theory stresses the need for balance in all groups, no matter what the task. However, such balance was hard to achieve in their class of biology students, because it was heavily skewed from the start. Apparently students that choose a line of study don’t only have the same interests, but tend to have similar personality types. If it is possible to have cross disciplinary teams, or distributed, perhaps even global teams, the chances for diversity among the students increases.

If something like the MBTI is used as a help to form diverse teams, it is important not to look only at if the teams will be diverse, but also how they will be diverse. What differences can the team gain the most from, and which ones will more be the cause of problems? “Despite the emphasis on Intuition and Thinking in learning style theory, there are the Judging-Perceiving and, to a lesser extent, the Introversion – Extroversion dimensions that most affect group harmony and provoke the kind of fundamental conflict that can disable a group before it even gets down to task. Moreover, similarities in these areas make for group harmony that influences student satisfaction with the course, although it may not show up in performance differentials.” (Miller, Trimbur & Wilkes 1994, p.37).

Degree of diversity or homogeneity is according to Bruffee (1999) an important issue for team formation. In general, diverse groups tend to make the best decisions because differences encourage challenging and canceling of unshared biases and presuppositions. Groups that are too homogenous tend to agree too soon, since they have an investment in maintaining the belief that their differences on basic issues are minimal. There is not enough articulated disagreement or resistance to consensus, and even worse, homogenous groups tend to find disagreement that does arise difficult to endure since, as Jarvenpaa
and Leidner (1998) point out, diversity when it comes to different cultural and geographical background can challenge the potential existence of trust.

Members of decision groups that are too diverse may not have any basis for arriving at a consensus, or no means for doing so, since they “don’t speak the same language” (Bruffee 1999). The times when diversity will be really destructive for collaboration are when the differences are not acknowledged, and because of this might lead to misunderstandings and confusion. “Teachers organizing consensus groups have to keep all these variables in mind – degree of heterogeneity, group size, ethnic background, phases of work, and so on. When collaborative learning ‘just does not work’, any number of forces may be in play.” (Bruffee 1999, p.29). Diversity can make it harder for members of a team to understand each other and come to a consensus, and it can also be the cause of severe conflicts. It is a fine line to walk between a too stable, homogenous, and harmonic existence, and an environment with too much conflict and diversities that are hard to get passed (Miller, Trimbir & Wilkes 1994).

3.1.3 Theories Regarding Teamwork

3.1.3.1 Theories on Team Stages
To create a good work environment, sufficient support is needed, and to get sufficient support, knowledge about team stages and common problems is important. Knowing the challenges teams meet, make it easier to handle them. To be able to help participants in a team turn problems into opportunities it is not only helpful to know the potential problems, but it is also important to know when they are likely to occur. This is especially important when planning teambuilding activities. The wrong exercise at the wrong time might only make participants doubt the usefulness of the activity, and will perhaps make them not take future activities seriously, and it won’t help their teambuilding.

There are different ways of looking at the stages teams go through and here three are briefly covered. The first one looks at the social and processual side of teambuilding, including ways the team members build trust and get to know each other, and problems and conflicts that will arise. The second one examines the task or product-related stages teams have to go through to get their work done. The third one looks at the relations between time, interaction, and performance.

FIRO: Fundamental Interpersonal Relationship Orientation
One of the most common group stage theories is the so called FIRO theory which was developed in the beginning of the 1950s by Will Schutz. Schutz was a psychologist and worked as a researcher in the American navy when he was developing the ideas around FIRO. Schutz studied group efficiency aboard a battle ship and discovered that some teams worked really well and some didn’t function well at all, in spite of a similar mix of competence within the group.

Schutz found in his research that teams go through three (or depending how you look at it, six) different phases in their development towards becoming an efficient unit. These phases or process stages are; 1) Suspicin 2) Honeymoon 3) Conflicts 4) Control 5) Togetherness 6) Separation

Before entering a group people are suspicious, nervous and don’t know what
will happen, what the group can achieve and what the other team members are like. After getting to know each other the team reaches the honeymoon stage; everybody seems nice and they think they know each other. After a while the group gets into conflicts, realize they want different thing, see flaws in the others and the idyllic picture gets crushed. In the control stage the communication becomes more open, hierarchies are worked out, conflicts are resolved and people start to be accepted as they are. In the togetherness stage the focus is on the everyday work, to keep in contact, and keep the communication and energy up. After this the group either separates or new members come in and the process starts all over again.

A group that is striving for togetherness and efficiency must, according to Schutz, go through these phases in the stated order, to reach a successful result. Schutz thought that the group process is in a natural cycle. A group who has reached the togetherness phase in its development will now and again return to the previous phases, for example when there is a crisis, or when a new member enters. The more mature a group is, the less time is needed to return to the phase of togetherness and affinity.

For a team to be able to solve its tasks, the participants need to put in a lot of energy. When it comes to group processes and interpersonal relations, the group will focus its energy in different directions depending on in which phase or state of maturity it is in. During the Honey moon phase the energy is focused on questions about membership and belonging to the group. A lot of time is spent on finding out how much you want to adapt to the other team members, if you accept them, and what resources the group has access to. To be able to reach the control phase, the team members must be prepared to take chances and risk getting excluded from the group. For the team to develop it is important that the members dare taking risks.

During the Control phase, it is questions concerning leadership that is the deciding factor for the group development. It has to be decided how to share responsibility, handle conflicts, and decide what role everybody is supposed to play in the team. The control phase is the hardest phase for a team to get through and it often demands a lot of time. When the members of a team have found their roles, the team can move further to the togetherness phase. To reach the Togetherness phase is most of the time perceived with great satisfaction and content, since the conflicts are now solved. The entry to this phase is characterized by carefulness and the members are anxious to keep the comfortable atmosphere. The energy is focused on keeping the feeling of belonging and openness. The leader’s role in this phase is important to avoid stagnation. During the continuous development, the energy is focused on developing positive ways of communication, trust, and acceptance. In the togetherness phase the group doesn’t have to solve membership issues or conflicts, but the energy can be used to solve the tasks efficiently. Relationship problems are solved when they occur.

Product Related Stages
Tom Kosnik (1999) developed a team stage model that focuses on the activities of a team, i.e. product related stages. This model can be useful to achieve a good picture of the process, and can be hands on support for teams in their work, to see
what topics to focus on at a certain time.

a) Orientation – why am I here?
b) Trust building – who are you?
c) Goal clarification – what are we doing?
d) Decision making – which way?
e) Implementation – how are we doing it?
f) High performance – wow!
g) Renewal – why continue?
h) Finishing project – summing things up!

TIP Theory
TIP theory stands for the theory of time, interaction, and performance (McGrath 1993). TIP theory assumes that a group will use a default path if it can, and in any case use the least complex path that its purposes, resources, and circumstances will allow. This view contrasts with most theories that invoke “problem-solving phase sequences”. Most phase-sequence theories invoke that there is one “most rational” or “most efficient” sequence. The TIP theory does not posit such a most rational or most efficient phase sequence, but rather posits a default sequence that is “satisficing” or “least effort” path. TIP theory asserts that the default path will prevail unless conditions warrant some more complex path (McGrath 1993).

<table>
<thead>
<tr>
<th>FUNCTIONS</th>
<th>Mode I Inception</th>
<th>Mode II Problem Solving</th>
<th>Mode III Conflict Resolution</th>
<th>Mode IV Execution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>Production Demand/ Opportunity</td>
<td>Technical Problem Solving</td>
<td>Policy Conflict Resolution</td>
<td>Performance</td>
</tr>
<tr>
<td>Well-being</td>
<td>Interaction Demand/ Opportunity</td>
<td>Role Network Definition</td>
<td>Power/ Payoff Distribution</td>
<td>Interaction</td>
</tr>
<tr>
<td>Member Support</td>
<td>Inclusion Demand/ Opportunity</td>
<td>Position/ Status Attainments</td>
<td>Contribution/ Payoff Relationships</td>
<td>Participation</td>
</tr>
</tbody>
</table>

Figure 4: TIP- theory (McGrath 1993)

3.1.3.2 Hackman's Mediational Theory
Hackman’s mediational theory is a set of organized and interrelated propositions that attempt to explain how groups make effective decisions. The theory claims that communication is the means, or medium, by which contextual features, such as group structure and process assistance, influence the process criteria of effectiveness, such as member effort and knowledge and skills. The latter, in turn, via communication, influences whether a group will make an effective decision. Hackman (1990) explains his theory by first identifying three conditions that “enable” a group to make high-quality decisions: a group should exert enough effort to accomplish the task at an acceptable level of performance; a group should
bring adequate knowledge and skill to bear on its task-related work; a group should employ task-performance strategies that are appropriate to the work and to the setting in which it is being performed.

Hackman calls these enabling conditions the process criteria of effectiveness. Although he cautions that the three variables ultimately do not determine how well a group performs, he suggests that they are useful in assessing how a group proceeds with its work. Influences on group effectiveness do not come in separate, easily distinguishable packages. They come, instead, in complex tangles and to sort out the determinants of group effectiveness can lead to the conclusion that no single factor has a very powerful effect. In fact, the performance effectiveness of groups is a product of multiple, non-independent factors whose influence depends in part on the fact that they are redundant (Hackman).

According to Hackman, several social and environmental conditions influence the effort a group puts out to complete its task, the knowledge and skill a group processes to complete its task, and the task-performance strategies a group uses. He describes three contextual factors with strong influences: a group structure that promotes competent work on the task; an environmental context that supports and reinforces excellence; and expert coaching and process assistance. Hackman maintains that a group must set up an appropriate group structure to capitalize on group members’ effort, knowledge, and skills, and to adapt appropriate task-performance strategies. Three elements are important for an effective group structure:

- Task clarity: The degree to which group members find the task clear, meaningful, and consistent with the group’s purpose. Task clarity allows members to share responsibility and accountability for their work.
- Group composition: The degree to which a group consists of the right members for the work that needs to be done. Members should have the expertise to make good decisions and the interpersonal skills to work well together.
- Core norms: The degree to which clear and strong rules that regulate and control group behavior exist. Effective core norms make it easier for group members to coordinate their actions.

A group cannot use the decision-making process effectively or arrive at an effective decision if group members do not have a clear understanding of the task, if they do not have relevant knowledge and skills, or if they have not created effective methods and procedures for managing task-related and relational issues.

Hackman also contends that groups most often reach high-quality decisions when they operate in a supportive context. A supportive context should include: a reward system that recognizes both individual and group achievements; an educational system that provides members with any training or technical assistance they need; an information system that provides members with the data they need to make high-quality choices.

The final factor is process assistance. Hackman claims that it is a mistake to expect individuals to know how to work effectively in groups, and that group members often have to be taught how to work together. He suggests that a “help
provider” (for example, a group leader or a consultant) can promote the effectiveness of group decision making and problem solving by helping members learn how to avoid faulty group processes and how to tap into the creative potential of working together (two heads are better than one).

Within Hackman’s theoretical framework, communication serves a mediational role; it is the medium through which the process criteria of effectiveness, context, and ultimately performance are linked. It is largely through communication that contextual factors influence the process criteria. For example, the help provider communicates information to group members that gives them the skill and knowledge they need to work on their task. And it is largely through communication that the process criteria are able to influence group decision-making and problem-solving performance. For example, in their discussions, group members pool and utilize the knowledge that helps them make good decisions. In Hackman’s theory, communication is a conduit that allows contextual factors to influence the process criteria and those criteria, in turn, to influence group performance.

3.1.3.3 Theory of Predecision Preferences

Hewes (1986) suggests that we cannot be sure that communication has an effect on decision outcomes simply by counting the frequency of different communication behaviors. Hewes suggests that non-interactive factors, factors that have nothing to do with communication in groups, may have more influence on decision outcomes than communication. Among those factors are the skills and abilities of members, the methods for combining individual preferences into a group decision, and the agenda a group follows in reaching a decision. One non-interactive factor is “the predecision preference” of group members, the solutions or alternatives that individual members favor before a group discussion. He argues that until proven otherwise, the primary determinants of effective performance must be non-interactive in nature. The task for communication scholars, then, is to establish that communication exerts an influence on group decision performance that is above and beyond the influence of the predecision preferences of group members and other non-interactive factors.

Unfortunately, when people simultaneously face two goals, e.g. focusing on the task and managing relationships and conversation, they often pursue one at the expense of the other. At any point in time, group members may exert most of their efforts toward accomplishing the group’s task or maintaining social relationships within the group. That can pose serious problems for the group. Whether members focus primarily on the task or on their relationships, their decision performance is going to suffer. One tension that group members must manage, then, is achieving an optimum balance between its task-related and social realities. A second tension that group members face is between expressing one’s ideas and positions, regardless of what other group members say and do, and adapting one’s communication in response to the communication by other group members.

3.1.3.4 Reference Theory

Having common knowledge is crucial for people to achieve reference when communicating. References enable people to jointly identify the objects and
events that they want to talk about (Whittaker & O’Conaill 1997). Hindmarsh et al. (1998) say that workplace studies have demonstrated how communication and collaboration are dependent on the ability of people to invoke and refer to features of their immediate environment. An essential part of this process is individual’s abilities to refer to particular objects, and have others see what they are looking at in a particular way.

In distributed communication through ICT participants become explicitly engaged in, and distracted by, the problem of establishing mutual orientation and it becomes a topic in and of itself (Hindmarsh et al. 1998). In some cases participants assume the availability of their gestures (Hindmarsh et al. 1998) and listeners have to infer a speaker’s intended meaning by supplementing what was said with contextual information external to the utterance. In general, listeners are able to generate such external inferences quickly and accurately, and hence determine the speaker’s intentions (Whittaker & O’Conaill 1997). “The analysis of interaction in CVEs, like earlier discussions of media spaces and MTV, point to critical, yet largely unexplored aspects of collaborative work. In particular, they reveal, par excellence, how collaborative activity relies upon the participants’ mundane abilities to develop and sustain, mutually compatible, even reciprocal, perspectives.” (Hindmarsh et al. 1998, p.226).
3.2 Effects of Distribution

3.2.1 Distance vs. Face-to-Face
Verbal interaction face-to-face is undoubtedly the most natural way of communicating for human beings, and most people would probably agree that we need physical contact and human presence to feel good. The change of the world to one big open market with multinational companies and possibilities for virtual interactions has not changed that, “even as our day to day activity is enacted in increasingly complex global organizations and social networks, we find that we cannot do without our most basic form of human communication – face to face.” (Nardi & Whittaker 2001, p.36). Does this necessarily mean that people that work together has to see each other? If people get their share of human contact in other situations, do they need to see their teammates to keep a distributed project going?

There is definitely value in having face-to-face interactions when working together. Nardi and Whittaker (2001) argue that in addition to its information richness, face-to-face communication will persist in workplaces because it is the surest way to establish and nurture human relationships. Business relationships are grounded in social bonding and expressions of commitment that is most easily accomplished through face-to-face communication. Bradley et al. (1993) point out that communication is a central part of the psychosocial work environment and for (most) people at least some human interaction at work is necessary for them to enjoy work as well.

Cues will disappear when moving away from actually seeing each other, and it is much harder to build a working relationship without these cues. O’Dwyer, Giser and Lovett (1997) observed that until there was some face-to-face contact that helped distributed teams get to know each other, the work through e-mail and voice mail was frustrating, time consuming and inefficient. Team members felt like messages went into a “black hole” and they were rarely sure what was being done, if anything. After they got to know each other from face-to-face meetings, they found that the efficiency of e-mail and voice mail was enhanced. Armstrong and Cole (1995) mention that face-to-face group meetings appear to be particularly important when forming a group, cementing shared commitments to key decisions, and resolving major conflicts among members.

An interesting aspect of distance is that it seems to matter how far away people are from each other for how they act and interact with each other. Findings in communication’s research indicate that the degree of physical proximity between people and their use of different ICT affect their work relationships (Armstrong & Cole 1995). People tend to communicate more with people that are close to them. That does not only include communicating more face-to-face, but communicating more frequently in general and in more situations, in both scheduled and coincidental encounters and people even tend to use more communication media. “Beyond a very short distance, people began to miss out on spontaneous exchanges and decision making that occurred outside of formal meetings.” (Armstrong & Cole 1995, p.195).

There are not only more frequent casual interactions with people that are physically “around”, but there is also a tendency to be more aware of people you
see often. You know their skills and how they work; you have more direct access to information of what they are doing, etc. But considering only this, it shouldn’t make a difference how far away a person is, as long as he or she is out of sight. Armstrong and Cole (1995) say that you “make the same mistakes if the distance is 4,000 miles or 10. You still tend to turn to the person in front of you for the answer.” (p.197).

Research has shown that this intuitive conclusion is not always true. How big the distance is between two people does matter. For example, Armstrong and Cole (1995) found that “communication frequency between research-and-development (R & D) researchers dropped of logarithmically after only 5 to 10 km of distance between offices. Kraut, Egido, and Gallegher (1990) found that people in adjacent offices communicated twice as often as those in offices merely on the same floor, including via E-mail and telephone transmissions.” (p.189). Bradley (1993) has a different view on distance and states that information and communication technology affects our perception of time and space in a way that we perceive that we have less time and are closer to each other regarding space.

Research has also shown that distance affects how much people believe in and value what others say. Moon (1998) found that perception of decreased physical distance between people increases persuasion. Not only are people near each other more likely to change responses to conform to the other individual’s suggestions, but they also judge the other individual to be more credible and the quality of the information to be higher.

There are different theories why proximity affects how people judge and think about others. For example, studies have demonstrated that physical proximity facilitates attraction. This relationship has usually been explained as being a function of either accessibility or familiarity. In other words, people not only tend to like those who are familiar to them, the “exposure effect”, but tend to form friendships with those who are accessible to them for interaction (Moon 1998). People also tend to make the assumption that somebody close to them think more in the same way, and the fact that they might actually meet the other person sooner or later can also inspire communication. “In social impact theory, immediacy (defined partly as closeness in space) is conceptualized as one of three major determinants of social influence.” (Moon 1998, p.380). The proximity increases the perceived likelihood of future interactions, and these anticipated future interactions make people more responsive to nearer people.

It is not only the case that people get more attracted to and interested in people that are located close to them. People we find attractive might also influence us more easily. Moon (1998) mentions that it appears that when two conditions are met; a recipient lacks the motivation or the ability to process the message arguments carefully, and the vividness of the source cue is enhanced. Message recipients tend to be influenced quite substantially by source cues unrelated to the content, such as physical attractiveness, expertise, or speaking style. However, in most computer-mediated communication situations, recipients lack access to these cues and distance in itself becomes a factor.
3.2.1.1 Diversity and Culture

Distance does not necessarily have to be only a geographical factor. “Distance among members of a distributed work group is multidimensional. Objective measures of distance include not just geographic distance (m/ km), but also time difference (time zones), organizational distance (different departments, functions, and levels), and cultural difference (both national culture and organizational office site culture).” (Armstrong & Cole 1995, p.210). All of these factors have to be dealt with when working in a distributed team, and the geographical distance is not always the hardest to overcome.

Culture is not the focus in this dissertation, but it is vital to not forget the importance of the context and culture teams and team members come from and are located in. Communication and culture are not separate. Each is produced through a dynamic relationship with the other (Schirato & Yell 1997). Culture is to society what memory is to individuals. It includes all that has worked in the past, and in that sense has become a shared perspective, transmitted from generation to generation (Triandis 1997). We all come from a background and act in a context that affects our behavior and communication. Or as Goodwin (2000) expresses it, context is not simply a set of features presupposed or invoked by talking, but itself a dynamic, temporally unfolding process accomplished through the ongoing rearrangement of structures in talk, participants’ bodies, relevant artifacts, spaces, and features of the material that surrounds us.

Manstead (1997) brings up the concept of “worldview” provided by a particular culture. A worldview is a set of fundamental values, beliefs, and sentiments about reality which are often tacit and taken for granted. It is the filter through which we implicitly perceive, organize, remember, interpret, and emotionally experience life. A worldview is difficult to put your finger on, and therefore difficult to analyze, and still as real and as powerful as more physical entities.

Every questioning and action grows out of a tradition, a pre-understanding that opens the space of possible answers. In trying to understand a tradition, we must first become aware of how it is concealed by its obviousness. “It is not a set of rules or sayings, or something we will find catalogued in an encyclopedia. It is a way of understanding, a background, within which we interpret and act.” (Winograd & Flores 1986, p.7). It is vital to understand that these implicit beliefs and assumptions cannot all be made explicit. There is no neutral viewpoint from which we can see our beliefs as things, since we always operate within the framework they provide. This inevitability does not diminish the importance of trying to gain a greater understanding of our own assumptions so that we can broaden our views. But it does preclude the possibility that such understanding will ever be objective or complete (Winograd & Flores 1986).

Culture is a difficult parameter. It affects us in numerous ways, but most of us are not aware of the extent of culture we carry with us. “All humans are ethnocentric, at least to some extent. This observation can be analyzed in two parts. (1) Most people do not know that they have a culture, because they believe that the way they see the world and act is universal; and (2) when they discover that those on the other side of the mountain or across the sea look upon their environment or act differently, they judge them harshly. Specifically, people see
their own culture as the standard and evaluate other cultures according to their similarity to their own culture. This is an aspect of the human condition (Triandis, 1994b) comparable in importance to having two legs and a large brain.” (Triandis 1997, p.342-343).

The aspects of different company, university, or country cultures on different sites, on top of the geographical distance, increase the risk for conflicts. Armstrong and Cole (1995) studied distributed teams where the two sites had completely different definitions of product quality and tested their work with different procedures. This naturally lead to conflicts, but was hard to anticipate. Basic values and features are often taken for granted, which lead to that it is not discussed, and the topic might not even come up until it is too late. Armstrong and Cole (1995) state that multicultural confusion seems to be most insidious in routine organizational exchanges, for example exchanges such as giving instructions to subordinates or participating in meetings. Often, these “unexamined behaviors express unspoken expectations and assumptions about work roles.” (p.192).

That people come from different backgrounds does not necessarily mean that they don’t understand each other, or that they can’t communicate effectively. What it means is that words and gestures will be interpreted and evaluated differently by different people, depending on the cultural background and the specific contexts in which practices take place (Schirato & Yell 1997). The context affects how we interpret the information we receive by our senses. It enhances our ability to interpret information, but it also creates blindfolds. Information becomes colored, or as Gärdenfors (1996) puts it, captured by our culture. Our perception is controlled by our expectations, which builds on previous interactions with the environment. When perceptions of our environment go against our expectations, there is normally a “resistance” to recognize the unexpected or the incoherent (Gärdenfors 1996).

Jarvenpaa and Leidner (1998) suggest that electronically facilitated communication may even make cultural differences irrelevant. This because the lack of nonverbal cues eliminates evidence of cultural differences, such as variations in clothes, gesticulating, and greetings; the written medium eliminates the effects of accents which would reduce the saliency of differences in cultural background; and because the asynchronous mode gives individuals more time to process messages and respond, there might be fewer language errors, particularly among nonnative speakers of the language being used by the group. Since cultural differences are less noticeable, electronic media may thereby increase the perceived similarity among members.

A distributed team is situated in a context and probably has participants from different cultures located in different cultures, but a team can also develop a culture of its own. Manstead (1997) calls this socialization. With this he means that extended exposure to a specific milieu have a strong influence on individuals. The lasting quality of this influence is attributable to people’s need of a sense of identity; with beliefs, attitudes and behaviors. This implies that the context has a powerful impact on the way in which we perceive the world around us. Culture has consequences in the sense that those who are socialized into a particular culture adopt certain values that have a lasting effect on the way in which they
construe the social environment, and thereby on their social behavior. The impact of culture on thoughts, feelings, and behaviors is a subtle, yet important one.

Dale (1994) states that collaboration can be hard to foster in the individualistic culture of the West. Other researchers (Hall 1976; Hofstede, 1980, 1991) claim the exact opposite; that people from individualistic cultures will adapt to virtual collaboration more easily. They claim that it makes people less concerned with self-categorizing, less influenced by group membership, give them greater skills in entering and leaving new groups, and encourage engaging in more open and precise communication than individuals from collectivist cultures (see Jarvenpaa & Leidner 1998).

3.2.1.2 Demeanor, Behavior and Skills

When a team is distributed, new skills are demanded from the team members. According to several researchers, if distributed collaboration is going to work as well as collaboration in face-to-face teams do, team members should communicate feelings, context, and sensory information, they must establish roles and identities, and they must create a sense of team. In addition, effective virtual teams must resolve ambiguity, reduce uncertainty, and take collective action (Knoll & Jarvenpaa 1999). Duarte and Snyder (1999) on their hand claim that there are special competencies needed to succeed in a virtual team setting. According to them, there are six virtual team-member competencies important for a successful process; project management, networking, the use of technology, self management, boundary management, and interpersonal awareness. O’Dwyer, Giser, and Lovett’s (1997) also define the main collaboration and communications skills needed to use groupware most effectively (in a slightly different way). The skills they emphasize are:

- Inquiry – the skill of asking questions to recover high quality results that would otherwise stay beneath the surface, unearth mixed messages, contradiction, etc. People often see the importance of inquiry, but they do not actually ask the questions.
- Identifying and examining assumptions – we all make assumptions about everything (including other people’s assumptions) and we typically don’t share them, and we do not inquire into other people’s assumptions. Even when we are aware of other people’s unshared assumptions, we are afraid to identify and examine them. The goal should be to use the inquiry skill and constantly check and identify the assumptions that have been made.
- Calibration – the skill of attuning yourself to the cues people give that adds a great deal of meaning to their words. Calibration requires experience with other people and inquiry.

Palloff and Pratt (1999) also listed some personality features they found important to successfully enter a virtual community:

- The ability to create a mental picture of people you don’t see.
- The ability to deal with emotions in textual form.
- The ability to have an internal dialogue in order to formulate responses.
- The ability to create a sense of presence online.
Berleur and Valenduc (2001) point out that it is important that distributed team members are able to handle more “soft” skills, and not only ICT, including organizational aspects and the ability to communicate, the capacity to work in teams and to co-operate in defining problems and finding solutions. This is something also Järvenpää (2001) focus on. Leadership styles vary across cultures, which leads to that people may need to learn new management skills and new ways of motivating people, create new reward systems, etc.

Distributed work, especially project work, is different from on-site work in a lot of ways, and people have to know about the differences and know how to handle them to be able to collaborate and communicate successfully. The need to structure the communication and the work, and make things clear is important in all teams, but absolutely necessary in a distributed team, since people do not see what their teammates are doing and can’t solve the problems “as they come up”. Knoll and Jarvenpa (1999) discussed this problem area and saw that teams that successfully worked and managed to deliver a common document succeeded in part because they found a structuring tool.

3.2.1.3 Distributed Collaboration
It is not always possible to transfer knowledge from face-to-face interactions and assume things will work the same way in a distributed work environment. This is something that team members, teachers and project managers working in distributed environments have to take into consideration. As Cheesman and Helesen (1999) phrased it, that one cannot rely upon the pedagogical know-how from face-to-face environments and the collaborative goodwill of students and teachers in net based learning. They point out something very important; as it is now, distributed work often demands a lot of extra effort, tolerance and goodwill from everybody involved. People might agree to the extra time and effort now, because they find the technology and the experience new and interesting in itself. If distributed collaboration is going to be scalable, or survive at all, goodwill is not anything to depend on or expect in the long run.

People in distributed environments can easily feel isolated or feel that they are not really part of a team, and that can lead to lack of motivation (Puntambekar 1999). If team members don’t feel that they have a choice, don’t see the point of the collaboration, and don’t feel like they are part of a team, fruitful collaboration can’t be expected. Bradley (1979) emphasize people’s need for control and self-determination, need for an interesting and meaningful job, and need for companionship and solidarity with other people. If those needs are not fulfilled, it can lead to a feeling of powerlessness, pointlessness, and isolation; and all of this can in turn lead to alienation.

Bradley also points out the vast amount of issues that can affect and make contact and communication harder. This list is a development with the base in Bradley (1979, p.130-132), but with the focus on and adapted for distance workers. A few of the things that affect the work environment are: work hours, if it is part time work, the distance, power structure and hierarchy, lack of control over the work situation, tasks and content of the work, replaceability, personality, skills and knowledge, confidence, different disciplines, physical work
environment, technology, team space, grading and reward system, and leadership.

It always takes time for groups to start functioning effectively, and the process will most likely not be faster in a virtual environment, and it has to be allowed to take time. A teacher or team leader can’t influence the personalities, cognitive styles, or past experiences of a group. What they can do is design the tasks so that everybody gets an opportunity to be in his or her element at least some of the time, which help keeping everybody engaged, feeling that they are useful to the team and see the value of collaboration. This, in extension, increases the team feeling (Miller, Trimbur & Wilkes 1994).

If a project has too many activities, there is too little time to actively work together, take advantage of the diversity, or reach team consensus, and it is easy to simply split the tasks in-between the team members. On the other hand, if a team doesn’t have enough deadlines, it is easy that time just disappears and no work gets done. In a work environment it might be harder to affect, but in a learning situation there is definitely “a dilemma in deciding how many and what kind of graded group activities to employ. On one hand, it is important to have enough assignments so that the group has the opportunity to become cohesive, while on the other hand, too many activities appear to have a negative affect.” (Brown Fiechtner & Actis Davis 1992, p.62).

Participants in a team have to feel that they gain something from collaborating or using a specific tool; otherwise they will only divide the tasks, work individually on their specific part, and not use the tool. One of the greatest problems with collaborating is convincing people that sharing knowledge will increase effectiveness for all and not necessarily at the expense of their personal power. “If knowledge is power, sharing knowledge is often seen as a sure way to lose power.” (Coleman 1997, p.190).

3.2.1.4 The Distributed Collaborative Learning Environment

Since the participants in the case studies covered in this dissertation mainly have been students, the work environment was naturally affected by the fact that it was a learning environment. Research in CSCW and CSCL that deals with teams in an educational setting is going to be covered here. There won’t be any deeper analysis of the learning aspect of CSCL, but the focus is the area of collaboration in distributed learning environments.

The definition of collaborative learning varies across and within academic fields. The broadest definition is that it is a situation in which two or more people learn or attempt to learn something together (Dillenbourg 1999). In a collaborative learning environment students get the chance to experience something close to what people really working in their area are doing and they get to see how professionals reason, the conversational process, and not only results of what other people have thought (Bruffee 1999). “Collaborative learning provides the kind of social context, the kind of community, in which normal discourse occurs: a community of knowledgeable peers.” (Bruffee 1992, p.28).

Many students today are used to and enjoy collaborative learning, even if it is still far from the most common way of teaching and learning, and most students still have a lot to learn about it. Bruffee (1999) states that students working together in small groups go through a fairly predictable process of adaptation in
which they relate to one another differently at different times during the collaboration. Brown Fiechtner and Actis Davis (1992) say that when working in projects, students experience something close to what they will meet in corporate environments. The business environment has become more complex, so the ability of one person to cope with it satisfactorily has been greatly reduced. Hence, group learning is an attempt to introduce students to real-world experiences before graduation.

There is no way to circumvent the challenges of collaboration, but that is also one of the benefits of it. Every project presents an intriguing opportunity. When projects are good, it won’t only lead to satisfied students, but even instructors can gain a lot from discussions, see new ways of looking at and approaching problems and get fresh perspectives on their subject. It is therefore not only the students’ motivation and inspiration that increases, but teachers will most likely become more engaged (Leigh Smith & MacGregor 1992).

Compared to a traditional classroom organization, having students work together collaboratively may feel out of control (Bruffee 1999). “If you teach with an Atlas complex, you see yourself as primarily responsible for the learning that occurs in your class.” (Finkel & Monk 1992, p.50). Teachers have to be willing to give away control and realize that the most important work lies in formulating the tasks so it inspires collaboration and ensures that students learn, and then be there to support the learning. It is not only difficult for teachers to give up control, but it is also hard for a lot of students to start taking responsibility and control over what they learn, and not only rely on the teacher for answers (Finkel & Monk 1992).

One documented benefit of collaborative learning is that students learn to appreciate diversity (Miller, Trimbur & Wilkes 1994). A lot of students don’t know how to behave and do not always know how to read situations or solve problems when working in a team. For example, according to Knoll and Jarvenpaa 1999, students in their study often thought conflicts arose around product issues, but it was actually more common that they had conflicts regarding the process, although they failed to recognize it as such. Most students need help dealing with problems they encounter, to avoid getting trapped in process issues, and that demands time and effort from instructors, coaches, or T.A.s. “Initially, course instructors were surprised to find that the process-related issue of group dynamics consumed as much or more faculty effort than issues related to content.” (Miller, Trimbur & Wilkes 1994, p.34).

It is often difficult for students to get used to criticizing each other, and it demands both practice and tact to do it well. “At first students refuse to admit that they see anything wrong with a fellow student’s work. Then they refuse to admit that there is anything of value in it at all. They become, as a student once put it to me, either teddy bears or sharks.” (Bruffee 1999, p.19). Discussing can also be intricate since nobody is really in charge, or has the final say, so in worst case discussions can go on for ever. When working in teams, both students and teachers are going to encounter problems and conflicts they don’t have in regular classes, and it is up to the individuals to decide if the problems are to be considered learning opportunities or problems that has to be removed by the teacher. Students can experience confusion and even anxiety about the work in a collaborative classroom and about how they will be evaluated (Miller, Trimbur &
Wilkes 1994).

Students are regularly not supposed to talk in class, unless the teacher is asking a question, but read, write, or calculate formulas and do equations by themselves. Working together is in a lot of situations in the educational system considered cheating. Bruffee (1992) claims that there is a fundamental distrust of collaboration. Even if it might not be seen as something bad to discuss topics, the end result should definitely be an individual product and not a “copy” of a group discussion. To create a successful collaborative learning environment an instructor has to think through what the desired effects are and how to accomplish them in the best way (Bruffee 1992). Expecting students to know what to do and what is expected from them when they are placed in a collaborative learning situation is risky.

MacGregor (1992) made a list of changes that students have to deal with when switching to collaborative learning: From a listener, observer, and note-taker to an active problem-solver, contributor and discussant; From low or moderate expectations of preparation for class to high ones; From a private presence in the classroom (and few or no risks therein) to a public one, with many risks; From attendance dictated by personal choice to that having to do with community expectation; From competition with peers to collaborating with them; From responsibilities and self-definition associated with learning independently to those associated with learning inter-dependently; From seeing teachers and texts as the sole sources of authority and knowledge, to seeing peers, oneself, and the thinking of the community as additional and important sources of authority and knowledge. It is important to remember these changes, and the demands it puts on both students and teachers. “Entirely too many students are leaving the classroom experiencing only the frustrations of group work and not the numerous benefits possible through team effort.” (Brown Fiechtner & Actis Davis 1992, p.59).

It is important to realize that teams in educational environments might not have time to get to know each other and mature the way teams normally do (Bruffee 1999). An issue that needs to be handled is that there are people who use group work as an excuse to do as little as possible. Both teachers and teams have to know how to handle this, since “there are groups in which one or more members cannot be reached by telephone, do not show up for meetings, break commitments to their group, and in the worst case disappear for several weeks with the entire group’s work in their possession.” (Miller, Trimbur & Wilkes 1994, p.34).

In spite of the problems there are a lot of well knows advantages of collaborative learning. Leigh Smith and MacGregor (1992) point out that reasons for using collaborative learning are that it makes students become more directly immersed in the ideas of the class and they may develop the ability to stay focused and sustain an idea. It also gives students a chance to practice skills on entertaining ideas, raise questions, listen to others, and respond to other’s questions, as well as to learn how to disagree with others with respect and courtesy. In the long run (if they do not already have that ability), they may even learn to recognize and acknowledge the limitations of their own point of view.

Leigh Smith and MacGregor (1992) talk about effects of collaborative learning. According to them collaborative learning leads to involvement in
learning and in other students. These are factors that make an overwhelming difference in student retention and success in college. By its very nature, collaborative learning is socially and intellectually involving. Cooperation and teamwork lead to teams encountering differences, recognizing and learning how to deal with them, as well as learning how to live and work in a community. To sustain democracy it is important to have citizens that have a sense of responsibility for the larger community.

Smith, Johnson and Johnson (1992) saw two environmental factors that were significantly predictive for positive change regarding learning; interaction among students and interaction between faculty and students. This definitely speaks in favor for collaboration in education. “It is no secret that students learn more when they are active participants in the learning process.” (p.35). By working in a group people learn how to work in a group. The process of working in a group teaches important skills, including how to move a group forward, how to disagree without being destructive or disregard new ideas, and how to include all members in a discussion. Few students have these skills and fewer still ever get formal training in them. It has been pointed out by professionals that the best thing universities could do for students would be to train them how to engage in group efforts productively (Bruffee 1999).

When teams are working on their projects and tasks, it is important for the teacher to be available for the students, since it is important that students get continuous help and can get almost immediate input if needed. Instructors have noticed that “providing immediate feedback on group projects is helpful because it reduces students’ frustration. This also seems to provide them a visual demonstration that we’re still doing our job. In addition, we have found that providing immediate feedback on group projects is helpful because it reduces students’ most frequently expressed fear – that we are allowing ‘the blind to lead the blind.’” (Brown Fiechtner & Actis Davis 1992, p.65).

3.2.2 Advantages for Distributed Teams

Even if a whole new set of problems and aspects to deal can come with distance, being in a distributed team can have its advantages as well. It is easier to avoid getting stuck in old habits and traditions when situating people and the whole setting in a new environment. A teacher does for example not have to deal with classrooms designed for lectures (Bruffee 1999). Distance can also be an advantage when a teacher wants to change their instruction methods, like for example changing to collaborative learning. It can be easier for people to accept new ways of doing things, if the environment is different (Bonk & Dennen). The Internet is not restricted to business hours or class time and used wisely, the flexibility can make the interaction both better and more time efficient, since people have the opportunity to ask questions on e.g. web forums as soon as they think about something, and others can answer and everybody will see the answer, and not only the person who asked the question.

The fact that people do not always want to meet each other shouldn’t be ignored. Sometimes it is more comfortable to not have to dress up, or deal with people face-to-face. Nardi and Whittaker (2001) conducted a study where the participants mentioned the emotional expense of face-to-face interactions; the
need to pay attention, to engage in diverting chats, to be pleasant, to wear presentable clothing. Meeting face-to-face can be an “expensive” medium when used judiciously. Human communication demands effort and even if face-to-face communication can simplify communication and collaboration, when there is a conflict it can be an exhausting experience.

ICT takes away some important cues (see Chapter 3.3), but can also take away or reduce some cues that might be considered annoying. There are people that get along better at a distance, and respect each other more and there are cases when people who did not get along made use of electronic communication to reduce the need to meet face-to-face, while still managing to carry on their work (Haythornthwaite, Wellman & Garton 1998).

3.2.2.1. Reflection
Geographical distance and moving to a virtual environment can actually help people gain distance and reflect on what they are doing, since it demands more active thoughts on how to communicate, what to communicate about, choice of communication channels, etc. “When we move from the physical reality to the virtual reality we are subject to a change of principles and premises of being and acting through the insertion of a meta-level of representation which creates a reflective distance.” (Sorensen 1999, p.585).

“The insertion of a meta-communicative level in learning actions and interactions creates ‘distance’ between the acting subject (the learner) and the object (the intended action or interaction). Processes of reflection do not only imply distance, they are preconditioned by distance. Consequently, we may conclude that the virtual universe – contrary to the physical world in which involvement may be viewed as primary to reflection (Heidegger, 1986) – provides a context and an ‘ontology’ in which reflection is primary to involvement.” (Sorensen 1999, p.585). When communicating (successfully) at a distance people tend to start thinking about the communication in itself, and start analyzing why they and others behave in certain ways. It can be like observing yourself from a distance; analyzing the way you act and the implications of your actions (Sorensen 1999).

3.2.3 Disadvantages for Distributed Teams
Researchers found that people tend to have problems directly related to the distance when working distributively. Armstrong and Cole (1995) found that members of distributed work groups experienced two problem areas that were considered uniquely difficult. The first was misunderstandings in communication and the second strangely escalating conflicts. Communications were often fragmented, with gaps and misunderstandings among distant group members; telephone conferences were confusing, with people on different pages of documents; group members failed to return telephone calls or respond to inquiries from distant members; key group members at remote sites were left off email lists and distant members were not informed of key decisions or important information. Misunderstandings developed on the basis of different assumptions about the tasks and assignments, and messages were interpreted differently in different places, sometimes fueling ongoing conflicts among office sites. Conflicts between sites
went unidentified and unaddressed longer than conflicts among members of colocated groups and flared up more suddenly, a fact that took distant managers by surprise. Leaders were also surprised by unexpected reactions from distant sites and they reported difficulty analyzing performance problems and coaching from a distance (Armstrong & Cole 1995).

When studying distributed research and development sites, DeMeyer (1991; 1993) found that the researchers needed regular face-to-face contact to be confident that they accurately understood each others’ work, particularly innovative ideas. The confidence decayed over time when researchers communicated through ICT. Sooner or later, they felt the need to meet face-to-face again to renew trust in their mutual comprehension (see Armstrong & Cole 1995).

The less a group is working together, the higher is the likelihood that they will have difficulties establishing report and understanding. “Even with a critical decision hanging over the heads of those in the meeting, people often don’t collaborate, as they have their own agendas. This is a tough lesson for a facilitator to swallow, but one that proves true time after time!” (Coleman 1997, p.189). The less people see each other, virtually or face-to-face, the higher is the likelihood that they focus on their own agendas and spend less time and effort to make their distributed team work well.

When working in a distributed team it is harder to reach a common viewpoint, set common goals, and it is less likely that relationships within the team will last. Armstrong and Cole (1995) say that “distant members struggling to get onto the same page, literally and figuratively, in terms of a shared viewpoint or strategy. Conflicts escalate strangely between distributed groups, resisting reason. Group members at sites separated by even a few kilometers begin to talk in the language of ‘us and them’.” (p.188). Distance in itself can, as previously mentioned, be a problem. When considering time differences, a whole new dimension is added to the problem. “Time differences amplified the effects of physical distance. Distributed group members faced the challenge of ‘finding each other at the same time, in different times.’” (Armstrong & Cole 1995, p.197).

Besides conflicting expectations, there can be other problematic management issues. Nardi and Whittaker (2001) point out that more management time is needed in a distributed team, since it is harder to keep track of what is happening. All meetings have to be set up (since there are no coincidental ones), and it is much harder to keep track of the process of a project.

We can’t expect that virtual interactions provide the same degree of intimacy as face-to-face interactions do. Smith, Sipusic and Pannoni (1999) pointed out that we don’t know whether it is possible or even desirable to create a virtual collaboration environment that provides an equivalent feeling of human contact. On the other hand they alleged that they definitely saw that virtual collaboration maintains a surprising amount of group cohesion of face-to-face groups and that the collaborative experience remains very rewarding for participants, even if perhaps in different ways than in face-to-face collaboration.

Feedback and turn taking are some of the problems that become evident when moving away from regular communication settings. A joint effort and feedback are necessary to achieve meaningful conversations (Gärdenfors 1996) and
expectations of feedback play a central part in human communication. Since cues disappear when being at a distance, it is much harder to give as well as understand feedback. “Once we utter something in a conversation, one might suppose, all we need to look for is negative evidence – evidence that we have been misheard or misunderstood. If we find some, we repair the problem, but if we don’t, we assume, by default, that we have been understood. This is, indeed, what is explicitly or tacitly assumed in many accounts of language use. [...] But if negative evidence is all we looked for, we would often accept information we had little justification for accepting. In fact, people ordinarily reach for a higher criterion. As the contribution model says, people ultimately seek positive evidence of understanding.” (Clark & Brennan 1991, s.224). According to the contribution model there are three kinds of positive evidence; acknowledgements, the initiation of the relevant next turn, and continued attention (see more in Chapter 3.4.4.3).

Meeting does not only provide a possibility to get to know each other in a situation where people feel comfortable and that they know how to interpret. It demonstrates an enormous amount of commitment when somebody actually takes the time and the trouble to go to the same place as the person they want to build a relationship with. Not only do face-to-face experiences reinforce the social bond through shared experiences, but the simple fact that it occurred at all can serve to deepen relationships. Technology cannot simulate showing up, because a symbolic meaning derives from the fact that people offer their actual bodies in space (Nardi & Whittaker 2001).

3.2.3.1 Conflicts

When people work in teams they normally encounter problems related to the teamwork, sooner or later. If the team consists of students, it is even more likely that they are unaccustomed to how to structure the work or handle inter-personal issues, and it is even more likely there will be problems at some point. If distance is added to the equation, there is a whole new layer of complexity, since the team has to handle conflicts perhaps without really seeing or knowing each other, and they have to communicate with the help of ICT that changes interactions. Handling conflicts can therefore be a big problem for distributed teams. Knowing how to manage different personalities, wills and conflicts in general is hard even on-site and it becomes even harder at a distance, when it is more difficult to read from body language and cues how people feel, what they really think, their personalities or how they will handle stress, criticism, etc.

When collaborating through ICT the communication is not the same as in on-site collaboration. There is not only a greater potential for conflicts (or at least for unresolved conflicts), but conflicts are also harder to detect and handle. There are new reasons for conflicts. Palloff and Pratt (1999) claim that the absence of face-to-face contact can make some people feel less constrained to remain within the confines of socially appropriate behavior. Since distributed teams mainly have to resolve conflicts and complicated discussions via written messages, it requires patience and hard work, and it is much harder to achieve consensus. Another problem is that when the group finally reaches a decision, it is hard to discover how other team members really feel about the decision that has been made.

Different studies have come to different conclusions about how disinhibiting
effects affect groups working at a distance. Armstrong and Cole (1995) say that with less inhibition, conflicts tend to be sharper and escalate more quickly. Consensus is also more difficult to reach in complex matters. Prentice-Dunn and Rogers suggest that deindividualization and lack of concern for others is caused by two factors; a reduction in accountability cues, e.g., anonymity leads to reduced concerns about others’ reactions, and reduced private self-awareness, and therefore decreased self-regulation and use of internal standards (Joinson 1998). Distributed teams do not only try to avoid conflicts; it is also easy that conflicts are ignored if they actually occur. The fear of conflicts seems to augment the risk for conformity and leads to fewer fruitful discussions and less new ideas since everybody agrees and don’t dare to argue. Joinson (1998) noticed this opposite effect on people.

Since people have started to be aware of that it is easy to over-interpret things when getting them in a written form and it is easy that words come out too strong in e.g. email discussions, people can almost be too careful to avoid conflicts. “Except for a few U.S. students, team members were quite tolerant of language errors. [...] Most team members appeared hesitant to criticize any expression that might be difficult to understand, for fear of shutting off the only source of communication. In one case, apparent criticism of language use did exactly that.” (Knoll and Jarvenpaa 1999, p.8). Knoll and Jarvenpaa (1999) claim that lack of cues appeared to inhibit conflict, not introduce conflict. Team members in their study tended to ignored conflicts when they occurred, which lead to that conversations often resumed at a point prior to a challenge, as if nothing had been said. Teams appeared to deliberately emphasize interaction that smoothed the way, to achieve an end result that could be delivered and on time. This is not beneficial for the collaboration, and does not create an open environment where a team gains as much as possible from the differences of the team members.

Distribution often leads to more diversity in a team. The more diversity there is in a group, the higher the risk for misunderstandings and conflicts. Just because there are conflicts in a group, does not mean that the team members do not work well together or do not learn a lot. And just because people are having fun, it does not mean that the collaboration is good. “There is no correlation between group performance and group conflict or between group performance and group satisfaction.” (Miller, Trimbur & Wilkes 1994, p.38). Miller, Trimbur and Wilkes point out that it is easier for people to work harmoniously with each other if there is less diversity. At the same time, conflicts born from diversity can promote intellectual negotiation and innovation and thereby enhance performance, even if not necessarily satisfaction.

It is almost impossible to make a team work well if participants don’t share the same goals. That will definitely lead to conflicts (or lack of collaboration), sooner or later. Duarte and Snyder (1999) listed issues that can help teams gain more focus and encounter less conflicts: be clear and make sure to have a shared understanding of vision, mission and strategy; make sure to have a shared understanding about roles and accountabilities; identify result oriented performances, measures for the team and for each team member; develop methods to review progress and results; share best practices with other teams.

A common problem when working at a distance is that conflicts are
unexpressed longer, unrecognized, and addressed more slowly (Armstrong & Cole, 1995). It is harder to speak ones mind and be direct when you can’t “read” persons you are talking to, and that means that people will probably be even less willing to deal with conflicts than they are on-site, or might handle it bluntly and make the situation worse. “With conflicts at a distance, thresholds for expressing the conflicts are higher the greater the geographic and cultural distance.” (Armstrong & Cole 1995, p.199). Sharples et al. (1993) also saw this as a very noticeable problem; that the potential for disagreement may be latent in a group for a considerable time before it is expressed implicitly as a clash of perceptions or explicitly as an argument. Conflict management involves the realization that a conflict is present, the identification of its source. This can be hard since conflicts are often transferred from a personal to a task-related source. “Highly cohesive groups are prone to suppress task-related conflicts, resulting in poorer solutions to the common group activity, a condition known as ‘groupthink’” (Sharples et al. 1993, p.10). Even after a conflict is detected and out in the open, it is harder to solve problems at a distance, and smaller conflicts may never even come up, since people get fewer chances to detect and correct misunderstandings. Face-to-face encounters with all its informal channels allow things to be corrected more easily (Armstrong & Cole 1995).

Independently of if there are more or less conflicts in a specific distributed collaborative environment, something that is very apparent is that if there is a conflict, it is harder to figure out why, and what to do to solve it. “It was difficult to distinguish the source of differences among members of a distributed group. The subtle interplay of personal style, national culture, and organizational and occupational cultures often made accurate attribution of style differences difficult for group members. Deciphering the precise cause of conflicts and performance problems was almost impossible.” (Armstrong & Cole 1995, p.202).

One way to ease conflicts is to try to bring differences out in the open, and show that they are taken into consideration. For example, Armstrong and Cole (1995) mention that multinational companies that exercise fairness and procedural justice in their decision making with subsidiaries enjoy a higher level of compliance with those decisions; remote offices are more willing to implement the full spirit of decisions if there is two-way communication and the remote site believes that the head office is familiar with the local context.

It is hard to deal with conflicts even when seeing and knowing each other, and the rules that apply to an on-site setting can’t necessarily be applied to a distributed setting. An example of possible problems is found in Knoll and Jarvenpaa’s study (1999) “In face-to-face groups, members increase the amount of communication directed toward the deviant member as pressure for conformance [11]. This mechanism proved fruitless when working in virtual teams. Teams resorted to sarcasm or flaming directed toward the ‘deviant’ as a way of pressuring for participation uniformity. Unfortunately, this appeared to have the opposite effect of reducing participation levels.” (p.7-8).
3.3 Communication and Collaboration through ICT

Plenty of things in our every day life are affected by the use of ICT and communicating through technology. It is easy to blame ICT when communication is not working, but a lot of factors influence how successful the communication, leadership, organization, ICT, personality, knowledge, etc. will be. Before people learn how to act and interact through ICT, it will definitely be there as a very noticeable filter. “It would certainly appear to be correct if one were to say that the somewhat direct forms of physical interactions are increasingly being replaced by verbal and other relatively abstract forms of interaction and exchange, particularly in the emerging form of late twentieth-century society, which can be best described as an ‘information culture’. It is primarily in the form of words that the information about human interactions and other events are communicated and stored.” (Semin, p.294). In this chapter views on communication and collaboration through ICT, how ICT affects the communication’s structure and how we interact, and specifics of different media are presented.

Dale (1994) states that the most significant and intractable obstacle to implementation of ICT won’t be technical, but will come from a source much deeper and well-established than computer science, that is, human nature. Armstrong and Cole (1995) point out that a shared agreement across distance concerning how to use the technology is just as important as the technology itself to get a fully functioning team. Much of the critical group leadership and learning at a distance will involve facilitating clear group norms and skills about how to use the communication technology effectively.

Working through ICT can a lot of times be an extremely trying and exasperating experience. “It has been said that what we have to be concerned about in thinking about computer technology with respect to cooperative work is not the ‘support’ notion, but first of all ensuring that the computer does not disrupt the collaborative activity that is already going on!” (Bannon & Schmidt 1991, p.4). We have to be able to understand the nature and characteristics of collaborative work, to be able to start thinking about the support and what can be done to improve distributed collaboration. “The focus is to understand, so as to better support, cooperative work.” (Bannon & Schmidt 1991, p.5).

This is not as easy as it may seem. When moving from on-site work to a distributed setting, people have to understand what they normally do, and why they do the things they do. It is important to appreciate the inherent complexity of supposedly routine tasks and the difficulty of capturing the tacit knowledge and day-to-day informal practices of everyday work (Bannon & Schmidt 1991). It is also imperative to understand that the integration between computer technology and telecommunications equipment has an effect on the design of occupational roles as well as on new patterns of how human roles will be integrated (Bradley 1993).

Axelsson et al. (2003) point out that people are generally (if necessary) very capable of adjusting to new conditions, i.e. achieving their goals with other means and techniques than usual. This applies also to altered conditions for
communication. Since communication is essential for most activities, people try hard to make it work. If it does not work out with old techniques, people create new ones. When communicating through some kind of media, the communication changes, for better or worse. “The good news is that speakers can adapt to machines; the bad news is that they do so by recruiting limited cognitive resources that could otherwise be focused on the task itself.” (Brennan 2000, p.3).

It is not only the direct use of computers that change the work environment. The influence of ICT is also indirect, or as Bradley et al. put it (1993), technology influences numerous spheres within the work environment; the power structure of the workplace, work content, the scheduling of working hours, etc. And we will benefit more from our new communications possibilities if we understand how technology complements (as opposed to replaces) human intelligence and face-to-face communication (Bradley et al. 1993).

### 3.3.1 Changes in Communication and Collaboration

Problems with ICT are still one of the bigger hinders for successful distance communication. It is both the fact that the technology does not always work, but also that the people have to learn how to use the different communication technologies. Another side of the problem is that people have to learn when to use specific media and for what activities. A lot of the time people use technologies they know and know will work (e.g. email and telephone), not because it is the best way for a particular situation, but because it is convenient, and they don’t have to think about it or learn how to use a new tool.

An important aspect of distributed collaboration is that the pace of the interactions is normally slower. When teams are using asynchronous tools, like e.g. email, in new situations or for new tasks they often run out of time. “The team realized rather slowly that the discussion proceeds rather slowly via the email, it takes a week before everyone has commented on an idea presented by one member of the team. So we had a few rounds of ideas and comments before it was realised that now we should start the compilation of the document.” (Knoll & Jarvenpaa 1999, p.9).

Garland, Teles and Wang (1999) noticed that issues that hindered collaboration were mostly related to students’ particular preferences and software problems (down- and uploading time). One frequent reason for failure of groupware systems is according to Dix et al. (1997) that the people who get the benefits from the systems are not the same as those who do the work. The conclusion is that systems should aim for some level of symmetry. If somebody has to work with a system, they should obtain some benefit from it.

Xiao et al. (2001) mention that studies of computer systems have shown that systems normally fail because of an inadequate understanding of existing work practices. Paper-based forms, for example, perform functions beyond simply conveying information. Ignoring these other functions may have detrimental effects on the usability of computer systems. It is also important to design tools so they support complex tasks at the same time as they fit in with users’ normal patterns of work. It is difficult to uncover and analyze these strategies, and even more difficult still to design computer systems that will support them (Sharples et al. 1993).
Even if systems support regular ways of working, when working in a distributed environment people often have to deal with people from other places and cultures. Regularly people can’t know what e.g. the email culture of the recipient is when sending a message. It varies between organizations and even between groups and individuals within organizations, and the medium itself gives few clues. A lot of people do not even realize that there are such cultural differences (Dix et al. 1997). “When we come to use computer-mediated forms of communication, we carry forward all our expectations and social norms from face-to-face communication. People are very adaptable and can learn new norms to go with new media (for example, the use of ‘over’ for turn-taking when using a walkie-talkie). However, success with new media is often dependent on whether the participants can use their existing norms.” (Dix et al. 1997, p.511). The possibilities of communication via ICT are great, and the development of both the technology and people getting used to working with the new media available is rapid. As Gackenbach and Ellerman (1998) say, “the potential of communication via the Internet are many and not easily reduced to the previously studied mediated communication, which was one way, or too simple versions of face-to-face communication.” (p.18-19).

As mentioned, when moving to a new environment, the communication’s structure changes. “In creating tools we are designing new conversations and connections. When a change is made, the most significant innovation is the modification of the conversation structure, not the mechanical means by which the conversation is carried out” (Winograd & Flores 1986, p.169). The same message delivered by different media conveys different meanings to us. Communication mechanisms have been around a long time and people understand the social force of different media, i.e. for media like paper and voice where we have a shared culture. The situation for ICT is far less clear (Dix et al. 1997). ICT also affects communication structures indirectly; like the work organization, professional roles, work content, influence and power, working hours and career patterns. These factors in turn influence communication between people (Bradley 1993). Computerization of the work environment places greater demands upon the social and emotional components of communication, so it is necessary to look at interactions between people at work from both a quantitative (i.e. number of human contacts) and qualitative perspective. The qualitative aspects of communication include such things as creativity, emotional involvement and opportunities for problem solving, listening, respect, trust and to “make visible the unique qualities of human-human communication” (Bradley 1993, p.39).

It is important to remember that new ways of communicating do not only imply more work but can also be rewarding. Computers enable people to communicate in ways not possible in face-to-face interactions. Communication can switch from synchronous to asynchronous modes, or any mixture in-between. Some aspects of negotiation can be hidden, it is easier to be anonymous, shared knowledge can be represented in a common view, and descriptive measures can be computed automatically (Pfister, Wessner, Holmer & Steinmetz 1999). ICT may provide greater richness than face-to-face communication because it can extend rather than replicate face-to-face communications, with the possibility to communicate asynchronously, at a distance, store communications, and have
simultaneous transmissions (Haythornthwaite, Wellman & Garton 1998). The communication’s structure itself can change and Armstrong and Cole (1995) point out that research from separate research fields generally suggests that communication and relationships unfold differently face-to-face than they do through ICT.

Looking at it from a different perspective, O’Dwyer, Giser and Lovett (1997) suggest that the change in communication is only superficial. Beneath the surface operate the same old patterns of thought and behavior, which in most cases are fear-based, that is, behaviors and mindsets that block collaboration. If people weren’t questioning theirs and others’ assumptions and sharing high quality information before using ICT to collaborate, chances are this won’t change. Bradley (2001) says that an increased use of ICT makes the different purposes of communication clearer; it has a knowledge function, a social function, a control function and, not least, an expressive function. Qualitative aspects of communication are necessary and shouldn’t be forgotten.

The demanded changes that come with the new communication media do not only imply possible problems, but they can also be seen as new opportunities for learning and communication. For example, the demand to start thinking about how to communicate, thinking about what to say and do and how to say and do it on another level, combined with features like having an opportunity to go back in a discussion, can really enhance learning and thinking. “While the problems of asynchronous discussions do not go away, their reliance on writing, their time lags, and the absence of nonverbal communication present both students and faculty with the opportunities, the means, and the motivation for thinking critically.” (Lang, p.21).

The unstructured character of e.g. forums provides a permissive rather than prescriptive environment. They allow users to define their own use of a media and offer flexibility for new and unexpected uses. New communication technology leads people to pay attention to different things, have contact with different people, and people depend on one another differently (Haythornthwaite, Wellman & Garton 1998). Haythornthwaite, Wellman and Garton (1998) found that people communicating in more formal environments make more use of media that allows control over the timing of the interaction (scheduled face-to-face meetings and email). For social communications, spontaneity via unscheduled face-to-face meetings is important, but for those who communicate frequently, social communications tends to spread to other media. Overall, those who communicate frequently use more media to communicate, and use more media for those types of information exchange that is important to them.

Lang points out that the most balanced conclusion about the quality of thinking in online discussions is probably that the potential is there for both success and failure. Some discussions fail miserably, while others are spectacularly successful. Using media the right way, choosing the right technology for communication, being aware of the difficulties people face when reducing face-to-face interaction, and on top of that having somebody, a skilled facilitator or manager, that helps guiding a team in the right direction, is key to the success of interaction.
3.3.1.1 Cues
Lack of cues can definitely be a problem when trying to communicate in a distributed environment. Without cues it is hard to get to know each other, build trust, discover conflicts before they get out of hand, read other people, it is easy to get misinterpreted, and it is easier to lose motivation and prioritize other, more immediately visible people or tasks. As Reid (1998) says, without cues it is sometimes hard to even trust people’s identity. If a team is aware of the lack of cues and decides how to deal with the ICT they have access to; it is possible to get a good communication going and find appropriate media to use for different situations.

It is more difficult (in especially text based) communication through ICT to feel if there is tension in a room, if people are nervous; you can’t feel a sweaty hand, smell a newly washed hair or hear a trembling voice. Perey (1997) pointed out that visual cues such as rolling eyes and tapping fingers, fidgeting and even leaving a room are hidden in distributed teams. When not seeing others, people are less apt to concede to the solutions of those they think may be adversarial. Conversely, viable solutions may develop when nonverbal communications conveyed between virtual meeting participants encourage thoughts that would otherwise have been abandoned. Perey (1997) suggests using videoconferencing to provide more cues for distributed teams.

The value of videoconferencing (especially with limited bandwidth) is questioned by many, but the want and need for more (visual) cues have also been raised. Knoll and Jarvenpaa (1999) stated that “No matter how successful the teams were in their group processes and product development, all students desired more visual cues in any form: pictures, videotapes, or videoconferencing. They yearned for more cues that would reveal how their fellow teammates might react to various communications, before they communicated.” (p.10-11). In small face-to-face groups, each member can communicate to all others via a wide spectrum of communication modalities: verbal, paraverbal (e.g., voice inflection), and nonverbal (e.g., smiles and gazes). In distributed teams, both the channels and the modalities are constrained (McGrath & Hollingshead 1994).

Hollingshead (1996) conducted studies that showed that groups who interacted via computers shared less information of all types and reached poorer group decisions because of lack of cues. In another study, Hollingshead examined the memory of dating couples and strangers. The couples outperformed the strangers in face-to-face interactions but performed no differently from strangers when they interacted via computer. Computer-mediated communication apparently disrupted the couples’ ability to cue one another for information. A lot of the advantages people have from knowing each other disappear when moving to a distributed setting, and it won’t be as easy to read what people are really thinking, even when knowing them from before. Armstrong and Cole (1995) believed that the lack of cues also leads to that ICT work best for routine tasks done by defined groups with established roles and motives.

There are examples of that the lack of cues in online settings can help people as well. An online environment provides scope for more participation as it allows time for people to think and articulate their thoughts. In the absence of visual and auditory cues participants focus on the meaning of the message. Because of this
ideas can be collaboratively developed, creating a socially constructed meaning (Pallloff & Pratt 1999). The lack of cues can e.g. make a discussion more focused. Groups communicating via computers have a narrower band of available communication modalities, since nonverbal and paraverbal modalities are not available, and in some situations, such narrow-band communication can allow information to be communicated with more precision and less noise. There is room for rational judgment processes to operate with less intrusion of non-rational considerations. In other situations or for other purposes, nonverbal and paraverbal modalities are more necessary and less dispensable (McGrath & Hollingshead 1994).

According to the reduced social cues model (Joinson 1998), fewer social and contextual cues leads to an attentional shift towards the task rather than the recipient, a reduction in the normal hierarchy by removing status cues, leadership cues, and so on, and to de-individuation. This is caused by a combination of anonymity, lack of self-and other-focus, and lowered self-regulation. The fact that people are more anonymous, or can use completely anonymous settings, can be useful and can actually help people to be more truthful (Coleman 1997), but all these factors could lead to a less personal and less friendly environment. According to this theory, the reduced social presence of CMC will lead to depersonalized communication and less attention paid to the presence of the other participant in discussions. Therefore, CMC will be less friendly, emotional, or personal and more businesslike, or task oriented (Joinson 1998).

The effect of staying more focused on the task (for good and for bad) that distributed work seem to have on people has also been noticed by Bonk, Wisher and Lee. They saw reduced off-task behaviors of students as a benefit of e-learning and mention that several other researchers discovered that students in computer conferencing environments stay on task 90-95 percent of the time. Students in these studies were in fact so task driven that they often failed to interact beyond basic task requirements. To start trusting each other, broaden the discussion and really collaborate, it is important to have some social interactions as well as focused work. If the team is too focused on the task, this won’t happen, and they emphasized that students need help with that.

It is important to remember that communication is not restricted to the exchange of propositional information, and an aspect of content coordination concerns the affective state or interpersonal attitude of participants. This can be social information about participants’ feelings, emotions, and attitudes to others and to the issue discussed. As with conversational intentions, participants generally do not make this information verbally explicit, so it usually has to be inferred (Whittaker & O’Conaill 1997). When working together, the human body is unlike most phenomena. Within interaction the body is a dynamic, temporally unfolding field that displays a reflexive stance toward others, the current talk, and the actions in progress (Goodwin 2000).

Cues are especially important in the beginning of relationships to get to know each other, but are vital even after the initial phase of the collaboration is over. Even when knowing a person the lack of cues can be a problem. “After being ‘out of touch,’ as we so perspicuously say, initiating communication can be problematic. Responsiveness diminishes. Communication zones require renewal
and ‘refreshing’” (Nardi & Whittaker 2001, p.7). It is much harder to keep the motivation and energy up when not seeing people you are working with. When people don’t see what is going on there is a tendency to try to foresee and anticipate what will happen, or as Harvey (1997) says, that people strive to structure or pattern any unstructured situation of sensed importance and will ascribe meaning to that pattern, and that is one of psychology’s most basic and well-established principles.

Even if the amount of cues decreases radically when moving to a virtual environment, people still interpret the cues they get. Research (see Moon 1998) has shown that response latency affects people’s impressions of others in various ways. For example, long speech pauses have been found to decrease perceptions of credibility, increase perceptions of deceit, and adversely affect personality impressions. At the same time, speech hesitations have also been found to be a reliable indicator of increased thoughtfulness. “Indeed, response latencies have been used in numerous studies as a means for measuring cognitive effort, the longer the latency, the greater the cognitive effort being exerted. It thus seems that in interpersonal communications, pauses that are either too long or too short can have a negative influence on persuasion” (Moon 1998, p.381). Moon also discusses the possibility that people rely on whatever peripheral (or heuristic) cues are available to them to judge, to be able to respond to messages. This could include message-related cues such as message length; it could also include source-related cues that are not dependant on visual or audio information. This affects us in virtual environments, especially when we are not aware of how we normally work or communicate.

The more people learn how to use new communication media, and learn about how people react to what they “say” when they write or interact at a distance, the smoother the communications will become. Regular users of email and chats use sticks and other comments and symbols to restore some of the missing cues and to avoid conflicts. “Similarly, various guides to Internet etiquette stress the importance of type characters (‘emoticons’) to avoid offence.” (Joinson 1998, p.45).

A feature of face-to-face conversation is that in general only one person speaks at a time. Less than 5% of speech is delivered in overlap (two people speaking at the same time), and still gaps between one speaker finishing and the next starting are frequently measurable in milliseconds (Whittaker & O’Conaill 1997). This radically changes when people are moved to communicating through ICT.

A problem for speakers in coordinating content, even in face-to-face interactions, is to determine whether their utterances had the intended effect, that is, whether the listener drew the correct set of inferences from what they said. Listeners’ knowledge and beliefs are usually not directly accessible to the speaker, so feedback mechanisms are crucial for the maintenance of communication. Speakers in face-to-face interactions provide listeners with frequent opportunities to offer feedback about what was just said, to show acceptance or to clarify their level of understanding. These feedback processes take place on a moment-by-moment basis, so misunderstandings can be quickly identified and rectified (Whittaker & O’Conaill 1997).
In most distributed settings, in addition to the loss of back channels, the speaker’s tone of voice and body language are absent. These normally convey the affective state of the speaker (if he or she is e.g. happy, sad, angry or humorous) and the illocutionary force of the message (if it is an important and urgent demand or a deferential request) (Dix et al. 1997). Feedback processes are conducted with very subtle means. Whittaker and O’Conaill (1997) draw attention to the fact that people actually spend relatively small amounts of time gazing at others while conversing. The amounts of gaze directed to others can be as low as 3-7% of conversational time, in the presence of relevant visible objects mutual gaze is even lower and normally below 5%. It appears that conversational participants have restricted opportunities for eliciting visual information about others and neither speakers nor listeners have access to all the visible behaviors of others. This research also showed that conversationalists are often more visually focused on their environments than on other people (Whittaker & O’Conaill 1997). Dix et al. (1997) has a slightly different view. They state that even if intense gazing into other people’s eyes is usually reserved for lovers, normal conversation uses eye contact extensively. Eye contact gives us information whether people are listening or not, if they are interested, confused or bored. These cues are lost if we don’t have any visual contact, and misleading cues via e.g. a video connection can be even worse.

It is important to realize that the correspondence between visible information and communication is not direct. The same type of visible information can support multiple communication functions, and one communication function may be supported by different types of visible information (Whittaker & O’Conaill 1997). According to Nardi and Whittaker (2001), research often stress how people read body language and facial cues in face-to-face situations and use them as clues for the meaning and affective state of speakers. These accounts take the recipient’s perspective in decoding information about content of the messages being sent. By contrast, Nardi and Whittaker discuss research that looks at how speakers use eye contact and body language to engage others in the room. It is a speaker’s dilemma to capture attention so that his or her message can be heard, and that is an aspect that shouldn’t be neglected.

Neij (2002) says that what we display with our words is about 10% of the message we communicate. The rest is body language, tone of voice, and other nonverbal signals. Whittaker and O’Conaill (1997) state that the role of visible information in communication is both complex and subtle and we need detailed understanding of the functions visible information have in communication. From a practical viewpoint, we need to understand when and how visible information is vital for communication. Much of the prior technology-oriented work has been based on the intuition that visible information will necessarily be beneficial to interaction, without having specific hypothesis about how those benefits will come about. One conclusion from Whittaker and O’Conail’s (1997) studies of low-quality video systems is that in certain circumstances adding visual information can detract from the interaction process. With both decreased interactivity and increased formality it leads to a lecture-like style of interaction, with conversational turns in the videoconferencing being three times as long as face-to-face ones.
It is necessary to understand that even high-quality audio and video do not replicate face-to-face processes and why that is so. One possibility is that current systems do not accurately simulate the presentational aspects of face-to-face interaction and that certain types of information are substitutable across different conversational media, whereas others are not (Whittaker & O’Conaill 1997). Perey (1997) on the other hand states that videoconferencing can help with at least some of the missing cues. When people who need to negotiate cannot meet in the same room, for some reason, to discuss how their mutual interests will be protected or met, real-time interactivity with videoconferencing offers an alternative.

Positive effects of lack of cues and more anonymity are often balanced with negative ones. Increased participation and better generation and sharing of ideas are offset by lengthier discourses, an effect that may occur precisely because of the lack of status cues and rules for turn taking (Haythornthwaite, Wellman & Garton 1998). Anonymity can make people discuss more, because they feel less inhibited, but it can also take away motivation and make people feel more shy and uncomfortable with discussing freely. It is also more easily confusion about what the problems really are; i.e. that people confuse process conflicts with content conflicts. “According to the students, explicit conflict arose around product issues, in other words, the content of the assignment. In fact, more often the students were in conflict regarding process, although they failed to recognize it as such. The difficulty associated with developing team rules may account for this clash of perception and reality.” (Knoll & Jarvenpaa 1999, p.5).

3.3.1.2 Turn Taking
One feature that has been proven problematic in distance communication and in virtual meetings is turn taking. The work environment has changed and people can’t assume that old rules will apply in the new setting. The mechanisms for turn taking are different communicating in different media. In some media all participants can “talk” simultaneously, which can sometimes lead to a chaotic sequencing of messages, and to overload (McGrath & Hollingshead 1994). To make communication work it is necessary to establish a new set of rules, a new system of conventions to get a smooth flow in the communication.

Turn taking problems appear mainly in situations where the speakers have to self select themselves as next to speak. People don’t want to interrupt others who might want to start speaking, so in the absence of cues, when there is no moderator or discussion leader and it is not obvious who’s turn it is, people tend to wait to see if anybody else is starting to speak and there tend to be many long silences. When speaking people also tend to start at the same time, which leads to that the transition breaks down (Bowers et al. 1996).

It is necessary to provide a method of passing control in interactive sessions, since established human protocols of turn taking won’t be sufficient to permit efficient interactions, and it will be necessary to develop new skills if misunderstandings are to be avoided (Siemieniuch & Sinclair 1994). It might not necessary be to have turn taking protocols built into tools, but more importantly, people have to learn and agree about how things should be done.
3.3.1.3 Text based Communication

The process of writing something down causes a distance between the thought and the thinker. It is often through the search for words to express ideas that we discover what we think. This has partly changed with the new media available. IM has for example dialogues more like face-to-face discussions and promote brainstorming more than reflective thinking.

Haythorneithwaite, Wellman and Garton (1998) point out that text-based messages lacks a lot of different cues; the redundant verbal cues (e.g., voice tone and volume), non-verbal cues (e.g., gaze, body language), and contextual cues (e.g., meeting sites, seating arrangements) that provide knowledge to aid in the interpretation of the communication. They noted that a lot of text-based, asynchronous media such as e.g. email, also provide little information about people’s social characteristics (gender, age, ethnicity), personal characteristics (appearance, clothes) and social positions (location in a power hierarchy, centrality in community). Lindquist (2002) is skeptical about using text for too many types of communication. He claims that it is too difficult to understand the full context of communications through a text based application. Although visual cues such as “emoticons” are available, there is greater risk that the emoticons are misinterpreted or the use deemed inappropriate in a workplace setting.

Dix et al. (1997) bring up the issue of differences between different text-based communications. Text as communication is familiar to most people, since they e.g. have written and received letters and other documents. However, the styles of letter writing and that of face-to-face communication are very different. Text-based communication in groupware systems is acting as a speech substitute, and, thus, there can be problems adapting to the new way of writing. King and Moreggi (1998) draw attention to the fact that not everybody is adept to write with the intent of disclosing intimacies previously unexpressed. Text that is conversational in nature, as it exists on the Internet today, is according to them a new phenomenon. Communication can easily appear colder and much more impersonal than the author intend. They say that people still often tend to have the impression that written text represents the well-thought-out and carefully edited views of the writer while Internet communications are most often the product of someone typing off the top of his or her head.

Virtual speech and action have both the spontaneity and immediacy of traditionally undocumented social speech, but also the indelibility of writing. Reid (1998) explains that a “primary characteristic of flame-wars – those intensely vitriolic exchanges that regularly erupt in on-line environments – is the speed with which individuals become polarized and fixed in their opinions. The often minute analysis of words that occur on Usenet and in mailing lists cause the author of those words to become inextricably tied to defending what they have said.” (p.37). Unlike regular speech, writing is easily reviewable. Words do not disappear, but are recorded. Thus writers can read, reread and revise their comments and in the process discover and develop what they mean, all before the reader sees anything. In other words, writers don’t need to “say” anything until their words are thoughtful and clear (Lang). This is part of the problem with Internet writing. Far from everything that is written on or over the Internet is thought through carefully, especially not in chats and IM, but not even in email or on web pages.
According to Reid (1998), online, we are what we write in a far more intimate and inflexible way than we are ever purely and merely what we say face-to-face. This makes it much harder to be flexible, since easily referenced documentation of our words makes flexible look like hypocrisy or indecisiveness. This has to be compared with that we don’t have to suffer any consequences for how we act and what we say, so in one way we are much less what we say (we can decide to play a part or show one side of our personality).

One of the most profound differences between face-to-face and text-based communication is the lack of fine-grained channels. The coordination of face-to-face conversation depends heavily on back channels and interpretations of listeners’ expressions. Text-based communication loses these back channels to a large extent and speakers have to pause to seek back channel confirmation or to offer the floor. People must either continue regardless, or finish the message, effectively passing the turn (Dix et al. 1997).

There are some advantages to the fact that written text is more static than spoken words. According to Lang online participants have a more equal opportunity to speak since they, unlike face-to-face participants, don’t have to compete for attention. The opportunity to respond can last a week instead of a few moments and the participants can’t be interrupted. Thus, while the time lag in asynchronous settings can certainly reduce the spontaneity of a discussion, it can also provide opportunities and means for thoughtful exchanges.

With all the changes in how we communicate, people have to realize what the different types of writing are, how to master them and be prepared to be judged from them. “Today’s online professional may suddenly find him/herself in an arena where the written word is determined to be evidence of the quality of one’s professional expertise and finesse. Voice tonality, pitch, and timbre – all good qualities in face to face (F2F) and telephone communication – no longer apply where email and online conferencing are increasingly commonplace, actually preferred in many circumstances.” (King & Moreggi 1998, p.78).

3.3.1.4 Status, Norms and Rules
Do people behave differently in virtual environments? If they do, in what ways is it different, when is it different, how does it affect communication, and why is it different? “Evidently, there is a growing acceptance that the Internet somehow leads people to behave in ways they don’t in ‘real life’.”(Joinson 1998, p.45).

Harré (1997) defines “rule” as a technical term for labeling the local norms of proper and improper behavior. A lot of the rules and norms are different when communicating through ICT, some rules from face-to-face interactions are simply abandoned because there are no repercussions, others are not necessary in the new environment.

According to Joinson (1998) when communicating through ICT people tend to not follow rules and regular conventions for communication or deciding status of people as much as on-site (and the set of rules seems to be different). It has been noted that the normal constraints and rules of conversation may not exist on the Internet. That “people using computers to communicate ‘overstep conventional time boundaries dividing office and home; they mix work and personal communications; they use language appropriate for boardroom and ballfield in-
terchangeably; and they disregard normal conventions for privacy”” (p.45). Communications through ICT is in a way both more impersonal and free.

Communicating through ICT is freer when it comes to not following rules and hierarchies, hiding feelings or expressing them immediately. This can lead to that people are more frank and open in e.g. email communications (Joinson 1998). It is common to hear people argue that it is easier to email an unknown person than to telephone or approach the same person face-to-face. In part, this may be because the social norm of online behavior allows people the freedom to contact those they do not know in an informal manner (Joinson 1998), without being considered strange and with a high possibility of actually succeeding. Some researchers claim that current applications of computer communication technology lower social inhibitions and barriers to communication (see Weisband, Schneider & Connolly 1995). There is research that shows that both participation in group decision and influence over final decisions generally is more equal in electronic groups than in traditional face-to-face groups.

Computer-mediated communication appears to produce different kinds of exchanges and relations among people compared to face-to-face contacts, perhaps because people react to each other with less politeness, empathy, or disinhibition when they cannot sense others’ presence. According to Armstrong and Cole (1995), researchers have found more diversity of input and debate in CMC because of the fewer signs of status, prestige, or visible differences transmitted in the medium. At least some research show that people tend to focus more on the content of the task and less on the direction of high-status opinion leaders, and that CMC in this way was more democratic and less hierarchical, with negative information being conveyed to superiors with less delay. At the same time, they found less awareness of the needs of other group members or the group in general (Armstrong & Cole 1995).

In a way Moon (1998) contradicts this idea by showing that people tend to apply stereotypes not only to people, but also to computers they interact with. Moon says that research has shown that people apply gender stereotypes on computers, they have politeness norms and form relationships with computers. The explanation for these findings is based on the idea that when individuals interact with a computer, they do so mindlessly, which means they do it without consciously processing the fact that the machine is not human.

Weisband, Schneider and Connolly (1995) found results that argue against a general status-equalizing effect of computer mediation. They found that high-status members dominated group discussions in both communication modalities; results that contrast with the findings of several earlier studies. It appears that the combination of known group status mix, small group size, and the message headers conveying members’ names provided enough information to allow group members to correctly label each other by status and people were definitely affected by the information. Hollingshead (1996) says that just because the media is supposed to give everybody a more equal chance, especially when people don’t know each other before the interaction, does not mean that the discussion is necessarily equal, or that people will be treated equally. “Spears, Lea, and Lee (1990) found that when group member identities were known or visually available, status differences persisted even in a computer-mediated setting.”

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Hollingshead (1996) suggests three alternative perspectives on the possible impact of computer-mediated interaction and status on the quality of group decision, information, and perceived influence: participation equalization, status persistence, and information suppression. According to her, there is evidence in the literature for each of these alternative perspectives, and each leads to a different prediction for the impact of status on computer-mediated interaction.

Even if rules and norms change, or rather because of that, it is necessary to be explicit about them in a distributed setting. It is not easy to get people to actually make implicit norms and rules about correct and incorrect behavior explicit. Knoll and Jarvenpaa (1999) conducted two studies where students in one study were explicitly told to set process rules and in the other they weren’t, but the students set up norms and rules to the same extent in both studies. The studies also showed how important deciding rules was. “When teams did not realize they had to evolve a way of working together that was amenable to all, too much time was spent on process issues disguised as content issues.” (p.7).

Plenty of researchers (see e.g. King & Moreggi 1998) have discussed the challenges online communication puts on expectations people have about the nature of oral and written correspondence. The most widely reported finding from researchers who have studied the interpersonal aspects of online interactions is the disinhibition that occurs. The improbability of any local real-life repercussions for online social activities produces a new psychological phenomenon.

Disinhibition is a frequently discussed effect of Internet communication. If inhibition is when behavior is constrained or restrained through self-consciousness, anxiety about social situations, worries about public evaluation, and so on, then disinhibition can be characterized by an absence or reversal of these same factors. “Prentice-Dunn and Rogers (1982) see disinhibition as a product of reduced self-awareness, which should lead to less concern about the judgment of others.” (Joinson 1998, p.44). Disinhibition on the Internet is not flaming or hostile communication, but should rather be seen as any behavior that is characterized by an apparent reduction in concerns for self-presentation and judgment of others, behavior that is less inhibited than comparative behavior in real life, and can have both positive and negative effects on communication.

According to Joinson people seem to be more honest online than in real life, even when anonymity is removed. The finding that behavior is disinhibited even when participants are named suggests that anonymity, a necessary precursor to deindividuation, may not have a critical role in disinhibited behavior online (Joinson 1998). Positive effects of disinhibition on teamwork can e.g. be that people have an enhanced opportunity to feel at ease with others in the online environment. Communication is reduced to its elemental state of exchanges of ideas and concepts. Matters of age, race, and even gender have much less influence over online interactions than they do face-to-face, and people don’t have to worry about how they look, if they blush, and what others might think of them (King & Moreggi 1998).

Another possibly positive effect of disinhibition is the higher likelihood for self disclosure. For different reasons a lot of people open up much more in online environments. An example is the apparent willingness of people to make available
on their homepages personal, normally protected, information (Joinson 1998). According to Joinson there is considerable evidence that self-disclosure on computer networks often focuses on personal information (e.g. symptoms) or socially undesirable information. He found evidence of reduced socially desirable responses even when participants were non-anonymous, suggesting that participants’ inhibitions are still diminished when their personal identities, rather than social identities, are salient.

3.3.2 The ICT Facilitated Work Environment

It is very difficult to separate technical issues from social concerns when designing ICT support for teams (Ellis et al. 1991). It is important to choose suitable media for a specific situation and for the persons involved, or like Bannon and Schmidt (1991) put it, that many focus too much on the design of technology, believing that if we get the technology right, then collaborative work will follow. The problem is not so much that computer systems do not support cooperative work, or that computers disrupt it, but rather that they induce or compel a “collectivization” of work in ways that we do not fully understand. It is this process that needs to be understood and should serve as the basis for investigations. As Schmidt (2000) point out, the notion of “shared knowledge” which spontaneously comes up ignores the work required to make knowledge “shared”. In order to develop ICT that can enhance the possibilities for distributed collaboration the orderliness of cooperative work cannot be taken for granted. It is necessary to go beyond the common sense notions of everyday working life.

Haythornthwaite, Wellman and Garton (1998) mention the importance to find advantages of distributed work and ICT and that a problem has been that early research focused on what CMC lacked relative to face-to-face communication. More recent research shows appreciation for the new ways of communicating afforded by CMC and delights in the (re)discovery of emotion and community online. To improve distributed collaboration it is necessary to investigate what kind of media is appropriate in what situations, and try to mix the ICT used in an appropriate way, to serve everybody involved in the best possible way. Nardi and Whittaker (2001) discuss the formation of a media ecology, as an expression for a mix of media that works as a whole for a specific situation. They also claim that “the endless search for a single technology that substitutes for face to face communication is a misconstrual of the problem. Instead of looking to supplant face to face with some killer app, the most successful application of new technologies to distributed work will be to combine them with face to face.” (p.27).

People are gradually learning how to use the new technologies available. Nobody really thinks about how to use the telephone anymore. Email, chats and IM are also starting to become more of an everyday activity that people have learned how to use, or as King and Moreggi (1998) put it, “E-mail communication is increasingly becoming a part of people’s normal lives.” (p.79). Smith, Sipusics and Pannoni (1999) point out that while networks have proven quite adept as a medium for asynchronous and broadcast forms of communication, highly interactive, real-time, multi-way communication have proven to be more problematic. That might be true, but as other research has shown, a lot of the time people simply have to learn how to use the media, and it is not that it is
impossible. Results from studies (see Kvan, HungYip & Vera 1999) have e.g. shown that the quality of the final design solution and the performance of collaborating designers were similar in chat lines and video and audio enabled communications. Participants simply adapt to the low bandwidth condition by reducing the amount of exchanges proportionally in each step. They found that the percentage of exchanges for the collaborative problem solving steps of Meta-planning, Negotiation and Evaluation were very similar under the two different communication conditions.

Problems arise when people think they are going to get the same feeling, or that they can act the same way, when using ICT as meeting face-to-face. To even try to completely replicate face-to-face is probably futile, and the mistake is “the assumption that successful collaboration can only be achieved if the communication media attempt to replicate, through high bandwidth, the conditions found in face-to-face experiences. Hollan and Stornetta (1993) have highlighted the difficulties in this assumption and the failures of attempting such replication. Such an assumption fails furthermore to credit other conditions for their positive contributions.” (Kvan, HungYip & Vera 1999, p.328). Ellis et al. (1991) say that this is the same using all ICT. None replace face-to-face interactions, each has a niche where it is a unique and useful mode of communication. The challenge is to apply appropriate technological combinations to different types of interactions, to benefit the most from the new media.

There is also the issue of privacy when using most new media. Who is going to see what is written or said? Is it possible for others to “listen in”? According to Cheesman and Heilesen (1999) this was not a problem in their experiment and participants tended to prefer the group conferencing spaces to be open to all other participants. Or rather, they wanted to be able to learn from other groups, by following the discussion in groups where relevant themes were covered.

Winograd and Flores (1986) discuss the problem with transparency in communicating with computers, but the same can be assumed about communicating through computers as well. “In working with people, we establish domains of conversation in which our common pre-understanding lets us communicate with a minimum of words and conscious effort. We become explicitly aware of the structure of conversation only when there is some kind of breakdown calling for corrective action. If machines could understand in the same way people do, interactions with computers would be equally transparent. This transparency of interaction is of utmost importance in the design of tools, including computer systems, but it is not best achieved by attempting to mimic human faculties.” (p.164). The problem with a lot of the communication is that it is not automatic; the ICT is not transparent, but always there as a filter, disturbing the actual communication.

3.3.2.1 Specifics Regarding Different ICT

There are a lot of research done about the use of different media and what the specific problems and opportunities are for them. Here a brief overview is given of some of the communicative changes various common ICT brings about. Unfortunately there is no space to go too deeply into issues not directly related to the more general research approach.
Clark and Brennan (1991) mention the importance of choosing the right media for an activity. “By the principle of least collaborative effort, people should try to ground with as little combined effort as needed. But what takes effort changes dramatically with the communication medium. The techniques available in one medium may not be available in another, and even when a technique is available, it may cost more in one medium than in the other. Our prediction is straightforward: People should ground with those techniques available in a medium that lead to the least collaborative effort.” (s.229).

Phone
As Whittaker and O’Conaill (1997) point out, despite the multimodal nature of face-to-face communication, the most pervasive and successful technology for communicating at distance is the telephone, in spite the fact that it relies solely on the voice modality. They also mention that early attempts to supplement the voice by adding visible information, i.e. video telephone, did not lead to the expected improvements in remote communication.

I won’t go deeper into the conversational patterns of the phone, since it is so common and well known. It is important to remember that two of the reasons it is such a useful tool is that voice is a very powerful instrument from which we can read a lot of cues and get a feeling of presence, and telephone is such a common tool, so most people know how to use it, know the rules for conduct, and feel relatively comfortable using it.

Email
Email is one of the most common and preferred ways of communication today. Even people sitting close to each other tend to use email instead of talking face-to-face. It is popular because it is fast, easy, it doesn’t take more time than necessary (people don’t get stuck in conversations), when contacting somebody people don’t feel they disturb them because they give them an opportunity to respond when they have time to, etc. People get in touch with friends and loved ones, make appointments, have work conversations, and receive news letters and important updates via email.

Haythornthwaite, Wellman and Garton (1998) say that the major appeal of email is its asynchronicity and rapid transmission across great distances, making it an effective substitute for both face-to-face meetings and more traditional “snail mail”. Email participants do not need to be near each other to communicate. Messages can be left anytime and sent from almost any location. Moreover, messages are received close to instantaneously, yet they can be read at the convenience of the receiver. As it works today, email often acts as a support mechanism for face-to-face meetings. Rather than replacing face-to-face interaction, it supplements and augments it.

There are some downsides of email, though. In most email systems it is hard to know if the receiver has read or gotten the message or not, discussions can be very lengthy and it is hard to come to conclusions. Grohol (1998) says that another downside with using especially mailing lists, is their lack of community and continuity. He points out that email was started and still remains a largely private activity, used in-between two persons. King and Moreggi (1998) claim that there
is less sense of social presence using email and that the lack of tactile sensory feedback and the privacy of being in one’s own home contribute to a different sense of social connection. How it differs exactly from e.g. telephone and letters is yet to investigate.

IM

Smith, Cadiz and Burkhalter (2000) state that chat may be the form of computer mediated communication that most closely resembles spoken interaction, but in contrast to spoken interaction, it is hard to manage interruptions, organize turn-taking, convey comprehension, and resolve floor control conflicts. A problem with IM is that it organizes turns in order of their arrival and not in the order of turn and response in which they were constructed. This undermines the techniques people use for organizing coherent conversations. This can result in confusing exchanges of short messages in ambiguous order and make IM less useful for decision making and knowledge storage (Smith, Cadiz & Burkhalter 2000).

Nardi, Whittaker and Bradner (2000) point out the importance of the informal character of IM exchanges and that the key reason for this informality lies in the near-synchronous nature of IM. Standard capitalization is often ignored even if it can be used for emphasis. Multiple exclamation points and question marks are used liberally and this informality lends IM a kind of intimacy often absent from other types of mediated communication. Conversations are also often very interactive and the rapid and evolving nature of IM provides a suitable context for interaction. This context seems to reduce misunderstandings and promote humor. Another reason IM interactions tend to be informal is that users typically interact with a small set of people they know well, or plan to get to know well, and is often used to keep in touch with friends and family while at work (Nardi, Whittaker & Bradner 2000).

Some of the characteristics of informal face-to-face communication that are present in IM is that; it supports quick questions and clarifications, coordination and scheduling, organizing impromptu social meetings, and keeping in touch. This leads to that IM and face-to-face interactions are sometimes seen as interchangeable (Nardi, Whittaker & Bradner 2000). One big difference is that the screening possibilities, delayed responding, and plausible deniability of presence allow recipients much more control over responding than face-to-face interaction or phones do. “Instead of conversations taking place at the convenience of the initiator, IM allows genuine social negotiation about whether and when to talk. The attentional contract can be negotiated on a more equal footing between initiator and recipient than with face to face or phone interaction.” (Nardi, Whittaker & Bradner 2000, s.6). But as Nardi, Whittaker and Bradner point out, IM does more that support quickfire informal communication. It facilitates some of the processes that make informal communication possible. They define a somewhat unexpected use of IM as outeraction, i.e. a set of communicative processes outside of interaction exchange, in which people reach out to others in patenty social ways to enable information exchange.
Video
In studies of collaborative work done at a distance over a video link, it has been found that there are subtle and unexpected communication difficulties encountered by participants attempting to coordinate their efforts through these systems. In Smith, Sipusic and Pannoni’s (1999) study participants reported that they had difficulty in the real-time management of a number of social behaviors that support conversations, such as turn-taking and the coordination of joint attention through eye-gaze. Joinson (1998) said that anybody who attempts to use e.g. videoconferencing will realize that the narrow bandwidth available reduces the use and availability of cues in communication. He noticed that the narrow bandwidth leads to that many online relationships progress to other media and meetings in real life, and that can be seen as a sign that reduced bandwidth really limits communication possibilities.

According to Armstrong and Cole (1995) video links showed to not be as effective in generating new relationships or in resolving divisive differences, and miscommunications were easily experienced as rudeness. Nardi and Whittaker (2001) make the analysis that technologies such as videoconferencing that attempt to replicate the face-to-face experience may fail because they provide neither the high fidelity interactivity of face-to-face, nor the social benefits of sharing a common physical space. Videoconferencing may create misleading assumptions about shared space that can be highly disruptive on the communication. Other technologies, like IM, who are simple low bandwidth technologies, have a higher chance to alter the everyday lives of workers struggling to communicate with distant others, like the telephone has revolutionized communication in part because of ease of use and reliability.

Video has been shown to be much less important than audio in broadcast learning environments, but according to Smith, Sipusic and Pannoni (1999) that might not always be the case, and it is sometimes necessary to support non-verbal communication, since the visual channel may play a crucial communication role. The addition of video can, at least in an introductory phase, be nice, to get a feeling for what co-workers look like, how they act or simply to get some mental image of them. Perey (1997) points out that as collaboration and cooperation increasingly involve international players, the ability to see the impact of one’s words on the other team members may mean the difference between offending and complementing them. With a good picture resolution, video can help and is a good tool to keep in touch. “In a world where workgroups are dispersed, and even more frequently virtual, the role of video and audio will become even greater than in today’s relatively centralized organizations. People in remote offices and in clusters of activity distributed on a single large campus find that their commitment to a project and overall collaborative potential is easier to direct, sustain, or ‘tap into’ when face-to-face [via video] communication occur daily, or even weekly.” (Perey 1997, p.326).

Lanier (2001) draws attention to the fact that human interaction has both verbal and nonverbal elements, and videoconferencing seems configured to confound the nonverbal ones. In most videoconferencing systems it is impossible to make eye contact properly, for instance, because the camera and the display screen cannot be in the same spot. This usually leads to a formal effect on
interactions, since eye contact is a nearly ubiquitous subconscious method of affirming trust. Furthermore, participants aren’t able to establish a sense of position relative to one another and therefore have no clear way of directing attention, approval or disapproval.

3.3.2.2 Media Richness Theory

“Media Richness Theory, and the ‘message-medium fit’ approach that emerged from it, holds that rich information needs the immediate feedback and interactivity of a rich medium” (Haythornthwaite, Wellman & Garton 1998, p.206). The Media Richness Theory states that lean information is most effectively communicated via lean media, and rich information via rich media. Rich communications are ambiguous, equivocal, contain socially sensitive or intellectually difficult materials, or require negotiations, consensus, and commitment to an action. Rich media convey many redundant cues and thus provide more “social presence”, as well as they provide immediate feedback and interactivity. Lean media rely more on rules and procedures.

For example, face-to-face meetings have been judged to be more appropriate for socially sensitive or intellectually difficult information and for persuasion, bargaining, or getting to know someone. Electronic media have been judged more appropriate for task-oriented activities such as exchanging information or asking questions. Groups in Haythornthwaite, Wellman and Garton’s (1998) study using email had greater difficulty in reaching consensus than face-to-face groups, suggesting that this leaner medium was not as effective even for lean tasks.

Haythornthwaite, Wellman and Garton (1998) discuss the shortcomings of the message-medium fit theory, that when applying it to a real-world settings, you run into the problem that a single communication often contains many types of communications and serves multiple goals. For example, planning work may also involve negotiation; problem-solving may involve idea generation, work meetings may include socializing; and community members may provide services as well as emotional support. “A strict adherence to the lean-information, lean medium match has been challenged in research by Rice (1992). Analyzing results from five studies, Rice found that performance improved significantly when rich media were used for either lean or rich information, although more so for rich than for lean information.” (Haythornthwaite, Wellman & Garton 1998, p.207). Smith, Sipusic and Pannoni’s (1999) research even showed that students using video-mediated collaboration experienced higher levels of user satisfaction than in a lecture setting. They also point out that such analyses see people’s effectiveness as communicators as being tied to their ability to choose the right medium (rich or lean) for the message. Similarly, the effectiveness of the design of a medium is associated with its ability to provide the appropriate richness or leanness. Usually, this has meant providing a rich environment (i.e., trying to replicate the face-to-face environment) (Haythornthwaite, Wellman & Garton 1998).

It might not even be easy to divide different media into rich or lean. Technical features may also affect perceptions of the richness of the medium. Rapid transmission can make email interactions more frequent and interactive than face-to-face interactions, particularly when participants are not near each other, increasing the perceived social richness of the medium. A medium may also
appear richer because it reaches a wider network of associates, increasing the likelihood of receiving answers to queries (Haythornthwaite, Wellman & Garton 1998). A leaner media can also be perceived richer when you know the person you are communicating with. It is easier to read between the lines and picture the person you are communicating with, so “when there are established relationships between participants, the so-called ‘leaner’ media such as email and the phone can indeed be very expressive.” (Nardi & Whittaker 2001, p.31).
3.4 Effects on Individuals

There are a multitude of factors that affect distributed project work and different aspects of the environment have diverse effects on individuals. The focus in this chapter is the effects on individuals and the area of teambuilding and trust; issues found vital to create an environment that is comfortable and productive to work in, and which in turn is in essential ways affected by the distribution. The starting point for a good team is in the objective work environment; the team formation, the competencies in the team, and the design of the project. If the right components are not available, e.g. not the right people, or tasks that do not encourage or need collaboration, it is difficult to create an environment where people work well together, build a team and trust each other. Even if the base of effects on individuals can be found in the objective environment, special attention can also be given to the desired outcomes.

In distributed teams it is harder to get to know each other and gain trust, so more direct focus has to be directed towards how individuals are affected by the distributed environment. Factors like motivation, openness, trust, team feeling, awareness, reflection, etc., influence communication and collaboration in projects in essential ways. Specific problems in the area of team- and trust building that teams can encounter when communicating, collaborating and working at a distance, and examples of how to overcome the physical and mental distance, will be brought up here. What can people do to get to know, trust and feel comfortable with people they have not seen before? How is it possible to form successful teams, or even work together, in a distributed environment?

3.4.1 Motivation

Motivation, or rather lack of motivation, is one of the biggest problems in education as well as in work environments. It is always hard to change people’s attitudes and there is no easy formula for how to do it. “Bringing about changes in attitudes and intentions, let alone changes in behavior, is generally an uphill struggle, and the closer one gets to real-life behaviors the more difficult it is to bring about the sought-for change.” (Manstead 1997, p.241). Even if it is hard to change behaviors, Fishbein (1997) claims that behaviors that are assumed to be difficult, if not impossible, to change, can be changed and changed radically. Information in and of itself can produce behavior change.

People tend to become more involved when learning from and working with others, and Bruffee saw that students’ work tended to improve when they got help from peers and the peers offering help learned from the people they helped and from the activity of helping itself (Bruffee 1992). Smith and Mackie (1997) stipulate three basic motivational principles. These include the desire for mastery, to understand the universe in order to obtain rewards; the desire for connectedness to other people and groups; and the desire to maintain and enhance a positive view of the socially extended self, that is, the individual self as well as other persons or groups connected to the self. People form and maintain groups and relationships to gain protection and get concrete rewards, to solidify connections to valued others, and to magnify the group’s concrete outcomes, esteem, and value.
Fishbein (1997) brings up an important human trait, that people in general must believe that the benefits of performing a behavior outweigh the costs, i.e. that a person should have more positive than negative outcome expectancies to be motivated to do something. A person must also have a sense of personal agency, or self-efficacy, with respect to performing the behavior. That is, the person must believe that he or she has the skills and abilities necessary for performing the behavior under a variety of circumstances.

How interested somebody is and how much previous knowledge a person has regarding a topic definitely influences the motivation to put in effort and learn. Miller, Trimbur and Wilkes (1994) found that non-majors in their biology course for majors were more likely than the majors to resent the intellectual and social effort involved in collaborative learning and were often the cause of group dynamics problems.

Cockburn and Thimbleby (1991) draw attention to the fact that CSCW users have been forced into accepting work techniques imposed on them by collaborative systems. The techniques are usually different from those employed in personal work, so a learning and remembering burden is forced upon the users. This burden is particularly unacceptable when the need for collaboration is infrequent. If a tool is used in a project, there has to be some kind of incitement to use it, and a lot of the time the support is not integrated with the activities people undertake (Puntambekar 1999).

3.4.2 Awareness and Presence

One of the big issues for distance collaboration is awareness. It is easier to prioritize people and tasks that are close by and constantly visible. It is also easy that misunderstandings occur if people don’t see each other or don’t see causes of problems, only the actual problems. If people only see end products, but never the process or the actions that have led to the results, they won’t know why things are the way they are. When working collaboratively, awareness is an enormously important factor for success, and it is a factor that can be hard to deal with at a distance. Awareness of where others are, what they are doing, what they know, etc. Sorensen (1999) talks about the idea of awareness as denoting the up-to-the-minute knowledge a person requires about other people’s actions. This concept denotes four types of awareness in a collaborative experience: social awareness, task awareness, concept awareness, and workspace awareness. Fuchs (1995) also makes a four part division of awareness depending on the time and space criteria (see figure 5).

<table>
<thead>
<tr>
<th>Synchronous</th>
<th>Asynchronous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coupled</td>
<td>Coupled</td>
</tr>
<tr>
<td>What is currently happening in the actual scope of work?</td>
<td>What has changed in the scope of work since last access?</td>
</tr>
<tr>
<td>Uncoupled</td>
<td>Uncoupled</td>
</tr>
<tr>
<td>What happens currently anywhere else of importance?</td>
<td>Anything of interest happened recently somewhere else?</td>
</tr>
</tbody>
</table>

Figure 5: Fuchs’ Modes of Awareness (1995)
Dourish and Bellotti (1992) defines awareness as “an understanding of the activities of others, which provides a context for your own activity.” (p.107). This context is used to ensure that individual contributions are relevant to the group’s activity as a whole, and to evaluate individual actions with respect to group goals and progress. Awareness allows groups to manage the process of collaborative work.

Fjuk and Krange (1999) mention that the awareness people have in physical collaborative learning environments allows people to implicitly maintain information about other people’s interactions and common problems. “If two learners are co-located they cannot help see, hear and perhaps even feel the presence and actions of the others” (p.159). In distributed collaborative environments, where collaboratively oriented activities are mediated by various forms of ICT, these abilities are greatly reduced. Other people’s actions can be almost invisible. As a result, collaboratively oriented activities such as negotiation of meaning, creation of joint understanding, and division of labor and responsibility require specific actions to maintain collective effects of the distributed collaboration.

Nardi, Whittaker and Bradner (2000) talk about the importance of awareness moments that produce a certain feeling in people, rather than accomplishing information exchange. “Even when no direct information exchange is taking place, people want to maintain connection with others, outside the context of specific events of information exchange.” (s.7). If you are not aware of what other people are doing, what skills they have, if they are working or not, if you have anything in common with them or not, etc., you will probably not be as motivated to talk to or collaborate with them. It is important to support awareness information to help people shift from working alone to working together (Fjuk & Krange 1999).

To accomplish awareness in an on-site setting eye contact is very important, and really hard to achieve in the distributed work environments with technology of today. Even with good videoconferencing, the feeling is far from the same as when meeting face-to-face. “In some contexts, eye contact had to do with social bonding, with making a basic (mammalian?) connection to others by ‘looking people in the eye,’ a phrase many used. This fits with our understanding of making connections through body work. But informants also discussed how eye contact served a shorter term purpose of commanding people’s attention.” (Nardi & Whittaker 2001, p.18). You read people through their eyes, get attracted to them, get their attention, sense if something is wrong, if they are not truthful, etc., and that is very hard to accomplish with ICT. Since there is no or a very different eye contact or physical presence in virtual environments, it is only through signs and symbols people are “present” in the shared environment. Likewise, social relations, i.e. any action, communicative or non-communicative, taken, is not carried out directly, but through the insertion of a meta-communicative level, i.e. the manipulation of symbols and representations (Sorensen 1999).

The presence of a body is hard to accomplish with technology, even if avatars and projections of people are becoming more common. According to Nardi and Whittaker (2001), media theories have at least considered the body as a source of information for communication, documenting the importance of attaining a sense
of “presence” of other people. Key aspects of presence are signaled by a specific sense of other’s bodies, for example physical appearance, body language, facial expressions, as well as accouterments including clothing, makeup, hairstyle, and jewelry. Physical presence also has a value in itself, to show dedication and commitment. You “demonstrate an enormous amount of unconscious commitment when you actually take the time and the trouble to put yourself in the same place as the person you want to build a relationship with.” (Nardi & Whittaker 2001, p.14). A face-to-face experience can reinforce social bonds through shared experiences, but the simple fact that it occurred at all can serve to deepen relationships.

Nardi and Whittaker (2001) also put emphasis on the importance of shared bodily activities in facilitating social bonding and showing commitment. Activities like for example touching, eating and drinking together, activities that lead to mutually meaningful experiences in a common physical space, as well as showing up in person. Understanding these activities is key to understanding the uniqueness of face-to-face communications, because they are impossible in other media (though they can be simulated in MOOs\(^1\), MUDs\(^2\) and virtual worlds).

If face-to-face interactions and closeness are the easiest ways to get awareness, the “aim of systems design is thus to make mechanisms that provide corresponding opportunities, in spite of the physical distances amongst the actors.” (Fjuk & Krange 1999, p.139). ICT, like e.g. IM and cameras, make it easier to create awareness when located at different sites.

In a study of IM in two workplaces (Nardi & Whittaker 2001), people expressed that messaging helped them experience a strong sense of others that in turn helped them establish effective communication zones. Since IM provides simple awareness information about when people are logged on and active at the keyboard it is possible to tell who is “around”, and that was viewed as something very positive, even when people did not want to communicate directly. Whittaker and O’Conaill (1997) saw that a lot of people choose glance options, which indicates that people wanted to have direct control over who they connect to, and when they connect. Furthermore, people wanted to use glances as preparation for communication, not merely to know “who was around”. Glances that allowed “looking into” another office without the option of communicating were an infrequent choice. Nardi, Whittaker and Bradner (2000) on the other hand saw that people found value in simply knowing who else was “around” as they checked the buddy list in IM, without necessarily wanting to interact with people and that helped them overcome some problems that are easily experienced when being thousands of miles away from their coworkers. “Things like forgetting that they’re there.” (s.7).

Becker and Mark (2002) bring up the social presence theory which states that the nature of a medium affects the type of interaction. The stronger the perception of non-mediation is in the environment, the stronger the feeling of presence. A high degree of presence suggests the illusion that one is directly interacting with another, and the medium becomes less apparent.

\(^1\) MOO- Multi User Dungeon Object Oriented
\(^2\) MUD- Multi User Dungeon
3.4.3 Team Feeling

After a group is formed the process of actually becoming a team can begin. Team members get to know each other, people’s personalities, the competencies in the group, the goals, strengths and weaknesses, etc.

3.4.3.1 Team Identity

A big part in building a team is finding or creating a team feeling, a feeling of belonging together. To create this it is important to form some kind of identity. The feeling that the team shares a goal, have something in common, enjoy being in each others company, and belong together is a first step towards a team feeling. Having a team space and forming a team identity is very important to create a team feeling.

McGarty and Haslam (1997) say that when a team forms a social identity, that is, a part of a person’s self-concept derives from their group membership, there is a social influence which makes people bring about change in the opinions and behaviors of others. This can lead to a team feeling, but also to conformity. To create a team feeling Cook (1995) suggested having small group activities in distributed teams, since it works in on-site settings, to help teams become comfortable with the media and with each other, and create opportunities for discussion. The notion that teambuilding activities are really valuable is common, to take time to do them in a way that the people find them useful is harder, and it will take time and effort to find exercises and activities that fit a specific team. If there is a serious attempt to work collaboratively at a distance, “team building should be among the first activities implemented to encourage group cohesiveness.” (Cooper & Mueck 1992, p.73).

Bonk and Dennen suggest to use web based writing assignments to foster the social construction of knowledge. For example having personal profile introductions, electronic cafes, and other social activities to foster interpersonal relations and a psychologically safe environment. One thing that is easy to do in the beginning of a project, to get the team started and help them feel more like a team is to encourage people to assign a name to their group and possibly a group logo to use for identification purposes (Brown Fiechtner & Actis Davis 1992). It is important that everybody in the team is involved in a process like this, otherwise it might just be another area of conflict and Duarte and Snyder (1999) point out the importance to take into consideration that teambuilding activities might be subject to cultural bias and also that experienced virtual team members might think of the activities as a waste of time.

The team feeling normally develops naturally during the project work. If team members manage to get passed the difficulties of collaborating at a distance through ICT, it might actually make the team stronger. The feeling of accomplishing something difficult together is very likely to draw team members closer together. Cheesman and Hellesen (1999) pointed out that difficulties made participants collaborate intensely, to be able to overcome the many obstacles they met, and because of this groups were quite easily established.

One thing that clearly distinguishes the formation of a team identity compared to collaboration without teambuilding is the presence or level of support. Support when things aren’t going well and shared joy with success. “Any
member of a choir will tell you how the experience of singing together creates a feeling of community. This applies to many walks of life where small teams of people share goals, achievements and difficulties. The culture of mutual support is very powerful and in an uncertain world the culture grows in strength as people bond together in their daily lives. In a curious way groupware sustains this concept and facilitates the membership of an individual in his/her peer group. The technology reinforces this mutual interdependence by emphasising the shared nature of the data and the operating tools being used.” (Benjamin 1994, p.173).

If a team identity has been formed, participants are more likely to encourage and support each other, work better together and have an active social discussion. “Most students promoted a positive team attitude by communicating their friendliness, interpretable humor, and excitement about the project. Sometimes funny images were sent using special characters, although such images could convey sarcasm as well. They addressed each other by name, had personal remarks for each, and expressed supportiveness for each others’ comments and deadlines. On the other hand, flaming was infrequent and when it did occur, seemed to be unintentional.” (Knoll & Jarvenpaa 1999, p.6). Palloff and Pratt (1999) point out how easy it is for distributed students to be discouraged and not motivated and one of the reasons why developing a team feeling is important for the process to be successful, is that it helps keeping the motivation up.

It is harder to make jokes and have fun at a distance, and it is hard for a team to form its own traditions. This is something that normally improves when and after distributed teams meet. “During their first round of visits to each other’s site, the assembled management team also met face-to-face with each site’s staff in discussions facilitated by a consultant. The group even developed shared humor and jokes, such as requiring each site manager to sing a song in his or her native tongue to the assembled management team at his or her first meeting. This became an entry ritual for new managers as membership turned over.” (Armstrong & Cole 1995, p.206).

3.4.3.2 Community

New forms of communities have developed with the increased use of networked computers and ICT has provided new opportunities for distance communication and relationships. Shaffer and Anundsen define community as a dynamic whole that emerges when a group of people share common practices, are interdependent, make decisions jointly, identify themselves with something larger than the sum of their individual relationships, and make a long-term commitment to well-being (their own, one another’s, and the group’s) (Palloff & Pratt 1999). Virtual communities are formed around issues of identity and shared values. This is a conscious community, a community that takes a conscious commitment to a group and emphasizes on the members’ need for personal growth and transformation. Reid (1998) says that “on-line communities allow members to escape the strictures of the wider society, subverting distance, class, gender, and race.” (p.29). In an online world it can be easier to talk about things that are normally sensitive. Everybody is in a way a part of your world, no matter where they are. In a way, virtual communities also extend the possibilities for community, just as ICT extends the possibilities for communication (Haythornthwaite, Wellman & Garton
“There’s a parallel problem with people and businesses: whereas in a small community, online or real, you assume that everyone you meet is trustworthy unless proven otherwise, in a large one, you assume the reverse. The difficulty is that no matter how infinite and populated cyberspace becomes, it always feels small, partly because we experience it in the privacy of our own computers, and partly because everywhere you look people are dividing themselves into small groups: newsgroups (which often split if they get too big), conferences, IRC channels and chat rooms, and now small online discussions on Web sites organized around those sites’ official content.” (Grossman 1997, p.183).

Palloff and Pratt (1999) point out that to build a learning community it is important to create a distinctive gathering place for the group and clearly define the purpose of the group; promote effective leadership from within and define the norms and a clear code of conduct; allow for a range of member roles, facilitate subgroups, and let members resolve their own disputes. Signs of that an on-line community has been formed are according to Palloff and Pratt (1999) that there is an active interacting and sharing of resources among participants; comments are primarily made between participants rather than to a manager or instructor; there are questions with the intent to achieve agreement on issues of meaning; expressions of support and encouragement exchanged between participants as well as a willingness to critically evaluate the work of others.

Etienne Wenger (1991; 1998) introduced the concept of “communities of practice”, based in the belief that there are informal units, distinct from organizations, which are vital for learning and work. According to Wenger (1998) members of a community are “informally bound by what they do together – from engaging in lunchtime discussions to solving difficult problems – and by what they have learned through their mutual engagement in these activities. A community of practice is thus different from a community of interest or a geographical community, neither of which implies a shared practice.” (p.2).

Communities of practice move according to Wenger (1998) through various stages of development, characterized by different levels of interaction among the members and different kinds of activities. They develop around issues that matter to people and reflect the members’ understanding of what is important, which means that they are fundamentally self-organizing systems.

Wenger (1991) states that people are essentially social beings, which is the starting point for communities of practice. We live in societies and it is our participation in social communities and cultural practices that provides resources out of which we construct who we are, give meaning to what we do, and understand what we know. He also states that we are so accustomed to thinking in formal terms about organizational structures that we overlook the pervasiveness of the informal in our lives.

Wenger (1998) compares and distinguished communities from teams. “A community of practice is different from a team in that the shared learning and interest of its members are what keep it together. It is defined by knowledge rather than by task, and exists because participation has value to its members. […] It does not appear the minute a project is started and does not disappear with the end of a task. It takes a while to come into being and may live long after a project is
completed or an official team has disbanded.” (p.4).

Wenger (1998) declares that just because communities of practice arise naturally does not mean that organizations can’t do anything to influence their development. A lot of communities benefit from some attention, as long as this attention does not oppress their self-organizing drive. Wenger (1991) suggests that there are several things that can be done to promote the existence of communities, e.g. to pay more attention to the social aspects of work and respect its informal, improvised, inventive, negotiated character; be aware of that it is by social interactions a lot of the work gets done, when meaning is constructed, learning takes place every day, innovation originates, and identities are formed; view individuals as members of communities in multiple and complex ways. To not just throw information at people, but support their learning by opening possibilities for participation and membership.

3.4.4 Social Interaction

Social interactions are not really effects on individuals, but the desire to interact and get to know people is an important effect on individuals, which is why this discussion is placed here. Social relationships are built on interdependence; a property of human relations pertaining to individuals’ mutual reliance on each other for the satisfaction of needs and the provision of rewards (McGarty & Haslam 1997). According to Whittaker, Swanson, Kocan and Sidner (1997) communication theories and ICT have had a tendency to focus on formal meetings and neglected one important and vital form of workplace communication, namely lightweight, informal communication. Unlike formal, extended meetings, lightweight interaction is brief, informal, unplanned and intermittent. Nardi, Whittaker and Bradner (2000) also draw attention to different sides of social interaction and states that current theories focus on information exchange. They declare that information exchanges should be looked upon within a wider scope of outeraction, that is, processes outside of information exchange in which people reach out to others in social rather than informational ways. Bradley et al. (1993) point out that social contact and solidarity between people correlates with other factors in the work environment, like personal relationships and the possibilities of exchanging experiences and feeling companionship within a group, and are not isolated phenomena. The social environment is made up not only of things, but of relation between things, and this has important psychological implications (McGarty & Haslam 1997).

Is being social a value in itself? Is it always good? Tudge and Rogoff (1989) have the opinion that being social can be useful in certain situations and help the development of a project, but that when and how it is of importance should be investigated more. “We consider that social interaction does not carry blanket benefits, as is often assumed, but that social interaction facilitated development under certain circumstances that need more specification.” (p.17). In the same way it is easy to assume that meeting face-to-face is always beneficial for distributed teams. Meeting does not necessarily mean a team will work better together or get motivated, though. “Meetings, a ubiquitous institution in virtually all organizations, often failed both to transmit rich information and to deepen social bonds.” (Nardi & Whittaker 2001, p.23). Routine face-to-face meetings without a
specific purpose, or without the participants feeling the necessity of it, can be more demoralizing than helpful in a lot of situations. Having too many meetings only make people blasé, which in turn can lead to that they don’t pay attention to what is said in the meeting, and they don’t really socialize with others either.

The time for socializing at work is perhaps more in the informal meetings, talking in the corridor or by the coffee machine. These kinds of meetings are useful, but can also be a problem for a lot of people, since the risk of getting constantly interrupted in the work is impending. The recipient doesn’t always have control over unscheduled meetings, and people might “misread the cues and interrupt at inopportune times. Informal, unscheduled face to face communication exhibits strong participant asymmetry in that the intended recipient of the communication has much less control over the exchange than does the initiator, due to norms of politeness and the need to remain in good standing with others (Nardi et al., 2000; O’Conaill & Frohlich, 1995; Whittaker et al., 1997). Even when recipients refuse a communication, they have still been interrupted, and there is often a social cost to refusing communication in this way.” (Nardi & Whittaker 2001, p.21).

Even if the conclusion is that social interactions are in general beneficial for teams, it is not easy to create a virtual environment where people can socialize and have informal interactions. Dirckinck-Holmfeld and Sorensen (1999) mention that in physical institutions there are different socialization structures at work which support the learning process: the buildings, the course plan, the schedule, the pedagogical principles, the physical gatherings, the evaluation system, etc., all of which are elements in the socialization process. Normally these socialization structures work “tacitly” and, as such, they are not reflected. However, when establishing virtual interactions, it is necessary to make the socialization structures explicit. Dirckinck-Holmfeld and Sorensen (1999) state that in a distributed environment, where time and place in principle are stretched, one of the most important structures to deal with is the re-establishing of a shared context. Without re-establishing a social and shared context, it is not possible for the participants to communicate or collaborate.

There is a difference between what people should do and what they naturally do when they move to a distributed environment. It is not always easy to get people to talk to and socialize actively with each other, especially when they don’t know the other members of the team. “Schrage argues convincingly that effective technology-based collaboration requires the ability to socialize using technology [13]. Our study with global virtual student teams supports the argument that socialization is important for a continued electronically mail-based relationship. Yet people seem to have little propensity to chit-chat on electronic mail for long periods of time.” (Knoll & Jarvenpaa 1999, p.10). Knoll and Jarvenpaa (1999) suggest actually forcing people to socialize electronically, since there is real value in the interactions. The trick is according to them to set up a structure that promote “party type of behavior” without the complications that sometimes occur in other party contexts, and to make it feel natural when moved to a virtual environment.

Even if it can be hard to develop social relationships through ICT, Joinson (1998) says that online relationships, alongside with the development of interpersonal social cues (e.g., smiles, action signs) and category cues contained in
email headers and signatures (e.g., gender, location, occupation) suggests that ICT does not lack socialness. Haythornthwaite, Wellman and Garton (1998) also state that it is more a matter of time before people learn how to use ICT and make the media more social. Being social can be a sign that a team feeling is developing. “Thus, even in specialized work, leisure, and social support CSSNs [computer-supported social networks], communications may wander off topic and include socioemotional content. Such wanderings may even be taken as a sign that the group is becoming a community.” (p.218).

Virtual communication is in general slower than face-to-face communication, and building relationships and trust with technology as a filter has also been proven to be a longer process. On the contrary the lack of social presence can sometimes even make it easier for people to join and participate in discussions since they gain control over the timing and content of their self-disclosure. Increased self-disclosure makes it possible for weak ties to grow into stronger ties, moving relationships from task-oriented exchanges to full-fledged relationships, and the ability of the networks to foster such disclosure may increase the likelihood that groups become cohesive and create a team feeling (Haythornthwaite, Wellman & Garton 1998).

It normally takes time to develop trust, and trying to hard to earn it, might have the opposite effect. One belief is that trust and social exchanges in virtual environments are not impossible and are not that different from on-site settings, but the big difference is exactly the slower rate of transfer, and that it may simply take longer to reduce uncertainties about other people (Jarvenpaa & Leidner 1998; Parks & Floyd 1996). Others believe that it is slower, and perhaps even impossible to build relationships. “Research specifically on work groups suggests that they form more slowly, and perhaps never fully, if face-to-face contact is lacking” (Armstrong & Cole, 1995, p.190).

Haythornthwaite, Wellman and Garton (1998) on the other hand saw signs that relationships grow stronger faster when being distributed. They found several factors that may have accounted for the differences between the groups, like the fact that the CMC groups had continuous access to email, whereas the face-to-face groups met in three meetings. The study shows that it is worth examining interaction over time when considering face-to-face versus CMC. King and Moreggi (1998) mention that there are new cultural values in Internet communications; people have social norms for, and even encourage, contact with relative strangers which will probably help people get to know each other faster, since people on the Internet open up and talk about things they would normally never discuss with strangers. There are examples of successful distributed teams, relationships and communities that actually evolve faster than on-site.

According to Willmott and Wray-Bliss (1996) communications become more transparent, and more open to surveillance, when it is reduced to textual and numerical images. ICT lacks some of the interpersonal, private qualities of face-to-face communication. They state that the medium is not personal enough and is no substitute for face-to-face. There is a real and symbolic distance between the speakers which inhibits what may be said, as well as the possibility of someone “listening in” on communications. Billing (1997) says quite the opposite and claims that “It is easy to exaggerate the difference between words and actions, as
if the latter were more ‘real’ than the former. In social life words are rarely ‘mere words’. Many important social actions are performed through utterances.” (p.46).

When virtual relationships do have time to grow, it is common that communications wander off-line. Messages that have begun in one medium may continue in another or move to face-to-face when people have a chance to meet. Communication may wander across media. Not only do pairs who maintain stronger ties communicate about more types of information, they have also been found to use more types of media for their communications (Haythornthwaite, Wellman & Garton 1998).

Even though the Internet seems to give users endless possibilities for communication and interaction, it seems like people limit the amount of people they are communicating with, and when it comes to how much they actually interact, the differences between virtual and face-to-face are not that big (Haythornthwaite, Wellman & Garton 1998). Examining ICT from a social network perspective provides new ways of viewing this emerging phenomenon. Since the protocols and etiquette are new and evolving, it is useful to view this growth from a perspective that does not look for repetition of off-line behavior, but instead is open to show new structures, new relations, and a new world (Haythornthwaite, Wellman & Garton 1998).

3.4.4.1 Functions of Social Interaction

The informal interactions that take place in offices do not only have important functions in terms of creating human contacts, e.g. providing companionship and emotional support, but are crucial to the actual conduct of the work process itself (Bannon & Schmidt 1991). It is much easier for people to collaborate when they know each other well, and as Cheesman and Heilesen (1999) point out, a real life meeting is hard to replace with photos, CVs, home pages and the like. The social aspects of work is often missed or neglected, even in more successful distributed teams. Empirical work has shown the importance of informal workplace communication for effective collaboration. Informal interactions are generally spontaneous, brief, context-rich and dyadic. The interactions support joint problem solving, coordination, social bonding, and social learning, which are essential for collaboration (Nardi, Whittaker & Bradner 2000).

Knoll and Jarvenpaa (1999) found in a study of virtual teams that the teams that succeeded in producing a common document sent a slightly higher proportion of messages with socialization content than teams not producing a common document. They were able to communicate feelings, context, sensory information, roles and identities, and the sense of a team feeling to sustain interaction throughout the exercise. Exchanging personal information helped creating a team feeling. Team members discussed their families, their occupations, and the kind of things they did for fun.

The formation of a social environment can help distributed teams overcome problems that might arise because of lack of cues and the absence of regular ways of social communication. A space for personal issues needs to be made and fostered and Palloff and Pratt (1999) suggest that something like an virtual café should be available for informal discourse in distributed courses, otherwise students will probably try to bring personal issues into the discussion about the
project, or start feeling lonely without any social contact with the others in the team.

To have a common space is really important for the development of a team, both for the social interaction and to support the work. If people know were to find their teammates, the material they are working on, etc., it is much easier to work together. Moon (1998) state that immediacy (defined partly as closeness in space) is conceptualized as one of three major determinants of social influence.

The risk of people feeling lonely and isolated while working at a distance shouldn’t be neglected and have to be handled and discussed. “Virtuality, however, isn’t always as much fun as it is supposed to be. A room of one’s own, or at least a desk of one’s own, has been the executive security blanket for a century or more. A sense of place is as important to most of us as a sense of purpose. Email and voice mail have many attractions, including immediacy, but they are not the same as watching the eyes of others. The loneliness of the long-distance executive is well documented. Even office gossip and politics have their attractions, if only as an antidote to the monotony of much of what goes on in the name of work.” (Handy 1995, p.42).

Flexner and Wheatly (1997) also bring up the problem of loneliness in distributed settings and claim that the more ICT is used to bridge time and space, the more empty people will feel emotionally. The human need for social interaction does not go away just because we have technology that can replace the need for face-to-face meetings. Markowitz (1997) say that if meeting face-to-face is not possible, it might be useful to distribute photos, short biographies or have team members make short videos. The biographies shouldn’t only describe education and work experience, but also hobbies, interests, family, etc. These kinds of details are normally exchanged in “small talk” at meetings. While it may seem unimportant or irrelevant, it is often what fosters trust among group members and help them to be productive. Personal information help people see common interests they might have, and in that way give them something to talk about, a kind of “common background”.

The formation of a team feeling is a sign that people feel comfortable and their social needs are satisfied and is a good base for trust. If people feel comfortable in an environment and with the people they work with, the chance that the collaboration will be successful increases. Shaw (1997) brings up something important, that it is difficult to demonstrate concern for people you don’t know. Trust requires familiarity and that means listening to others and understanding their point of view. It also involves spending social time with people and taking an active interest in their work and careers. If people are isolated from each other, a variety of informal and formal mechanisms keep people from having direct and ongoing contact with each other. In the absence of familiarity, people can easily misinterpret the actions of others which often results in increased suspicion and negative assumptions about others’ motives.

People affect each other, or as Manstead (1997) put it, social situations are powerful. Most people are influenced by the behaviors or sometimes the mere presence of other people. People are affected by suggestibility, a readiness to be led (without the experience of voluntary choice) to behave in a particular way as result of social interaction and social facilitation; a process through which the
presence of other people enhance individual performance (McGarty & Haslam 1997).

We care about what other people think of us and we behave in specific ways because of that and most people place great importance to the way in which they are or would be evaluated by others, even where these others are complete strangers (Manstead 1997). Manstead also brings up traditional explanations for why social situations are powerful. Social influence is explained in terms of a distinction between informational influence and normative influence. Informational influence arises from the assumption on that other people are good sources of information about the world; if a lot of other people agree with each other it is irrational to ignore their consensus. Normative influence arises from the perception that the opinions and actions of the majority in a social group constitute a group norm; by conforming to this norm one can avoid rejection and/or increase acceptance.

Human beings desire social bonds, even if the degree of this need vary between individuals and situations. We care about how other people evaluate us, not because we are egoistical or insatiably curious about any information concerning us, but because how we are evaluated by others indicates how likely it is that we would be accepted by them as acquaintances or friends. Knowing what other people think helps us accomplish one of the key goals of human existence, namely the forming and maintaining of social bonds (Manstead 1997).

Misztal (1996) also claims that people are social for a reason; they are not social because they are moral, they are moral because they have to. People live together with others and therefore need to account for who they are. Morality matters because everybody has reputations to protect, relationships to maintain, legacies to leave, people to love and careers to follow. By adjusting our needs to the needs of others in daily negotiations we construct expectations and beliefs about others.

Bradley et al. (1993) state that communication at work refers to one of the three fundamental human needs, namely, the need for belonging and personal contact. They also point out that change of the work environment places high demands on the social and emotional components of communication. “Many of us have not adjusted to the information society (computers and telematics). Thus, we need to look at the interaction of people at work from both a quantitative (i.e., number of human contacts) and qualitative perspective. The qualitative aspects of communication include such things as creativity, emotional involvements, and opportunities for problem-solving.” (p.158).

3.4.4.2 The Depersonalization Phenomena
In the same way as ICT removes a lot of cues, it also removes a lot of possibilities for regular social information. McGrath and Hollingshead (1994) say that this can have both positive and negative influences on an interaction process, that “[…] computer-mediated communication tends to depersonalize the communication/interaction process, with several concomitant effects. Individuals tend to lose ‘mental sight’ of their interaction partners; that is, they lose the very particularized kind of mental image of their audience that people would normally have in face-to-face communication (and to a lesser degree in other media such as telephone or
video communications). At the same time, they lose access to a variety of cues that provide feedback to members regarding the impact of their behavior on interaction partners, and that communicate the status and individuality of the participants. Therefore, participants concentrate more on the message and less on the persons involved in the communication.” (p.45).

Messages themselves seem more ephemeral. Hence individuals feel less committed to what they say, less concerned and less worried how it will be received by the people they are communicating with. According to McGrath and Hollingshead (1994) this leads to that individuals engaged in computer-mediated group interaction tend to: feel more anonymous and detect less individuality in the people they communicate with; participate more equally (low-status members are less inhibited); focus more on tasks and less on personal and social aspects of communication; communicate more negative and more uninhibited messages (they are less concerned with social norms that regulate and “civilize” face-to-face communication); experience more difficulty in attaining group consensus (because of elimination of interpersonal feedback and reduced concerns with social norms).

Initiatives (e.g. volunteering to complete tasks) appear to strengthen and unify a team, but data also suggests that even more important might be the responses to the initiatives. Because communication through ICT entails greater uncertainty than face-to-face communication, there tends to be an intense need for response. A response is an endorsement that another person is willing to take the risk of interpreting a message and if necessary, supplying the missing elements to make it understandable. A response also suggests involvement, and involvement conveys attraction, intimacy, attachment, and affection (Jarvenpaa & Leidner 1998). Joinson (1998) mentions that it is not only the medium, but also the time limits imposed in many distributed situations that can affect the social sides of communication negatively. The context may encourage the use of business-like communication rather than relationship development and there is some evidence that when CMC groups are actually allowed to discuss for as long as necessary, the amount of social information exchange increases.

Interleaved with face-to-face interactions is often informal, off-the-cuff conversations, like jokes, gossip, how-are-the-kids questions, and other kinds of office chat. Such informal talk aids bonding and reinvigorates communicative ties. “Previous research has shown that seemingly inconsequential informal interactions unrelated to work serve critical functions such as coordinations and learning (Allen, 1977; Kraut & Streeter, 1996; Whittaker, Frohlich & Daly-Jones 1994; Nardi & Engeström, 1999). Informal communications have been shown to be extremely difficult to support using mediated communication (Kraut, 1987; Kraut et al., 1987; Kraut et al., 1990). Face to face provides support for such informal interactions.” (Nardi & Whittaker 2001, p.6).

Nardi and Whittaker (2001) make the case that communication is problematic in deeply social ways, it is not only a matter of channeling information to the pipe, social and attentional linkages must be accomplished. Often the work of making these linkages falls primarily (though not exclusively) on the initiator of the communication.

Much of the research that states that ICT doesn’t support informal communication if fairly old. With instant messaging, chats, a wider spread of the
use of email, this might have changed. But even if it has changed, it is still hard to
do the classical teambuilding activities and bonding when located in different
sites. “Eating and drinking together perhaps comprise the most fundamental way
in which people come to feel connected. On one level this is obvious and we all
know it from personal experience. But theoretically we have ignored these prosaic
activities, missing an important contribution of the body, and hence part of the
 uniqueness of face to face communication” (Nardi & Whittaker 2001, p.9).

3.4.4.3 Grounded theory
Every day we meet and communicate with people. When glancing at it,
communication and understanding seems like simple things. When looking at it
more closely, one can see that the communication process is rather complicated
and that there are a number of things that can go wrong on the way to joint
understanding. The most basic problem is that listeners do not always take notice
of the speaker. But even if the listener notices that something has been said, it does
not necessarily mean the listener heard what has been said, and it is even less
certain that the message has been correctly understood (Axelsson et al. 2003).

Shared understanding is a basic phenomenon in interactions involving both
people and artifacts. The research on shared understanding is found under various
names including: common ground, socially shared cognition, footing and
distributed cognition (Hunt 1993; Goffman 1981). Hunt (1993) claims that
conversation requires a lot of shared information to be successful, that people have
to have mutual knowledge, beliefs, and assumptions.

Definition
A common sense notion is that shared understanding involves two or more people
agreeing on ideas or appropriate actions during a conversation or stating some
cultural norms (Hunt 1993). Grounding is the interactive process by which a
common ground, i.e. a mutual understanding between individuals, is constructed
and maintained. An essential part of conversation is to ensure that other
participants share an understanding of what has been said and what is meant.
Grounding is a phenomenon that is central to the interplay between individuals
and between individuals and society (Clark & Schaefer 1989).

Since neither partner in a dialog has direct access to what the other is
thinking, they must coordinate their distinct mental states and get them to
converge to some degree in order to communicate successfully (Cahn & Brennan
1999). To communicate successfully, people have to coordinate not only the
content of what they say, but also the process of saying it and engage in the
process of grounding in order to come to a mutual belief that they understand one
another sufficiently well for the purpose at hand. People exchange evidence until
they reach the mutual belief that they are talking about the same thing (Brennan
1998). To coordinate on process, people need to update their common ground
moment by moment. All collective actions are built on common ground and its
accumulation (Clark & Brennan 1991).

The grounding process has been described within a framework that views
communication as collaborative action. It is not enough for a person to simply
produce an utterance; sufficient evidence that the utterance has been heard and
understood as intended must be acquired by the speaker. The grounding process requires that people are able to seek evidence of each other’s understanding, as well as provide evidence about their own understanding. The evidence may be either positive, stating that everything is on track, or negative, informing that a problem has been detected (Brennan 1998). How the grounding is done changes from one situation to the next. Grounding takes different shapes in different media and depend on the context and content of the information (Clark & Brennan 1991).

**Contribution Model**

Closely connected to grounding is the *principle of least collaborative effort*. In conversation, participants try to minimize their collaborative effort, that is, the work done from the initiation of each contribution to its mutual acceptance and the medium that affords the least collaborative effort will be the one used.

This is also called Clark and Schaefer’s *contribution model* (from 1987) and addresses the detection and repair of communication errors. According to the model, a conversation is made up of contributions, and each contribution has two phases, a presentation phase, followed by an acceptance phase. In the presentation phase, a speaker presents an utterance to an addressee; in the acceptance phase, evidence of understanding is accrued until it is clear to both parties that the propositions put forth in the original or revised presentation are mutually understood and therefore part of their common ground. The contribution model says that people seek positive evidence for understanding. Three common forms of seeking positive evidence are acknowledgments, relevant next turn, and continued attention (Hunt 1993; Cahn & Brennan 1999).

Personal media vary on many dimensions that affect grounding. According to the theory there are eight constrains and eleven costs that a medium may impose on communication between two people. The constraints are: *Copresence, Visibility, Audibility, Cotemporality, Simultaneity, Sequentiality, Reviewability, Revisability*. The costs are: *Formulation, Production, Reception, Understanding, Start-up, Delay, Asynchrony, Speaker change, Display, Fault, Repair* (Clark & Brennan 1991; Hunt 1993).

**Constraints on Grounding**

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>copresence</td>
<td>A and B share the same physical environment</td>
</tr>
<tr>
<td>visibility</td>
<td>A and B are visible to one another</td>
</tr>
<tr>
<td>audibility</td>
<td>A and B communicate by speaking</td>
</tr>
<tr>
<td>cotemporality</td>
<td>B receives at approximately the same time as A produces</td>
</tr>
<tr>
<td>simultaneity</td>
<td>A and B can send and receive at once and simultaneously</td>
</tr>
<tr>
<td>sequentiality</td>
<td>A’s and B’s turns cannot get out of sequence</td>
</tr>
<tr>
<td>reviewability</td>
<td>B can review A’s messages</td>
</tr>
<tr>
<td>revisability</td>
<td>A can revise messages from B</td>
</tr>
</tbody>
</table>
Costs of Grounding

<table>
<thead>
<tr>
<th>Cost</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>formulation</td>
<td>formulate and reformulate utterances</td>
</tr>
<tr>
<td>production</td>
<td>producing the utterance</td>
</tr>
<tr>
<td>reception</td>
<td>receiving a message</td>
</tr>
<tr>
<td>understanding</td>
<td>understanding a message</td>
</tr>
<tr>
<td>start-up</td>
<td>starting a new discourse</td>
</tr>
<tr>
<td>delay</td>
<td>planning and revising before executing</td>
</tr>
<tr>
<td>asynchrony</td>
<td>timing of discourse exchanges</td>
</tr>
<tr>
<td>speaker change</td>
<td>changing speakers</td>
</tr>
<tr>
<td>display</td>
<td>presenting an object of the discourse</td>
</tr>
<tr>
<td>fault</td>
<td>producing a mistake</td>
</tr>
<tr>
<td>repair</td>
<td>repairing a mistake</td>
</tr>
</tbody>
</table>

In interactions people trade off the costs of grounding with the benefits. Exchanging evidence of understanding is harder in some communication media than in others, and this fact affects the strategies and techniques people choose for grounding (Brennan 1998). Hunt (1993) describes implication of costs and constraints as the fact that people have to adjust the grounding criterion to meet the current purpose; taking into account the strength of evidence and feasibly divide the labor; use the information available in common ground both for presenting and accepting utterances, providing evidence as often as they afford.

Using Grounding

Brennan (1998) states that many of the errors that occur in interaction with or through computers can be explained as failures of grounding, in which users and systems lack enough evidence to coordinate their distinct knowledge states. Hunt (1993) points out that the efforts and tasks required to ground a conversation change with different media and the principle of least collaborative effort predicts that the medium that affords the least collaborative effort will be the one used for the purpose at hand.

Brennan (1998) also points out the importance of the communication medium. The immediacy with which two people can exchange evidence is critical and in media where people are not co-present and utterances are not ephemeral, people tend to ground larger installments than in spoken conversation. In these ways, the affordances of a medium impose particular costs on the grounding process and on how grounding shapes the conversations conducted over that medium.

Hunt (1993) says that the grounding approach has a lot to offer in the analysis of shared understanding. But one problem with it is that it is not clear how local references might build into the understanding, nor do cultural factors seem to find a natural place in the approach. Looking more closely, constraints such as visibility may be too coarse, i.e., significant differences in grounding ability may occur in being able to see someone’s room, body, hands, face, eyes, etc. It is also a need to examine how constraints and simple costs combine, perhaps in complex ways.
3.4.4.4 Symbolic Convergence Theory

Symbolic convergence theory is a set of organized and interrelated propositions that attempt to explain how communication creates consensus around group decisions and group consciousness. The convergence theory of communication is based on the theorem that over time, beliefs and behavior of individuals who share the same information will converge toward a state of greater uniformity. However, the information to which individuals are exposed is bounded by their communication networks and by selective exposure and perception (Young 1998).

Bormann (1986; 1989) who created the theory wanted to explain how interaction between group members helps create consensus around group decisions. The key concept he used to explain the emergence of group consensus is group consciousness. Group consciousness is the perception on the part of group members that they are a group, not simply a collection of individuals. Bormann describes it as a shared feeling of “groupness”. According to Bormann, as group members begin to interpret symbols in similar ways, they begin to form a common understanding and a consciousness that generates a group identity.

Group consciousness emerges from symbolic convergence, the process by which group members arrive at shared meanings for important verbal and nonverbal signs and symbols. One way groups develop a group consciousness is by sharing stories. Storytelling helps other members understand what a particular member means by, or how a member has interpreted, particular concepts, events, words, or phrases. Stories might describe a member’s own experiences, historical events, media events, or even imaginary events. Bormann calls those stories fantasies because they always refer to characters and events in some time and place other than the here and now.

The theory places an emphasis on fantasy sharing as a method through which group members arrive at shared understandings for significant signs and symbols as a means of creating consensus around group decisions. A fantasy does not refer to fictitious stories or secret desires. Fantasies are stories or jokes that contain or reveal emotion. Fantasies include events from group members’ past, or an event that may occur in the future. Fantasies do not include any communication that focuses on what is going on inside of the group.

A fantasy chain reaction is a positive and energetic response to an initial fantasy when the atmosphere in the work environment has gone from serious to comfortable and even energetic. Once the fantasy chain reaction begins, common ground is established between group members and a cohesion forms. Cohesion within a group is not an immediate form of action. A single fantasy chain event won’t bring about complete cohesion.

Through symbolic convergence, individuals build a sense of community or a group consciousness. As symbolic convergence ties a group together with cohesive bonds, a sense of togetherness is formed. Individual members begin using the words “we” instead of “I”. It is important to stress that there is a limit on how much conformity should take place. Groupthink occurs in very cohesive groups when members strive so much for unanimity, that they are basically incapable of thinking for themselves, and is a surprisingly common process.
3.4.5 Trust

To work well in a team, or when working with somebody in general, trust is one of the most important aspects for success. To trust that people won’t hurt you, trust the competence of each other, and that the other team members will do their work. Trust can also lead to that it is possible to avoid a lot of unnecessary discussions, and that team members have the confidence to make decisions of their own when necessary.

A high level of trust allows people to say what is on their minds without feeling that it will come back and harm them. A sufficient level of trust ensures that lines of communication are open and that no one is hiding information or wasting time trying to decide the political implications of his or her views. A team that is comfortable with direct and honest communication is also more likely to consider various alternatives to problems. Only trust won’t make a team work, though, but it is a good base for collaboration (Shaw 1997). Lack of trust, on the other hand, may be the most daunting boundary of all. As Mankin, Cohen and Bikson (1996) say, it creates inefficiency, blocks commitment, and inhibits change. Without trust, organizations can’t work well and the virtual organization can’t work at all. It limits the collaboration and the level of the discussion.

3.4.5.1 Definition of Trust

According to Misztal (1996) sociological literature conceptualizes trust as either the property of individuals; the property of social relationships; or the property of the social system. He also states that in this psycho-sociological work trust is confused with or closely related to cooperative mentality, honesty, loyalty, sincerity, or hope, and he claims that these attempts to develop a personality theory of trust are far too simplistic in their lack of social context, e.g. the fact that one may trust in one circumstance, and not in others.

Misztal (1996) tries to define “trust” starting with the main definition of trust in the Oxford English Dictionary: “confidence in or reliance on some quality or attributes of a person or a thing, or the truth of a statement” (p.16). In this definition, trust to a large extent merges with the idea of confidence, which expresses a firm trust. Trust is a matter of individual determination and involves choosing between alternatives while confidence is more habitual expectation.

Shaw (1997) looks at trust from a slightly different angle. He starts with the origin of the word: the German word “tröst”, which suggests comfort. Trust begins with an assessment of other’s capabilities or character. We generally trust those who demonstrate they are worthy of it, yet, trust is not always rooted in past experiences with others. Trust is distinguished from confidence, since confidence is a result of specific knowledge; it is built on reason and fact. In contrast, trust is based, in part, on faith. We sometimes give our trust in spite of evidence that might suggest we should feel some caution, if not outright suspicion, about relying on another.

Trust may be based on knowledge, but it cannot be explained by it. Trust is a form of faith defined as assured reliance on a person or principle (Misztal 1996). Trust, however, is not absolute faith. In its most extreme forms, faith can be seen as a belief that is largely immune to contradictory information or events. Pure faith is beyond reason. Trust is therefore more than simple confidence and less than
blind faith (Shaw 1997). Dunn defines trustworthiness as the capacity to commit oneself to fulfilling the legitimate expectations of others (Misztal 1996) while Shaw (1997) suggests as a working definition of trust: belief that those on whom we depend will meet our expectations of them, which is the one used in this dissertation.

3.4.5.2 Functions of Trust

Time is a crucial factor in today’s working and learning environments. People can’t afford distrust and can’t afford the time lost if somebody would give the wrong information or doesn’t do what they have said they will do. “In times like these, trust is precious: trust that when my computer links to yours your security will be good enough that my system won’t be compromised; trust that the information I receive and pass on is accurate and true; trust that when I give you personal information about myself I won’t find my privacy betrayed. As we’ve already seen, these are not simple things in a world mediated by technology. But the hardest one, as the Internet experiments with what works and what doesn’t, is trust that your communication will be worth my time.” (Grossman 1997, p.183).

Giddens discusses the importance of trust in the context of the specific features of modern societies, such as the reflexivity, globalization and level of risk. He argues that the rationality of modern society demands trust, and people have to consider the possibility of future damage, as a consequence of actions and risk taking (from Misztal 1996). People in collaborative relationships take risks when opening their thoughts and feelings to others. Trust is built when the risk taker receives positive regard from others for ideas expressed, inquiries made or feelings shared (Peters & Armstrong 1998). The presence of trust also leads to that individuals are allowed greater freedom. Simply by facilitating collaboration among diverse individuals and groups, trust contributes to creating a sense of community (Misztal 1996).

If people do things that hurt others in some way, it is natural that trust is lost. Without some point at which we withdraw our trust, we would expose ourselves to risks that could harm us as individuals or harm the group to which we belong. Each individual, team, and organization has a point at which it will withdraw its trust of others. Shaw (1997) calls this the “trust threshold”, which protects us from the untrustworthy. Once broached, a threshold blocks the rebuilding of trust. This is one way of explaining why distrust often appears to be self-perpetuating: the suspicious find reasons to reinforce their lack of confidence in others. “Even if the individual or group who violated our trust changes, it is all too easy to discount or explain away these positive actions. To be fooled again would hurt too much or entail too much risk. Every new error, however unintentional, becomes one more piece of evidence that the conciliatory effort is merely a sham and that nothing has really changed. It is possible to get out of such a cycle, but the potential for rebuilding a trusting relationship can quickly slip away.” (Shaw 1997, p.26).

Trust is essential for stable relationships, vital for the maintenance of collaboration, fundamental for exchanges and necessary even for routine everyday interactions. Luhmann states that without trust only very simple forms of human collaboration are possible, and even individual action is sensitive without trust (see Misztal 1996). Carnevale and Wechsler argue that trust shapes all aspects of
life. Trust is essential for effective problem solving, because it encourages the exchange of relevant information and determines whether people are willing to allow others to influence their decisions and actions (see Misztal 1996). Even if trust can have different shapes, can be defined in different ways, can occur on different levels and can be more or less spontaneous, it performs the same function; it reduces complexity by going beyond available information and generalizing expectations of behavior as it replaces missing information (Misztal 1996).

3.4.5.3 Influences on Trust

According to Holmes and Rempel the first step in a relationship is taken in pure hope. We don’t know a person and have no experiences to look back on. In the beginning we lack the evidence that a person is trustworthy and have to rely on our instincts and hope that a person’s appearance will correspond with our expectations. People are social and the interest in other people will support new acquaintances. In this sense social interaction in virtual environments does not differ from interaction face-to-face (from Axelsson & Schroeder 1999). In society today, and even more in virtual environments, trust building is different than it was when people lived in smaller societies, and is characterized by the increasing importance of “system trust”, which is built upon the belief that others also trust. It does not rest on bonds between people but includes reflexivity and a conscious approach and there is a need for impersonalized trust, understood as moral standards and reputations (Misztal 1996).

Depending on what personality people have and what they have experienced before, they are more or less likely to trust people they have just met. After a while the first impression is not enough and people have to start earning our trust. “We trust those who meet our expectations. It is more accurate, however, to say that we trust those who meet our positive expectations [...] In short, we come to believe that those we trust are both willing and able to meet our needs” (Shaw 1997, p.22).

Shaw (1997) pointed out that simply knowing and fulfilling expectations does not sustain trust. Malevolence and incompetence, even when expected or anticipated, will undermine trust. More often, through, it is inconsistency between what one expects and what one observes that raises doubts about the motives or ability of the ones in whom we place our trust. Trust is also based on perceptions of consistency in actions and words. In most cases trust declines when somebody acts inconsistently and fail to follow through on their commitments, since trust is partly based on being able to predict the behavior of others. Consistency between what we expect and how others behave is therefore vital for trust (Shaw 1997).

Shaw (1997) adduces three major imperatives to gain trust. The first one is to fulfill obligations and commitments, the second is acting with integrity, that is act with honesty in one’s words and consistency in one’s actions (and we distrust those whose words and actions dramatically change with the situation). The third imperative is that we trust those who we think care about us, those that we think understand our needs and concerns. Duarte and Snyder (1999) claim almost the same thing, that the three factors that have to be present for trust to be built are performance and competence, integrity and concern for others.
Misztal (1996) states that trust can be said to be based on the belief that a person, who has a degree of freedom to disappoint our expectations, will meet an obligation under all circumstances over which they have control. If circumstances arise which could prevent the fulfillment of the obligations, through no fault of the parties concerned, it won’t be perceived as a case of betrayal. This means that although we are willing to forgive mistakes or unintended consequences, the intended betrayal of our trust is a cause for enormous pain and distrust. By intended actions Misztal (1996) means not only actions which are conscious, planned or calculated, but also the possession of expertise to carry out the actions. In other words, intended actions consist of a person’s intentions and his or her emotional, technical or material ability to perform the intended actions.

“The process of granting and receiving trust often increases the likelihood that people, at all levels, will act in a trustworthy manner. In other words, in most cases, trusting others makes them more trustworthy.” (Shaw 1997, p.8). In other words, we are more likely to trust people that trust us. We are also more likely to trust people that acknowledge our needs and affirm our sense of worth. This is most clearly revealed when they are willing to sacrifice their own interests (Axelsson & Schroeder 1999).

One of the problematic issues with trust is that it normally takes time to develop, and trying to hard to earn trust, might have the opposite effect. “Trust is not something one changes with pronouncements or good intentions. Seeking to improve trust directly, in fact, can result in higher levels of suspicion if the process is not managed effectively.” (Shaw 1997, p.17). One belief is that trust and social exchange in virtual environments are not that different from on-site settings, but the big difference is exactly the slower rate of transfer, and that it may simply take longer time to reduce uncertainties about other people (Jarvenpaa & Leidner 1998; Parks & Floyd 1996).

Misztal (1996) states that social relations and the obligations inherent in them are mainly responsible for the production of trust. Central to the concept of trust is uncertainty about other people’s motivations. People’s commonsense knowledge about what to expect from various types of social relations and their understanding of the motives of others is also central. Misztal (1996) also points out that trust requires a time lapse between expectations and other people’s action. He claims that “What makes trust so puzzling is that to trust involves more than believing; in fact, to trust is to believe despite uncertainty. Trust always involves an element of risk resulting from our inability to monitor others’ behaviour, from our inability to have a complete knowledge about other people’s motivations and, generally, from the contingency of social reality. Consequently, one’s behaviour is influences by one’s beliefs about the likelihood of others behaving or not behaving in a certain way rather than solely by a cognitive understanding or by firm and certain calculation.” (p.18-19)

One of the paradoxes of trust is that trust cannot grow unless we take risks that may result in distrust. In other words, we must risk being wrong if we are ever to determine whether we are right in giving our trust. “Without risk, there is no need for trust. Trust and risk give rise to each other; it is rare to find one without the other.” (Shaw 1997, p.24). Trust is motivated in everyday situations by a lot of factors, from which we can exclude coercion, since trust can be promised and trust
can be earned, but it cannot be ordered. “Neither can it be purchased or bribed, since, as an age-old truth – immortalized in King Lear – illustrates, any attempt to ‘buy’ trust can only destroy it.” (Misztal 1996, p.21).

Jarvenpaa and Leidner (1998) conducted a study where they looked at how distributed teams formed and kept trust. Communication behavior that facilitated trust early in a group’s life was social communication, communication of enthusiasm, explicit verbal statements about commitment, and support. Expressions of enthusiasm increased the attraction to the group, tendency for agreement, and cooperation (Jarvenpaa & Leidner 1998). Other actions that facilitated trust early in a group’s life were coping with technical uncertainty and taking individual initiative. Jarvenpaa and Leidner (1998) noticed that communication behavior that helped maintain trust later in a group’s life were; predictable communication, substantial and timely responses, successful transitions from social to procedural interactions to task focus, positive leadership, and phlegmatic responses to crises.

Teams that were low in trust during the whole work process lacked optimism, excitement, and initiative. They seemed unable to develop a system of coping with technical uncertainty and an unstructured task. The teams who accomplished to move from a low trust situation to high trust had predictable, though infrequent, communication, more equal participation across members, and focused on the task (Jarvenpaa & Leidner 1998). Some teams in Jarvenpaa and Leidner’s study moved from a high level of trust to a low level. They had initial enthusiasm, but lacked of serious reflection of the challenges of working in a virtual environment. The existence of a stated leader in the teams seemed to lessen the felt need to contribute among the other members. What characterized teams with a consistent high level of trust were social introductions in the beginning. They had periods of intense online communication, which strengthened the group identity, and they seemed genuinely interested in the other members’ responses.

Social interaction seemed to be most important in the beginning of a project, for the team members to get to know each other. If the focus did not leave the social discussion, the teamwork never moved forward, and more was needed to keep a trusting working relationship. Jarvenpaa and Leidner (1998) said that extensive social discussion appeared to foster trust in the beginning of the project but was insufficient in maintaining trust over the longer term. The teams that had a high level of trust throughout the project developed an amicable social situation early on and continued to exchange social information until the final week, but the information was always integrated into otherwise task oriented messages. The team members appeared to be careful not to use social dialog as a substitute for progress on the task.

Jarvenpaa and Leidner (1998) mention that the media richness and social presence theories question the possibility of relationship development, and subsequent trust development, in virtual teams. The theories suggest that computer based communication may eliminate the type of communication cues that individuals use to convey trust: warmth, attentiveness, and other affections. Contrary to the theories, Jarvenpaa and Leidner’s (1998) empirical studies show relational information sharing in computer mediated teams. It is definitely harder to see the skills of remote team members, which in turn leads to that it is easy to
not gain trust in them. It is also easy to ignore remote team members or treat them as extra help. Armstrong and Cole (1995) saw in one of their experiments that remote sites were often given responsibility for small tasks and treated as subcontractors rather than actual team members.

3.4.5.4 Swift Trust
The concept of “swift” trust for temporary teams, whose existence is formed around a common task with a finite life span, was developed in 1996 (Jarvenpaa & Leidner 1998). Such teams consist of members with diverse skills, with a limited history of working together, and with little prospect of working together again in the future. The tight deadlines under which these teams work leave little time for relationship building. Because the time pressure hinders the ability of team members to develop expectations of others based on first hand information, members import expectations of trust from other settings with which they are familiar.

“...After the team has begun to interact, trust is maintained by a ‘highly active, proactive, enthusiastic, generative style of action’ [...] Action strengthens trust in a self-fulfilling fashion: action will maintain members’ confidence that the team is able to manage the uncertainty, risk, and points of vulnerability, yet the conveyance of action has as a requisite the communication of individual activities. In summary, whereas traditional conceptualizations of trust are based strongly on interpersonal relationships, swift trust de-emphasizes the interpersonal dimensions and is based initially on broad categorical social structures and later on action.” (Jarvenpaa & Leidner 1998, p.6).

The theory of swift trust is interesting when you are looking at virtual teams. There are some differences, though. Swift trust assumes clear role divisions among members who have well defined specialties. Inconsistent role behavior and “blurring” of roles erode trust. “Moreover, the theory seems to presuppose that participants come from many different organizations, have periodic face-to-face meetings, and report to a single individual. By contrast, in global virtual teams, members remain in different locations and often are accountable to different individuals. Such teams are assembled less based on their specific roles and more based on their knowledge differences, partially related to the geographic location of the individual which provides them with greater knowledge of that environment.” (Jarvenpaa & Leidner 1998, p.6).
4. Description of Case Studies

The chapter starts with an overview of the research activities, in Chapter 4.1, where important aspects and background variables for the research are covered, to situate the results and research in a context and aid the understanding of the specific situation the teams have been in, as well to assist in distinguishing the generalizability of the results. In Chapter 4.2-4.9 follow descriptions of all cases studies conducted and results from the individual studies.

4.1 Overview of the Empirical Research Activities

The first two studies were broader studies where essential variables were discovered and the foundation for the research was laid. Study 3-6 cover mainly details and in-depth investigations of organization of work and effects on individuals; i.e. developing team- and trust building exercises, guidelines, and analyzing team problems and team stages; since these were issues found essential in the first studies. Teambuilding exercises were developed and tested, and various ways to help distributed teams get passed problems and improve the distributed work environment were investigated. Case study 7 was once again a more in-depth study, even if not as thorough as study 1 and 2, investigating distributed project work first hand. Study 8 was a more focused study of the use of IM, complementing earlier studies with more up-to-date use of the ICT.

The research was conducted both at KTH, Sweden and at Stanford University, USA. Projects in three courses with collaboration between these two universities were examined, and at times the courses also had participants from universities in Singapore and Japan. The courses were IE264 (1999, 2000), ME310 (1999/2000, 2000/2001) and 2G1319 (2001). A study was also conducted about the use of IM for professionals (2003), but that investigation differs substantially from the other and is not covered in this first overview. To find out more about that particular study, see Chapter 4.9.

The projects have been in the engineering field, with more or less influence from business and marketing. They have been actual projects with sponsors paying to have students solve or investigate a problem of interest. The aim for the projects has been that teams actually produce something; whether it is a mechanical design, building part of a wireless network, designing spaces for distributed meetings, making a marketing or business plan for a product, or investigating the emerging actors in the changing telecommunication’s market.

Information have been gathered by observing classes, teamwork and team meetings; conducting focus groups and interviews with students, teachers, alumni and other people involved with the classes; and by being involved in discussing, designing, developing, and testing teambuilding activities in the Distributed Collaborative Learning thrust at Stanford Learning Lab. Quotes from the
investigations are included in the text to illustrate the participant’s views. Additional illustrating examples can be found in Appendix IV as end notes. In the following an overview of research activities is presented:

- Observation of distributed teams during extensive periods of time
  - daily work
  - formal meetings
  - informal meetings
  - local and distributed meetings
  - social interactions
- Informal interviews with
  - students
  - faculty
  - other people involved with the courses
  - alumni
- Focus groups with
  - students
  - faculty
  - alumni
- Observation and analysis of lectures
- Analysis of student papers and assignments
- Analysis of course and project webs
- Active work in Distributed Projects
  - learning environments
  - working environments
- Observation of the use of ICT
- Self observation
- Design of Teambuilding Activities
  - Broken Squares
  - Video introduction
  - Guidelines
- Testing of Teambuilding Activities with participating students and volunteers
  - observations
  - interviews
  - speak aloud
  - recording of sessions
  - recording of chat and discussion after use

4.1.1 Background and Context for the Empirical Research

The research has been conducted in globally distributed project courses at a university level. It is the collaboration and communication through ICT that has been the focus of investigations. A lot of the findings are applicable on distributed project work in general, but the main research has been done in an educational
setting and the dissertation is written with that as the background. Even if they were student teams, they all had corporate sponsors paying for their expenses, expecting usable final results. Distributed teamwork was a new situation for most participants, being restricted to a situation where almost all communication had to go through ICT. Because the participants were students they naturally had little experience of distributed projects (or teamwork in general), but they were in general experienced users of ICT and different forms of communication through ICT.

As mentioned, the last study was done with professionals and had a slightly different character, and specifics about that case study can be found in Chapter 4.9. Some of the variables have been principally set in the studies, and they should therefore be considered background variables. These specifics in the setting definitely affected the collaboration, and have been part of the analysis, but were not the focus of the research.

4.1.1.1 Description of the Teams and Setting

Regarding physical distribution, the teams observed were globally distributed (except one completely local team in ME310 that was used for comparison), but the observed team members always had at least one teammate on their side, so the global teams consisted of local teams that collaborated and no team directly observed had members that were completely alone on their site. There were never more than three sites involved at the same time.

The team members were mainly in the engineering field, and fairly used to working with ICT and computers, even if it varied how comfortable they felt with communicating and collaborating at a distance. The size of the teams varied in the studies. The size of the teams in IE264 was normally three students on each site. In ME310 the teams on the Stanford side had 3-4 members, but the Swedish side had 12. In 2G1319 the Swedish side of the team that was working globally had 9 members and there were 3 on the Stanford side.

The time frame for the projects was fairly long, at least one semester, and in some cases even three quarters. Since teams were distributed globally it led to particular implications. The distance was always present concretely as time zone differences, geographical distance, language, culture, costs for traveling and phone calls, etc. The time difference between Sweden and California is 9 hours, California and Singapore 8 hours and California and Japan 7 hours, so the time difference was always a factor. It should be noted that Stanford is a very international school and the students there were of different origin, and definitely not all born in California or the USA.

Concerning frequency of physical meetings, all teams met physically once during their actual work, but at different times in the project, and some also met for the final presentation. For some teams it was part of the class to meet physically, but all the teams for whom it was a choice, reserved money in their project budget to meet.

4.1.1.2 Project Type and Organization

All projects were of the kind where the team actively had to do something concrete together; like programming, constructing, doing research, designing, or
conducting investigations, as well as summarizing the results and presenting them together. Since the task was to handle a project from start to finished product the teams had brainstorming sessions, had to handle all kinds of discussions (both social and work related) share work material, make joint decisions, and had both formalized meetings with their teammates and the faculty and non-formalized meetings and discussions where they worked together.

The teams in the case studies divided their work in different ways. Not many teams simply split up the tasks, but all teams still had sub-teams that worked more closely together, and most of these were local. The teams tried to divide the work so it would be practical, at the same time as they tried to use the geographical spread and the diversity within the team to take advantage of and learn from each other. In the cases where it wasn’t clear why the collaboration was useful or necessary, and where it wasn’t obvious why the team would gain anything from the different participants, it was harder to motivate collaboration. When teams didn’t have to involve the distributed site, or the foundation was too different, the collaboration was often not utilized to the full extent.

The organization differed between the classes, with coaches, TAs, sponsors, and teachers that had more or less wish to control the teams. Some teams, like the Swedish side of the Orange team in ME310, had a set team structure, but most of the teams had a choice of how to organize their teams, and if they wanted set or rotating roles.

The planning, scheduling and organization differed between the courses collaborating in ME310, which made it clear how important synchronization and having a common goal were for distributed teams. The importance of having a goal for the distribution was also apparent. When classes and projects on the different sites were synchronized, as in IE264, it made it much easier for both students and sponsors. One problem in ME310 and 2G1319 was that there were only two distributed teams in the classes, the distribution wasn’t always necessary for the teamwork, and there was no particular support for them, e.g. the local teams and class in ME310 had teambuilding activities, but the distributed teams didn’t have any particular activities, and they would have needed it the most.

4.1.1.3 ICT in Use

It was easy for the teams in the case studies to end up using ICT they knew well and were used to, but especially the students in IE264 really took the opportunity to try different ICT and saw the advantage of using more than one and combining them right. As one student pointed out; each communication tool has its limitations when used independently and each communication tool brings new advantages and new frustrations (IE264 Lessons Learned paper).

The ICT used in the studies were telephone, email, videoconferencing, chats, instant messaging, cell phones, web boards, team web pages, web communities, FTP, other file sharing programs, NetMeeting, etc. The ICT in the teams was chosen based on the teams’ needs, but it also depended on what ICT was available. Sometimes teams didn’t know how to use the ICT, and there was no specific support or designated time to learn how to use it. The team members also had to learn what was needed to collaborate well, if they didn’t already know it, and learn communication skills, if they didn’t already have them, as well as
establishing rules for when to use what media.

All teams had more or less a choice of what ICT to use. In IE264 1999 it was an element of the class to test different ICT and most teams used diverse tools. They had to adjust their choices both to what was the most suitable as well as came with a reasonable cost, since the expenses for their team communication were part of the team budget. For the IE264 class 2000 the faculty formalized the available technology, to help the teams avoid spending too much time trying to figure out what to use.

In ME310 and 2G1319 the teams were free to choose the ICT that they wanted, but there was no focus on trying different ICT, so the students did not experiment with different ICT for communication and collaboration to the same extent as the students in IE264, and was not encouraged to do so either. In all classes there was a dedicated videoconferencing line available between the sites. The videoconferencing system was fairly hard to use, needed support staff and didn’t always work.

The ICT used in the case studies was still more or less unstable, especially the file sharing and videoconferencing, and was far from without usability problems. The teams couldn’t really trust the ICT and had to have backups and alternative ways of communicating. During the videoconferences they didn’t see or hear each other clearly, and mimic and other non-verbal signals were lost. The lack of especially visual cues was a hard obstacle to overcome when communicating through ICT but the teams got better at it during the course of the project, even if it took time before it worked even close to automatically.

4.1.1.4 Team Composition and Formation

Naturally a lot of the issues regarding team composition in distributed projects are the same as on-site considerations. The issue of diversity was one of the main reasons stated by the faculties for having distributed teams in all case studies. Team members resided in different places, they came from different nationalities and background, had different personalities and skills, went to different universities, etc., and most teams really thought they got input and saw problems from new angles, because of the diversities represented in the teams.

The actual team formation differed between the courses. Most participants didn’t know each other from before, in the local teams or between the sites. In 2G1319 the students choose project by making a list of the projects they wanted the most, and the course management assigned the projects based on that and the students’ resumes. In ME310 the students also made wishes for what project to get, but they chose whom to work with beforehand, and applied for projects as a group. There used to be a very conscious teambuilding striving for diversity when it came to educational background, age, gender, personality, etc. in ME310, but these formalized ways of creating diversity was not present in the class any more. In IE264 the students got assigned to projects, based on their resumes.

In spite of the stated importance of diversity by the faculty, there was no discussion around diversity in the teams in ME310 or 2G1319. The only course that really had discussions around diversity, personality and their implication was IE264. Lack of diversity was never a noticeable problem in the distributed teams.
4.1.1.5 Teambuilding

The distributed teams in the case studies didn’t have systematic teambuilding activities before meeting, except for in the later studies when activities were tried out (see case study 3-7). Some teams did minor things to get to know each other, e.g. started off the interaction with exchanges of self-introductory emails, in order to learn more about each other. Something to remember when looking at the teambuilding and the usefulness of face-to-face meetings in especially IE264 is the fact that the teams all knew that they were going to see each other and met fairly early in the team process, so the motivation to work hard on relationships and actually try to get to know each other before the physical meeting was not really there. With this not implying that there isn’t definitely a difference to see each other and get a “kick off” start to the project. The awareness of that they would meet can actually have had a negative effect on activities, since the importance of getting to know each other was not as obvious and emergent (it was easy to believe that everything would happen automatically once meeting anyway).

There were attempts to help the distributed teams get passed problems they might encounter. In IE264 special lectures were held about distributed work and team processes, team stages, cross-cultural collaboration, etc., to make the team members more aware of what they might expect and encounter. 2G1319 had some lectures in their mid-term seminar to support and teach teams about team stages and teambuilding, but it was not as thorough and organized as in IE264. This aimed to aid the teams to handle problems and situations better if they actually did encounter them, but the teams had problems connecting the theoretical knowledge to their actual problems. In IE264 the teams also had to write lessons learned to reflect about their situation and experiences. In some projects the faculty definitely did not give the participants enough guidance and support to help the teams through their difficulties, there was nobody there to keep the team motivated and keep the communication at a good level, and more continuous guidance would have been useful for all teams.

4.1.1.6 Distance vs. On-site

To be able to see what differences are between distributed and on-site collaboration, and to see advantages and disadvantages, it is important to compare the collaboration in distributed teams with on-site teams. There were a lot of obvious advantages for on-site teams, when the closeness was really utilized. They have easy access to each other and the material, can see the process, can clear out misunderstandings more easily (and see them more quickly), and the communication doesn’t have to be as explicit. Definitely not all local teams take advantage of the situation, but the ones who do can benefit a lot. But, being close to somebody can also lead to conflicts. People can get on each other’s nerves, take over, and become less polite and respectful. Things don’t happen automatically simply because people are co-located, which is an easy assumption to make.

The teams in ME310 had the advantage of having a team space, the inspiring environment in “the loft” (see Chapter 4.3). The teams in 2G1319 and IE264 didn’t have the advantage of a designated local team space. People tended to work in different places and met up in more or less anonymous meeting rooms, and didn’t have the possibility to leave things and see what other teams were working
with.

The distributed teams in all cases studies had the opportunity to meet physically by traveling (since funding was available for traveling in all observed teams). Meeting face-to-face is an expensive way of getting to know each other, but people involved generally thought that it was still the easiest and best way of building a distributed team. The teams generally only met once, though, and at different times in their project work.

The language difference was generally an obstacle for the communication and collaboration in the teams, even if not always explicitly so. Basically all communication was in English, so a lot of the participants had to communicate in a language different from their mother tongue. Important to remember is that a lot of the Stanford students came from different countries and didn’t use their mother tongue, but they still used English daily. Even if most Swedish participants spoke English fluently, it was still not the same as speaking Swedish, and students in Singapore and Japan had in general even greater problems.

4.1.1.7 Motivation and Attitude towards Participation
The universities participating in the studies are highly ranked schools that attract motivated and competitive students. For all students the course they were taking was fairly important, since it ran over a longer period and granted plenty of credits. Most students actively chose the course because it was project based and some chose it or a specific project to be able to work in a global environment, which naturally affected their motivation and willingness to deal with problems they encountered because of the distance, and it probably also influenced their openness towards other cultures. This was not always the case, e.g. the Swedish side of the 2G1319 did not choose to work in a global project, which affected how content they were with the extra work that came with the distribution. Most students took other courses during the period the project ran and didn’t work full time on the project.
4.2 Case Study 1- Global Project Coordination
1999

The research conducted on the IE264 – Industrial Engineering, Global Project Coordination – class was mainly conducted in the class that was held spring 1999, and the description of the course and research methodology described here focus on that. My data collection was mainly done from Sweden, but with two visits to Stanford in March and May. The research was done in close collaboration with researchers working at Stanford, with full access to their data.

In this first study, the main goal was to gather data concerning how members of the teams behaved and considered their situation and the collaboration when working at a distance, communicating with their distributed team members mainly through ICT. The students furthermore had to make an active choice of what ICT to use and reflect over what was useful, what worked and what didn’t. This knowledge has worked as a valuable base for an analysis of what ICT is appropriate and how to combine different ICT to support team activities.

4.2.1 Research Questions

- What are main differences between on-site and distributed teamwork?
- What problems and disadvantages do people encounter when separated from their teammates in time and space?
- What are important advantages of having distributed teams?
- What changes occur regarding communication when ICT is used in distributed project work?
- How should ICT be utilized to create a good work and social environment?
- What ICT is actually used in distributed teams and what are opinions regarding usefulness?
- Which factors in the psychosocial work environment are vital for the outcome and satisfaction in distributed projects?
- How can trust be built when people don’t see each other or meet on a regular basis?
- What affects teambuilding in distributed teams?
- What effects do teambuilding and trust have on distributed communication and collaboration?
- What kind of demeanor, skills and behavior are productive when communicating and collaborating at a distance?
- What organizational and managerial aspects are important to consider supporting distributed teams?
- Is it possible to help distributed teams prevent and get passed problems?
4.2.2 Research Methodology

4.2.2.1 Methods of Collection and Analysis of Data
In addition to the above questions, close attention was paid to topics and concerns raised by students during interviews, focus groups, and open-ended questionnaire answers. Research was undertaken using multiple methods. Data gathering and analysis methods included:

- Observation and reporting of face-to-face meeting in Singapore
- Observation and analysis of course lectures
- Analysis of use of the course web page
- Analysis of Lessons Learned papers written by all students in the class, covering the use of ICT, cross-cultural issues and distributed project work
- Student focus group interviews of two representative teams (conducted both at KTH and Stanford)
- Observations of team meetings that were held using a variety of ICT
- Individual student interviews
- Teaching assistant focus group and individual interviews
- Faculty interviews and informal discussions
- A final survey questionnaire with multiple choice and open-ended questions (given online)

Conclusions from the data are based on triangulation of results from multiple sources. It is worth noting that course faculty located at Stanford (Lena Ramfelt and Tom Kosnik) worked in close collaboration with the research team, and were continually informed regarding findings and interests. They also offered suggestions and pointed out problems they were having.

Classroom and Team Observations
Course lectures were broadcasted, with students at NUS, Stanford and KTH participating synchronously. The lecturers were alternatingly physically located at NUS, Stanford and KTH. The research team attended every lecture that was held at Stanford at 11 p.m. on Wednesday nights and most lectures were also observed from Stockholm (held synchronously at 8 a.m. Thursday mornings local time), resulting in two sets of notes for each lecture.

These rich notes highlighted the various experiences of students at the two sites, due to the filtering effects of the link technology, cross-cultural issues, and the different setups of the classrooms and accompanying technology. The research team took notes during observations about the research issues of concern. For example, it was noted when students were engaged and when they were not, how the classroom interaction flowed across the three nodes, and when ICT worked and when it did not. These field notes were later coded for analysis.

Team Observation and Focus Groups
Two teams were chosen to be more closely observed in their local team meetings and in their distributed team meetings. The teams were chosen because they were composed of students from all three countries. Two meetings conducted by each
team were observed by the researchers in Stockholm or Stanford. Focus groups with the Stanford members of these teams were also conducted at Stanford, with both an interviewer and a note-taker present from the research team. The focus groups were held for 90 minutes. Questions revolved around areas related to distributed lecture, distributed team dynamics, role of technology, and cross-cultural issues. These focus group interviews were videotaped and later transcribed and coded.

Survey
The survey handed out to the students had a combination of open-ended and multiple choice questions. It was circulated to the faculty as well as to other researchers in the Stanford Learning Lab for comments. After critique, it was placed on the web for the students to fill out. A weakness of the survey was that it was placed on the web late in the course when students were very busy finishing their projects. Therefore, there were difficulties getting a good response rate. If the survey had been handed out in class rather than posted on the web, it would have increased the response rate tremendously. Because of the statistically insignificant response rate, the survey results were analyzed only as a contribution to qualitative data and no quantitative results was reported. However, many of the responses to open-ended questions backed up observation and interview results.

Project Personnel
Stanford Learning Lab Assessment Team: Carolyn Ybarra, Renya Ramirez, John Nash
KTH Stockholm Team Member: Eva Jansson

Faculty: Tom Kosnik (SU), Sara Little-Turnbull (SU), Lena Ramfelt (KTH), Björn Pehrson (KTH), Jacob Lee (NUS), Bernard Tan (NUS)

4.2.2.2 Course and Research Context
The IE264 Global Project Coordination course was a graduate level course that aimed to teach students how to work effectively in cross-cultural teams. The students had to address the challenges of coordinating a global project, delivering quality results, on time, and within budget. The IE264 course held spring 1999 was taught by six engineering, business, and computer science faculty at three universities; the Royal Institute of Technology (KTH) in Sweden, Stanford University (SU) in USA, and the National University of Singapore (NUS) in Singapore. Enrollment to the course was 57 students.

Graduate students from KTH, NUS and SU worked on globally distributed projects. Guidance for the projects was provided by the companies and government organizations that were sponsoring the projects, given that they had interests in Sweden, Singapore and Silicon Valley. Managers of the sponsoring organizations also provided direction and coaching to the project teams. The purpose of the course was to teach participants how to work effectively in cross-cultural, distributed teams. The students learned how to blend the unique strengths of different countries and cultures, disciplines and communications styles. This
was a project-based course, with members from at least two of the universities on each project team. Students had to share knowledge at a distance, for example jointly editing project data and materials. The teams were working in a distributed setting, coordinating their work, actively using the fact that they were collecting data at different locations, and aiming at delivering results to their company sponsors within the time constraints.

Throughout the winter and spring quarters the students were engaged in project-based teamwork actively addressing the challenges of working effectively in a cross-cultural context coordinating a global project. The course also included a face-to-face meeting for the teams and the instructors in Singapore at the beginning of the course. No distributed teambuilding activities were held in advance of this meeting. As mentioned, there were lectures held in the course in parallel with the project work. The lectures rotated between the three universities, synchronously broadcasted over a digital video link to classrooms at each site. In the lectures the students learned several approaches to global project coordination, and were introduced to theory and tools for working in cross-cultural and distributed teams, and the applications of these theories and tools to practical teamwork. The course combined the use of complex technology for both lectures and team project work, and students had to simultaneously learn practical skills for collaborating and theoretical approaches for working across cultures.

Grading was based on a mid-term paper and the team project work. The midterm paper was a lessons learned report on the ICT used for team communication as well as a discussion of cross-cultural issues that had arisen during team project work. Team project results were presented to the corporate sponsors, the teaching team, and the rest of the class at the end of spring quarter. This final presentation was given at Stanford.

ICT
The students had a free choice of ICT, and was encouraged to try different solutions, which resulted in a collection and analysis of data regarding what the students thought about the different communication and collaboration tools that they used during the project and what they used them for. Students were given a list of possible communication and collaboration technologies. Some information and suggestions of the use of these tools was given in a lecture, but the teams choose ICT and were also free to look for other tools to use, which led to teams trying multiple dissimilar communicating tools, and actually used a lot of them as well. The students utilized all forms of communication available to them: telephone, regular mail, air express courier, video- and teleconferencing, Internet and regular telephony, fax, email, newsgroups, web forums, chat rooms, IM, and other tools on the World Wide Web. The teams used a variety of tools for sharing documents, holding synchronous meetings and asynchronous discussions. These tools were independently tested and evaluated by the students and the searching for and testing of tools detained a lot of valuable time from the project work and course content. No single tool free of charge or cheap enough for the team budgets that was found was considered good enough in itself for their assignments and project work.
Lecture technology

The videoconferencing system was used also for lectures and worked better for that kind of communication, one-to-many, than for the team conferences, but there were problems even in the lectures. Although videoconferencing allowed the students to listen to and see remote speakers, the very unstable technology and low image quality, that was less than ideal, took away some of the advantages. Since students on the sites remote from the speaker didn’t participate actively during the lectures, they became disengaged and restless. Not always being able to see even an image of the speaker or lecture slides caused additional frustration. This disconnection between the remote speaker and the students was clearly observed. The students felt it was much easier to listen and ask questions when being on the same site as the speaker.\textsuperscript{1} The image quality was bad, it was early morning or late night (because of the time zone differences), which implies that people were tired, lost their focus faster, and it was harder for them to stay awake and be an active part of the class.\textsuperscript{2}

This feeling of distance between the lecturer and the students (when the lecturer was off-site) was a challenge that was difficult to overcome. The technology itself caused distancing, because it filtered some of the communication cues. For example, when visuals were blurred or small, it was difficult to clearly see the person speaking. The sound was sometimes muffled or was breaking up and words disappeared. The technical person coordinating the broadcast sometimes focused on an object or a PowerPoint slide rather than the speaker, so the audience didn’t get a visual of the speaker or a complete picture of the scene. Even when the technology worked perfectly, it did not fully provide such things as eye contact and small gestures, which carry communication information in a co-located setting.

Insensitive speakers did not know when loosing attention from the audience, since there wasn’t any direct feedback and there were fewer cues. “It also appears to me that the inability to clearly see the facial expressions or body languages of remote audience makes a presenter less sensitive to them. For example, a presenter was giving a long, technical presentation and did not seem to realize that he was losing some of his remote audience from fatigue and dwindling interest.” (IE264 Lessons Learned paper). In spite of all the technical and presentational problems, students still thought that videoconferencing was useful for the lectures in the class. The ICT made it possible for them to get access to well renowned teachers from different universities, and that was something they valued tremendously.\textsuperscript{3}

4.2.3 Results

The investigation pointed to several concerns regarding the distributed collaboration, which included the inability of many students to connect theoretical knowledge on teamwork to the practical project work they were conducting; inequity of access to the learning process among students on the three campuses; and disengagement of many students viewing and listening to the remotely broadcasted lectures. The issues the students thought affected the communication and collaboration the most were \textit{ICT}, \textit{Teambuilding}, \textit{Culture}, \textit{Distance}, \textit{Diversity}, and \textit{Face-to-face meetings}. These topics will be covered in the following summary of the results from the investigation.
Distributed Collaboration and Communication

The distance, and especially the lack of cues, undoubtedly affected the communication and collaboration. Students noticed that misunderstandings escalated because the “wide bandwidth” available in face-to-face encounters wasn’t there to help settle the conflicts. The language was a problem for the communication and collaboration, since most participants were not using their mother tongue. This not only made it harder for the communication and understanding, but it affected the entire power structure in the teams. Team members who were less fluent in English were sometimes not able to express their ideas as effectively. It was not only that the persons with the best language knowledge and verbal abilities had an advantage in discussions, in extreme cases the language difference was used more or less deliberately as a tool to gain power, because “your ability to express different things is extremely tight connected to your capacity to handle the language. [...] also possess the power to easily talk people down and if wanted simply take control of meetings and situations.” (IE264 Lessons Learned paper). Since a student wrote this, even if it is phrased in general terms, he probably experienced problems with team members who used their position to gain power and get their way and in our observations it was noticed that the American students generally were more talkative and took more space.

One suggestion of how to improve communication that was emphasized was the importance of using words that everybody understands when working in teams where not everybody is using their mother tongue. It was also seen as important that everybody really asked when they did not understand something. “I think when we encounter any unfamiliar words, we should seek clarification from our teammates to prevent communication breakdown.” (IE264 Lessons Learned paper). One student pointed out that everybody has to take responsibility for overcoming the language barriers, both the ones that do not understand and the person talking. The person talking should try to sense if everybody is following the conversation when talking, and think about not using unnecessarily complicated words or too much slang, and the listeners have to dare to ask when something is unclear.

To overcome language problems the team members had to actively think about how language affected their work, and they created their own solutions on how to handle them effectively. One team for example, had problems in a brainstorming session in Singapore; they thought the session suffered quite extensively from having to pass through a language filter. Later on they successfully tried to have two separate sessions, each on the participants’ mother tongue, and summed it up with having a final discussion where they compared and brainstormed about the different conclusions from both groups, which worked much better.

Confusion arose in all teams because of the lack of knowledge and reflection about norms and rules at the other site, and teams neglected to discuss the issues. Local systems were easily considered universal, which was the case with for example week numbers (frequently used in Sweden, but not at all in the US), telling time (8 p.m. vs. 20.00), order of dates (18-03-2005 vs. 3/18/2005), measurement systems (Fahrenheit vs. Celsius; meters vs. feet), etc. More subtle
differences were even more troublesome to detect and easier to misinterpret. Even when the participants were aware of the different systems, it was easy to not be clear enough, and problems occurred e.g. because people forgot to mention what time zone they were talking about when making appointments or deciding deadlines. One student gave the advise that “time should be communicated in more concrete terms such as mention of date, day, time and place when working in global teams.” (IE264 Lessons Learned paper).

Plenty of students stated that conflicts within their teams were caused mainly by communication problems, or differences in communication pattern and working style. Some students mentioned that they had noticed that the Swedes and the Americans in their team used email in different ways. The Americans used it much more as a tool to communicate on a regular and frequent basis, each of them sending several short emails per day. The Swedish students tended to use it more infrequently as a way to communicate to the American side a summary of face-to-face discussions on the Swedish side. The Americans also tended to respond immediately, whereas the Swedish responses were more thoughtful and prepared. “Communication problems are arising from the lack of face-to-face contact and also from the time lag. In our project team we faced many problems in the beginning and all of those were closely related to communication problems.” (IE264 Lessons Learned paper).

Things got taken for granted, became misinterpreted, over-analyzed, people did not dare to say what they thought, or when they did, they offended others or took over the scene. One issue that came up was that people tended to be more concerned about their personal interests, and not about the team. “Most people are thinking locally, i.e. how to get their opinion approved, instead of considering what’s best for the project. The ability to step back once in an argument is a quality that not many of us are gifted with.” (IE264 Lessons Learned paper).

Students also pointed out the danger of being too cautious in their interactions, that they were “cautious when giving our opinions in the beginning, afraid that it perhaps could be misunderstood from the other part of the team.” (IE264 Lessons Learned paper). Or as another student phrased it, that a “High degree of communitarianism may not always be good, it may sacrifice an optimal solution for a sub-optimal one in order to make everyone happy.” (IE264 Lessons Learned paper). When everyone was too amiable or accommodating, did not dare to say what they really thought and felt, problems also arose because decision making took much longer than it had to. Awareness of cultural differences and the danger of getting into long unsolvable disagreements with team members from the other countries seem to have made the students cautious and more “politically correct”. Thus they became reluctant to bring up sensitive issues and concerns, like e.g. the quality and amount of work of others, since it could be considered lack of respect and trust to question someone’s effort and ability, or even worse, the reason for collaboration. The fact that someone had done less was not automatically a problem, but it became a problem when not being discussed. One student reflected on the fact that not discussing problems can be considered polite, but “It might have devastating effects, though, if this process of holding in concerns continues for a long time and the misunderstandings are not sorted out.” (IE264 Lessons Learned paper).
Time zone differences forced teams to plan ahead and organize more, and random encounters didn’t happen as often. It was hard to get a hold of people fast, since it was necessary to wait until they woke up and decisions couldn’t be taken quickly if the whole group had to be involved. Since the time differences made it impossible for the teams to work together all the time, it naturally led to that the work had to be somewhat divided between the different sites. “With one key member in another time and another place we cannot easily include everybody in every meeting.” (IE264 Lessons Learned paper). Even when using ICT that provided awareness, it was still difficult since people at one site were sleeping while people on the other site were working. When having meetings, the state of mind of the team members was also slightly different since the time was e.g. 5 p.m. in Stockholm and 8 a.m. in Stanford. This sometimes made it harder to collaborate, and added to the miscommunications, conflicts and the feeling of being distant from each other.

Some of the teams organized their work so they could use some of the obstacles with working at a distance as advantages, like e.g. time zone differences. A student mentioned the possibility to “work around the clock in a relay manner. Therefore, all sub-teams working on specific tasks, must be made up of a member on every continent. Not only does that help in keeping everyone involved and up to speed on all the developments, it also allows tasks to be done faster since work can be done round the clock.” (IE264 Lessons Learned paper).

The students emphasized that at the same time as there were differences, students working in the same field all over the world tend to have a lot in common. “In this project I once again was given the chance to work with ambitious people from all over the world and I was again fascinated by the fact that we most of the time could laugh to the same jokes, use the same frameworks and approach obstacles with similar tools of problem solving. To some extent, I guess we have to thank Hollywood for that” (IE264 Lessons Learned paper). They also appreciated the diversity, and as a student said, “we do not only have a lot of different cultural backgrounds we have also a good mix of knowledge in a lot of new areas. I think that this has been really helpful in our work.” (IE264 Lessons Learned).

The students noticed that to make collaboration at a distance work, it is even more important to be well organized and structured, and to be consistent so people know what to expect. “Consistency – We established a communication schedule early and we have adhered to it strictly. We meet every week regardless of the need and we always set an agenda 24 hours in advance.” (IE264 Lessons Learned paper). In some teams the students independently developed their own group norms, roles, and rules for meetings. For example, a team had a “facilitator”, “a note taker” and a “leader” for every teleconference meeting. These positions rotated between the sites each meeting and were set at the end of every meeting for the following week. The facilitator made sure all three nodes had their say, and the leader ensured that the content discussion proceeded and that the team took the necessary decisions. These simple measures provided a consistent framework for the team members to be informed and included in the meeting process and was considered very useful. The students reported that this worked well to ensure that everyone had an opportunity to speak, but it did not fully alleviate the turn-taking
problems or that some spoke more than others.

A common theme in comments from students was the emphasis on the importance of the face-to-face meeting. It was when meeting the team members got to know each other, and that was when they really started working together. An advantage for the local sub-teams with being located in the same physical space was e.g. that it was easier to keep track of the progress and see what the others were doing. When the teams were in the same space working together, they had the team members, the space around them, the artifacts, and the documents easily available, which meant that they did not have to put in as much effort to make collaboration happen. Even if the face-to-face meeting was considered very important, the students thought that ICT can help overcome the distance. No team managed to create a virtual space, partly because of the lack of suitable ICT support. It would also have demanded more effort, to set up a virtual team space, post things, and regularly check it, and wasn’t considered equivalent to a physical space. Not that many of the participants thought videoconferencing was a good substitute for face-to-face meetings, but the combination of all the different technologies available were considered very useful and helped making the distributed work easier and more convenient.

The students valued having a distributed project based course, since “there is really no substitute for actually experiencing things” (IE264 Lessons Learned paper) and working in a distributed team is the only way to actually get better and learn about distributed work. Students stated that until a person has experienced the problems and enjoyed working in a distributed team for real, the knowledge will only be superficial. It is by making mistakes it is possible to learn how to avoid them. Most importantly, the students really enjoyed working at a distance, thought they learn a lot from each other and about working in projects in general and distributed projects in particular. The projects and the course was truly organized so they could benefit from it; they learned how to handle distributed project work environments and saw some of the advantages of distributed work. “After the first half of the global project I now feel that working in global teams has more advantages than disadvantages. Of course, there are many difficulties in working with people on the other side of the world, but I was actually quite surprised about all the benefits.” (IE264 Lessons Learned paper).

ICT
The teams had to manage the change to communicating and collaboration through ICT. One general problem connected to the use of ICT discussed by basically all teams was the information overflow. Students suggested actively making an effort to limit the amount of data exchanged within a distributed team. This can be accomplished by team members being selective and making summaries of important information, especially since it is impossible for everybody to read everything anyway. Students pointed out that doing this can also be beneficial since the person making summaries learn a lot from it and has to make things clear to him- or herself, which will increase the competence in the team. When there was an overflow of email, or information in general, the problem was not only that there weren’t enough time to read everything; it was also hard to prioritize and find the most important or most recent information.
At the same time as it was considered important to reduce the amount of distributed data, it was also deemed vital to reduce the number of communication channels that needed to be checked, to avoid fragmentation and the annoyance of having to check a number of places to find information. Like a student pointed out, “using three interfaces simultaneously meant that it is three times more likely an error will occur. It is also quite easy to miss an important notice, if each person needs to check three mediums several times a day to catch all the information on time.” (IE264 Lessons Learned paper). The students saw the importance of choosing ICT wisely from the beginning, since once selected; it was costly, difficult and time-consuming to switch tools.

The students realized that it was not sufficient if the ICT worked smoothly, it should also fit the purpose and feel comfortable for everybody involved. “The general attitude is that one should use the medium that is best for communicating a specific message. This is true of course, but I would like to stress once more that the receiver is a critical factor in the communication link. Therefore one should also consider what medium he is most comfortable with and were you can add that little extra that makes the moment enjoyable” (IE264 Lessons Learned paper).

One team concluded that the aspects of ICT that had been significant for them to ensure a good collaboration, and that they came to value the most, was reliability, support for quick decision making, and smooth and efficient file-sharing. Having some kind of more personal interaction was also considered imperative.

There were examples of teams using ICT without really thinking through the need for it; e.g. the use of digital cameras to take pictures and share the daily project work and one student suggested that this would make the team closer. If the uploading process is easy, some students thought digital cameras would be a very convenient and helpful tool to make distributed participants more visible and to create a team feeling. Other students had noticed and pointed out the downside of recording everything or too much. Especially when the ICT didn’t work it became more trouble than support and nobody had time to go through all the data.

Learning how to use new ICT was time consuming, and using it often took a lot of extra time, so eventually the students who tried recording everything gave up and ended up not recording anything. In this case the ICT was both not easy enough to use and the reason for using it and the efforts involved were not thought through enough.

Different media was considered appropriate for different purposes, and it was above all regarded important to choose the right media for a specific purpose and situation. The students suggested using synchronous technologies for discussions, brainstorming, decision making, occasions where data has to go back and forth fast, situations where things might need explanations, etc. Asynchronous technology was considered as better suited for data and information sharing, since the sender doesn’t have to worry about if the recipient is awake and prepared to receive a message. The students emphasized that it is easy to believe that synchronous media is always better, since it is more like face-to-face interactions, but that wasn’t always necessarily the case. Face-to-face wasn’t even always considered the best alternative, since it could encourage unnecessary discussions, quiet participants might not be given a chance to speak, etc. One student divided the communication modes into three forms of contact that is required when
working on any project:

- The first is the real time exchange of ideas that is relatively short by nature; for example, having a discussion with questions and answers, or having a meeting to disseminate information and get feedback quickly.
- The second type is messaging that does not require an immediate response and has information someone can save; e.g. a memo or a newsletter.
- The third type is the sharing of work, or information-rich content, that takes time to develop and understand, and requires resolving storage and distribution issues.

A lot of the teams tried using videoconferencing for group meetings, but most of them concluded that telephone was a better option. Telephone was cheaper and the videoconferencing equipment was complicated to use. In general they thought that videoconferencing might be good, if it worked better than the equipment they had access to. Telephone was used mainly to make critical decisions. Its synchronicity and reliability were key factors, as well as that it provided the ability to have discussions with multiple persons at the same time using speakerphones. The cost was a major drawback since the communication was across two or three nations (and continents).

IM and chat forums were used effectively for smaller meetings which were more informal, with goals such as brainstorming rather than decision-making. Drawbacks were that the students had different access to the software, and it didn’t work at all in Singapore at the time for the course (1999), because of restrictions on the use of computers and Internet. Email was used extensively for communication among team members, as well as in the communication with other members of the class, faculty, and corporate sponsors. Students found it useful and convenient because of its asynchronously. It allowed them to edit their texts more carefully than when using IM. Students that had English as their second language, as well as those who were more thoughtful and didn’t like to throw out ideas without thinking, liked this characteristic. The participants were in general familiar with email and it is a reliable tool, so they felt comfortable using it. The drawback was that it was sometimes overused, resulting in excessive amounts of email.

To distribute files teams frequently used email attachments. Other ways of sharing files were distributed databases and the course web discussion board. The tools used lacked adequate functionality for structuring or sorting files and some were also considered unreliable or slow. The students all saw the need for a suitable tool for sharing files. No tool free of charge or cheap enough go the team budgets was available at the time of the investigation that was considered good enough, and the project budget wasn’t big enough for them to pay for one. The course web discussion board was mainly used to share information with people outside the project team. Students found it to be too insecure and not flexible enough for frequent use. For more details of what students thought about specific tools and their usefulness, and what advantages and disadvantages were of different ICT, go to Appendix III.
ICT Suggestions

- Email is useful for general communication, updates, short questions and confirmations. Discussions over email tend to take a long time and it is hard to come to conclusions.

- IM and chats are useful for lightweight discussions and social interaction, and is a very cheap, easy way to obtain an informal synchronous communication. It is not especially useful for big group discussions, since it is likely that the discussion becomes confusing with too many persons involved.

- Telephone and videoconferencing are useful for discussions, making decisions, allocating work, planning, and brainstorming. It is vital to have a presentation in the beginning of each session, so everybody knows who is there, and to inform the team if somebody is leaving (or coming in late). It is advantageous to have a facilitator or at least decide in advance how to take turns, to avoid disorder in the communication.

- It is important to not assume that videoconferencing will automatically be the best alternative to replace face-to-face meetings, but use it as a media as any other, and think about its advantages and disadvantages. If the quality is good, video has advantages, but using video can also make people feel awkward, and if it is suitable or not depends on the situation, the participants, and the topic discussed.

- Sharing files is fundamental for all collaborative work, and a team has to decide if they should use email, FTP, or some web based database to handle the file sharing. It is also important to decide how to name documents so there is no confusion about which is that latest version and figure out how to avoid that two persons are working on the same document at the same time as well as decide which format to use.

- Unfortunately there is no default best combination of ICT to use in a distributed team. What works best depends on the participants, their preferences, and the ICT available.

Team- and Trust Building in Distributed Teams

Many of the students emphasized the importance of doing other things than working together to really start working well together. This included personal introductions, socializing, having fun together, etc. “Our group dynamics have been strengthened by several factors, such as shared social norms, repeated computer-mediated communication, and shared experiences that facilitate the development of trust.” (IE264 Lessons Learned paper). An issue that was pointed out by a lot of students was the importance of humor, to bring laughter and fun into the working relationship. It was seen as especially important when they first met, to break the ice. Humor also made the environment more open and pleasant to work in. “In working with people from different cultures and on a global basis the key for success is apart from common sense, mutual respect and an open mind, really to have fun. This may sound blunt but if one can just appreciate the moment and spread that feeling among the people one is working with things will work out in the long run.” (IE264 Lessons Learned paper).

A lot of the students in IE264 reflected on the fact that they had problems getting a good picture of who the others were before meeting them in person in
Singapore. When meeting their teammates they realized how important the subtle cues were to get a closer connection, and how the face-to-face meeting helped them interpret the few cues they got when they were communicating without seeing each other face-to-face later on in the project. Since the students only had one face-to-face meeting during the actual project, they saw the importance of getting things done when they met, to reach a certain stage in their team development before they went back to their distributed environment. They noticed a difference in their actions after they met, when they knew each other better.

Establishing trust in the globally distributed teams was one of the primary and most challenging tasks. “Noting the lack of shared social context in such teams, it is difficult to delegate tasks and this impedes generation of momentum for the project at hand.” (IE264 Lessons Learned paper). Before people got to know each other it was intricate to clear out misunderstandings, and the communication wasn’t open and direct. The teams noticed that it was easy to stop really collaborating, and simply work side by side. “The most intuitive way of dividing up the project is to work in national subgroups. […] This makes the communication easier by decreasing the amount of the demanding global contact. Even though this way of working is the most obvious and probably also the most efficient it isn’t necessarily the best.” (IE264 Lessons Learned paper).

One of the students gave the advice that “the quickest way to begin to trust team members of a different country is to concentrate on the similarities that exist. Thus to do so, my team reconciled our differences and built our team’s foundation on those things we had in common, therein by inadvertently defining our own culture” (IE264 Lessons Learned paper). The danger with focusing too much on the similarities was that the participants sometimes missed the differences that actually existed within the team. Students sometimes had so much in common, so they failed to notice that they got into problems because of the differences. Some teams in the class experienced conflicts because of the fact that they failed to see that they actually were different in a lot of ways. Different regarding nationality, personality, educational background, etc.

One student said that “we basically have the same preferences; we study the same subjects and have similar academic and personal backgrounds. The lessons that I have learned is that even though one can expect major cultural differences in several aspects is it not certain that one will encounter any given” (IE264 Lessons Learned paper). It is interesting to notice that this was stated by a student in a team where other members of the team had noticed differences and problems that had arisen because of cultural differences. It was also noticed that some American students believed that there were no differences, partly because the other students were used to American culture, communicated in English and adjusted to them.

Dealing with conflicts was another concern for the distributed teams. To discover the problems in time, deal with them without getting into worse conflicts and without hurting people, and to be brave enough to try to diffuse any problems as soon as they started. Students pointed out the importance to be open, expressive and in this manner reduce the opportunities for miscommunication in the team, to prevent conflicts from escalating. “What we have learned is to always explain everything you do or say in details. Not be afraid of asking if something seems blur and always let everyone in the team get a copy of everything that has a
connection to the project.” (IE264 Lessons Learned paper).

Site Visit
A lot of the students in IE264 reflected on the fact that they had problems getting a good picture of who the others were before they met in person in Singapore. A common theme in the lessons learned papers were the emphasis on the importance of the face-to-face-meeting. “It was when meeting they got to know each other and that was also when they really started to work together. One student said that “Meeting and interacting in person improves team effectiveness. We get to know each other much better through meetings, dinners, outings and even jokes.” (IE264 Lessons Learned paper). As mentioned, when meeting their teammates they realized how important the subtle cues were to get a closer connection, and the face-to-face meeting helped them read the few cues they got when communicating at a distance after meeting.

It is hard to take risks when communicating at a distance. It is hard to know how other people will react and instead of pushing things too far and risk annoying their teammates and cause conflicts, people have a tendency to keep it safe and conflict free. To really get to know each other and get a lot out of discussions it is not possible to keep it safe, though. A student stated exactly that, and noticed the difference in his teammates’ actions when they finally met. “In Singapore we tested each other, still polite of course, but now allowed ourselves to display our personalities more openly. By using a lot of humour in our presentation and our daily work we probably bridge more gaps than we tend to believe feasible, because we develop a common ground of language and humour within the group.” (IE264 Lessons Learned paper).

Trust, personal relationships, getting to know people as friends and learning about their knowledge and seeing their competence in action were all important issues that proved to be easier to accomplish face-to-face. That “spending time with the team, has not only made us good team members but also personal friends. This leads to a greater understanding of everyone’s needs and capabilities.” (IE264 Lessons Learned paper). Meeting also made it easier to clear out misunderstandings, and the communication was more likely to be open and clear afterwards. “The fact that we all met in Singapore has helped us extremely much. We can understand some of the misunderstandings, which appear throughout the work, much better now, I think, when we know whom we are communicating with.” (IE264 Lessons Learned paper).

Successful teams managed to get a common starting point and get everybody motivated and working in the same direction during the site visit. Distributed teams probably reach a more mature stage faster when they actually meet face-to-face, since they know that they have a limited time together, they know it is important to get to a common understanding in that one meeting when they are gathered in one place; to actually have a discussion about goals and get to know each other. “The scenario of the team leaving Singapore either being in the grooming stage – getting nothing done, or having reached the fighting stage, spending the rest of the time arguing not being able to sort things out because of the geographical spread – would not have been beneficial neither for the project nor the team.” (IE264 Lessons Learned paper).
4.3 Case Study 2- Product Design 1999/2000
The research on the ME310 Mechanical Engineering Product Design class was mainly conducted in the class that was held fall 1999 to spring 2000. The research was done from Stanford, but a research group at KTH was working simultaneously on a Product Design Class (4F1162) with research that involved a team that collaborated with a team from ME310, and there were also some collaboration between the researchers on the two sites.

This project examined the ME310 class as a whole, but the focus was on three teams in the class. Most teams in ME310 were local; two teams were globally distributed, and a few others had sponsors located at a distance (both globally and in different locations in the USA) and some had Stanford Online students working at a distance. We compared the two globally distributed teams; one that collaborated with students from KTH (the Orange team) and another consisting of students from Stanford and Tokyo Metropolitan Institute of Technology (TMIT) (the Green team), with a team composed of only Stanford students (the Blue team). The Blue team was chosen as a comparison since it was completely local, with sponsors even in the same area code. The students at the different sites collaborated, but the courses were completely separated. Faculty in the class is coded as Red and alumni as Purple.

4.3.1 Research Questions
The purpose of the study was principally the same as the one of IE264. The analysis was focused on the team members communicating at a distance through ICT, but also covered and focused on teambuilding, and the differences between being local and being distributed. What added benefits and what added problems come with the distance? How can team members build a common team feeling at a distance?

The data in this second study was synthesized into categories. Categories were chosen that addressed the original research interests in team dynamics and collaboration, and that also were adequate to express the range of experience expressed by the students. The areas could be distinguished as 1) effects of distribution 2) communication and collaboration through ICT 3) team- and trust building and 4) action strategies to improve the distributed work environment

- What are main differences between on-site and distributed teamwork?
- What problems and disadvantages do people encounter when separated from their teammates in time and space?
- How does the physical environment affect the collaboration and (social) interaction in teams?
- What are important advantages of having distributed teams?
- What changes occur regarding communication when ICT is used in distributed project work?
- How should ICT be utilized to create a good work and social environment?
- What ICT is actually used in distributed teams and what are opinions regarding usefulness?
• Which factors in the psychosocial work environment are vital for the outcome and satisfaction in distributed projects?
• How can trust be built when people don’t see each other or meet on a regular basis?
• What affects teambuilding in distributed teams?
• What effects do teambuilding and trust have on distributed communication and collaboration?
• What kind of demeanor, skills and behavior are productive when communicating and collaborating at a distance?
• How does the project stage affect collaboration?
• What organizational and managerial aspects are important to consider supporting distributed teams?
• Is it possible to help distributed teams prevent and get passed problems?

4.3.2 Research Methodology
This was an exploratory, evaluation-only project. There were no interventions in the course technology by the research groups.\textsuperscript{3} We conducted research to understand the courses, the existing technology used for distributed teams, and the nature of distributed teams. The central topics for the research were teambuilding and collaboration in distributed student teams (see previous section). The central topic for the research team at KTH was the role of distributed team collaboration for the outcome of product design. The collaboration with the KTH learning lab assessment team consisted in sharing interview questions and data, as well as having frequent communications. This was facilitated by trips to Stockholm and Stanford in March and April.

4.3.2.1 Methods of Collection and Analysis of Data
The data gathering started fall 1999 with observations and interviews at the Stanford side. The data gathering phase was completed in the spring quarter. It consisted of observations, focus groups, and interviews of the teams at Stanford that included KTH students and TMIT students. For comparison a team that was not globally distributed was also studied and interviewed. In addition, interviews were conducted abroad with the TMIT and KTH students involved in the course, TA’s, alumni from the course, other students in the class (completely local and with distributed sponsors), and faculty members at all sites. Primarily, the KTH students were interviewed by SwellL staff, and the Stanford students were observed and interviewed by SLL staff. The observations have been written up in field notes, and the interviews were transcribed by an outside transcription agency, with a second pass done to correct errors. The names of students and teams from interviews and focus groups are coded to protect the privacy of the students.

Observations consisted of attending formal and informal class and team

\textsuperscript{3} The exception was a request for SLL technical staff to run the “Sweden/Silicon Valley Link” to the ME310 design loft. This was done, and there was some support given to this set up and use.
meetings, taking ethnographic field notes on behavior, activities, and social dynamics. Students and teaching staff were asked questions informally as they arose, as well as interviewed more formally. The course web page and group email lists were monitored informally, and information from those interchanges added to our data.

Analysis was also made by comparing results and observations in this study with results and considerations from the previous studies, analyzing differences and similarities regarding the distributed project work environment and its effects on communication, collaboration and individuals.

Project Personnel

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Asst. Faculty: Avo Kask

TMIT Faculty: Shuichi Fukuda
Asst. Faculty: Yasushi Ieki

4.3.2.2 Course and Research Context

The ME310 Product Design course at Stanford and the 4F1162 Mechatronics course at KTH have a history of project based, globally distributed learning, involving corporate sponsorship and coaching. The KTH course, 4F1162 Advanced Mechatronics, was given as a part of the Mechatronics program in the students’ fourth and final year in their Masters studies and attracted students from diverse engineering backgrounds; materials science, vehicles science, mechanical science and industrial management and engineering. The approximately 40 students were divided into teams, normally three to four teams with 10-15 students in each, and each team was given a project right from the start. The course ran over two quarters in the spring of 2000.

The Stanford course, ME310, was a graduate-level course offered by the Design Division of the Mechanical Engineering Department at Stanford University. This was a three-quarter (30 week) sequence in which design teams worked on design challenges proposed and supported by corporate partners. Typical teams had 2-4 members, with 1-8 years of industry experience. They were supported by a high tech design loft and advanced tools and services for computer supported collaborative learning. For 1999/2000 ME310 was carried by Stanford Online (providing lectures on the web) and students could register for distance studies even in the “local” teams. At TMIT, project team members were volunteer students appointed by Prof. Fukuda from his and Professor Ieki’s labs. The students did not receive credits, nor did they have a lecture course.
Each local team at KTH and Stanford was given a team coach. Coaches for the Stanford students were located in the Stanford area, and interacted for the most part only with the Stanford team members. At KTH, the assistant faculty members was considered coaches, although their role was mixed with the roles for faculty, TA and researchers observing the course.

Each team in the different courses had access to facilities at their respective university; laboratories, office spaces, computers, telephones and faxes as well as socializing spaces. Most of the students attended other courses during the Mechatronics course/ME310. The students from the three campuses involved in this study had different schedules, constraints, goals and expectations for their activities. It took the students some time to find out about these differences, and both this lack of knowledge and understanding and the schedule differences in themselves led to some difficulties in working together on their projects.

At Stanford, the course lasted three quarters, from October 1999 through June 2000. At various stages, beginning quite early, there were expectations for benchmarking, functional prototypes, and other very concrete products. At KTH, the course lasted one semester, from January 2000 through May 2000, with an initial orientation and team formation meeting in October 1999. A few Swedish students who were to be part of the distributed team in Sweden participated voluntarily in the initial design exercise of the Stanford class, without receiving credits or a grade. Some of the students at TMIT also participated in the early design activity at Stanford.

Due to the history of collaboration between the KTH Mechatronics department and the Stanford counterpart the two courses had been used as a test bed for experimenting with joint projects between the two sites before. This had been done at several occasions, with one or more teams at either side forming a team liaison. However, the primary aims of the courses were not to make students become experts in modern means of communication, but since working in a team was a basic component in the curriculum, the distributed teamwork was seen as an added component, however not officially in the curriculum, but anyhow considered important enough by the faculty to be embedded it in the courses. The following description is focused on ME310, since that was the main research object for this investigation.

Schedule
During the autumn quarter the students at Stanford met Tuesdays from 3:15-5 p.m. During the winter and spring quarters there were no formal lectures, but there were weekly seminars with invited speakers. Throughout the course each project team had weekly meetings with the teaching team. They also had weekly formal and informal meetings as a project team, sometimes with the coaches. Coaches were chosen or assigned from a number of experts from within and outside Stanford. They were assigned based on their areas of expertise in relation to the team project given by the corporate sponsor. At KTH, the course lectures occurred separately, and followed a different schedule. At TMIT, students involved were taking it as an independent study course, and there are no formal class meetings.

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4 The dates are written as day-month-year
At Stanford, the major activities during the autumn quarter included a team assignment activity based on the MBTI (Myers-Briggs Type Indicator) and Jungian psychology, through a technique authored by Stanford Professor Doug Wilde. Initial project teams were given an assignment to benchmark and design paper bicycles, and then participate in a race. In 1999, this race took place during half time of a football game at Stanford. The rest of the autumn quarter involved formation of new teams for the actual project work, presentation of corporate projects, assignment of projects to teams, a benchmarking exercise, and a critical function prototype design exercise.

Organization
The ME310 course appeared to be very time intensive, and it is difficult to imagine how students were able to simultaneously do work for other courses. For example, students had approximately one week to design and create a critical function prototype at the end of the autumn quarter. There were four TAs at Stanford, where one from KTH visiting Stanford at this time. The course was supported by an administrator, who helped with project team budgets, shipping, travel, etc. There were supposed to be 3-4 students per team, based on the course description. After the autumn quarter, some students did not continue, and other students joined the course (and the existing teams), which meant that some reformations occurred at that time. The grading policy was quite complex, with students and coaches involved in student assessment.

In the ME310 class the teaching team implemented something they called “small group meetings” (SGM). Once a week the students, teachers, TAs and coaches had a meeting and discussed the progress of the team. The meetings helped and forced the teams to set milestones and deadlines, obliged them to document, gave them the possibility to try ideas on faculty members, required them to be explicit about what they were thinking (since they had to verbalize their thoughts and formulate them for somebody else to understand), etc., and it proved very useful for improving the communication also within the team.

“OrangeS4: I would agree in this idea that design may become more and more of an international distributed activity and in that way it’s a preparation for the future. I’d also say that this sort of given that we go on and work in small companies that have every, all of our colleagues are geographically close by, having communicated with someone who’s geographically distributed forces the communication to be much clearer, and their documentation to be more thorough and so in a way it reminds you that you need to explain the big picture in addition to the details. And I think that that makes for better documentation in any case, even if it’s not international, just someone picks it up five years from now, it’s important to include those details that we’ve been more conscious of because we’ve had an international partner.” (Orange Focus Group II, 20-04-2000).

Differences between ME310 and the courses the teams were collaborating with led to that the level of participation and motivation differed between the sites. The information was not enough (or not clear enough) to avoid misunderstandings and in some teams people with completely different goals and motivation were supposed to work together, across distance, without any particular support.

Members of the alumni of the class had experienced the same problems as
students observed in these studies, so apparently it had been a problem in the ME310 class for a long time. “PurpleS8: I think it really depended, there were a lot of issues involved in having global partners, as PurpleS1 I think termed it. And one of the things was that, one of the experiences we found out they really needed to have the same motivation. That was something. If they don’t, meaning they get like a grade in the class, there was one, I have one particular case where that person wasn’t getting a grade, they were just supposed to be involved. Well they didn’t really contact the people very much, they kind of said hey you know, whatever.” (SLL Alumni Focus Group, 04-02-2000). There were also a lot of misunderstandings because of schedules, goals and time plans that were not synchronized, and the teams were not even informed about the differences.\textsuperscript{ix}

There were often miscommunications about what the sponsors really wanted and what the teams really needed to do, before they met face-to-face. Lack of communication led to that teams and sponsors had different expectations and goals about what should be done. It was complicated enough for the teams to do something they found interesting; that satisfied the demands for the class, and was what the sponsor wanted, without having to guess what it was or chase after the sponsor to get an answer. When teams had problems communicating with their sponsor, a lot of extra time and effort went into the communications, and it was still difficult for them to get the information needed to do a good job.\textsuperscript{xv}

Some teams in ME310 with remote sponsors experienced that it is was hard to get information from the sponsoring company, or even get them to respond to emails or phone calls before they met in person. This can be explained by e.g. the increased threshold to communicate, a low level of interest, lack of trust regarding the students’ capacity, lack of visibility, security reasons, availability of information, and priority of time. The communications seemed to be endless, and a lot of it was based on that the sponsor did not put in effort or take the time necessary, but also that they did not know what was demanded from the students in the course and what assignments the students had at different times. It became clear that the sponsors weren’t always properly informed of the requirements for the project and the class and what they could expect,\textsuperscript{xi} and that they didn’t know the differences between the classes and the schedule for the different sites in the distributed teams in ME310.

Team Formation
There was a tradition of very conscious team formation in the class, but the strategies for team formation was not as influential any more. The teams had traditionally been formed with help of a modified version of the Myers-Briggs personality test developed by Professor Douglas Wilde at Stanford University. The personality test used to be one of many measurements of diversity; along with gender, background, education, nationality, etc., and teams that were composed so they reached a higher level of diversity had a higher chance getting the project they wanted.\textsuperscript{xiii}

The modified Myers-Briggs test was not used directly for team formation any more, but was still present as an aid for the students and to form teams for the pre-assignment to the real project, the so called paper bike project, but there was no thorough discussion around why and how the test was used, and why and how
the students could use it. The students were only encouraged, and not motivated in any way, to use the test when forming their own teams, and the only form of diversity that was discussed was personality.

The participants didn’t seem to really take the test results into consideration when forming their teams, and most of them didn’t think about it at all. Most students didn’t even know what their or their team members’ results were. One participant pointed out that it wouldn’t matter what results the other members in the team had, since he thought they were so smart that the team would be great whatever their personality tests showed (from discussion with the Blue team 02-02-2000). The participants in ME310 had a chance to work with people and see them work in the paper bike project, and talk to each other at an informal dinner after the paper bike project was finished. There they had the opportunity to talk to whomever they wanted and it was a chance to get to know the others better, but also to figure out who was interested in the same project as they were. “OrangeS4: And sort of said ahead of time, ‘Well look, we all like each other and get along fine, I think we could work well together as long as we’re all okay with the fact that we’re going to have these really strong disagreements.’ And I think that accepting that was probably more important than recognizing our personality profile.” (Orange focus group, 28-01-2000).

The students said that they chose teammates after which project they were interested in, who they thought would be fun to work with, and who they considered had potential to work well, had the proper knowledge, and who they thought were intelligent. One student even admitted that he ranked the other students after the potential they had. “BlueS3: I made a list of everybody in the class and then I asked around to figure out who the real slackers were in the class, so I could avoid them. And then looked at some of the schools and stuff and talked to some other people. And so everybody, I think people got like a range of like 5 to 1.” (Blue focus group, 23-02-2000).

The team formation in ME310 didn’t always work smoothly, and the teaching team had to step in to sort things up and sometimes re-form teams. One problem seems to have been that the students didn’t really know what the teaching team based the re-formations on.

Teambuilding

The distributed teams didn’t have any particular team- or trust building, except for the site visit. Even if the teams were not located at the same place as their sponsor or remote teammates, they had the opportunity to meet physically by traveling, and they all chose to do so. Traveling is a time consuming and expensive way of getting to know each other and exchange information, but everybody involved in ME310 thought that site visits were still the easiest and best way to get good results in distributed teams.

Team Space

The Stanford students in ME310 worked in a room called “The Loft”. This was a place allocated for the students where they had an allocated space, had meetings, did project work, stored things for the project, had lunch, socialized, played and mingled with each other and members from other teams, and the space was an
important part of the idea of the course. In the loft there were also computers, phones, fax machines, printers, etc., for the students to use for the projects. Since so many of the students gathered in the same place, there could have been engineering knowledge exchanged between the different teams in the class, but according to the teachers there wasn’t any real peer-to-peer learning in that sense, but there were at least some “lower level exchanges” between the students. By being close they occasionally asked each other about where to get material and information, and they could test their prototypes on each other (Blue Focus Group, 23-02-2000). They also had the possibility to see what the others were doing for their presentations, which raised the level of effort in the class.

The teams had separate workspaces where they worked on their projects and left material. The teaching team had changed the layout in the room to increase collaboration between the teams and gathered all computers in a circle in the center of the room, which meant that the teams actually sat next to each other while working on tasks and written assignments. That led to that if one team used PowerPoint, then everybody else started using PowerPoint, and if one team filmed some video clips for their presentation, then the other teams started thinking of ideas on how to use video or animations in their presentation too (TA Focus Group 10-03-2000).

Both the students and the TA’s emphasized the importance of the loft, as a central meeting space, a place to keep things; where help, material, equipment, fax machines could be found; and where the teams could do actual work (without having to be worried about ruining or messing up their apartment). Having a shared team and class space made the work more public. The students could see what other groups were working with, they could tell what their own teammates were doing, and the teaching team was always nearby. As one of the TA’s described it, it is like the projects live in the loft. It helps create a feeling that project are more like real work than a homework assignment. It also helped the class develop a form of community and artifacts from previous classes helped students with less design experience to get ideas faster and helped them get started (TA Focus Group 10-03-2000, Blue Focus Group 23-02-2000).

Besides from the designated areas and the work spaces, there was also a common space for social activities with a big table and a fridge by a TV in the loft. During social gatherings the class had every week, the so called SUDS, the students seemed to avoid talking about their project work and concentrated on being social instead. This meant there was not as much cross-team collaboration as there could have been, but there were at least cross-team socializing. This is something that seems to always have been the case in the class, according to the alumni. The money used to buy food came from last years students that had won rewards for excellent designs in a design competition. By having this gathering the students got a chance to socialize, they were motivated to come by receiving free food and drinks and in this way they also interacted with members from other teams. It furthermore encouraged them and made them feel motivated to produce good results to win rewards for the class to be able to continue the tradition.

According to the faculty there was really a community formed in the loft in the ME310 class. Students tended to spend a lot of time in the loft, working on their projects and on other classes. There was a sofa there for relaxation and a lot
of the students had even slept there, taking naps or slept a couple of hours when working really late. The students worked, socialized, slept, ate, studied, and did basically everything you can imagine in the loft. Since the students had a team space of their own and other common spaces and tables to their disposal, it was very convenient for them to use the loft to work on assignments for other classes as well, which resulted in that a lot of students spent a lot of time there. This created a good foundation for collaboration. Because of the existence of the loft, there was never any discussion about where to meet and it made it easy to find people, because the students were there almost all the time, they got to know each other well, and knew where to find their things. The tradition of the class was also present in the walls of the room, physically represented by artifacts from previous classes hanging from the ceiling, old archived projects accessible to read, and by teachers, TA’s and coaches frequently present in the room if advise was needed, etc.\textsuperscript{xxxi}

Everybody involved in the course agreed about how central the loft was for the actual work and for the team spirit. There also seemed to be a relation between how successful a team was and how much time they spent in the loft. The teaching team liked when teams spent a lot of time there, since they saw it as a sign that they were part of the “loft community”, and by being a part of the loft community, they became more motivated and were more likely to produce an excellent end product (interview RedS1, 18-02-2000).\textsuperscript{xxxi}

The faculty tried to use tools to raise awareness and create a feeling of community also for the distributed teams; to help the students see each other when they were working and to give them a sense of shared virtual space. Having VIP cameras, as they did in the ME310 class, was one way of increasing awareness.\textsuperscript{xxxi} The cameras were always on, so the team members could see what was going on at the other site. A lot of the teams in the class formed tight bonds with each other. After the site visit in Sweden, and after getting to know the Swedish students better from working actively together on the project, the Stanford part of the Orange team managed to extend their team feeling to the team members on the Swedish side. Once knowing each other, it was easier to form a team feeling.\textsuperscript{xxxiv}

**ICT**

The students in ME310 did not use different ICT for communication and collaboration to the same extent as the students in IE264, and was not encouraged to do so. The ME310 course used a course web site with Perl mail and the so called Drop Zone, a team storing and sharing space. Some teams used other ICT, such as the panFora (a web-based discussion forum). This year the course was using a digital link for videoconferencing set up between Stanford and KTH in the design loft, to communicate with KTH, and a Pac Tel system to communicate with TMIT.

Students had project team mailing lists, but some students didn’t use the group email, which might have left out their distributed partners from internal team conversations. There was a so called VIP-camera in the common team work space, which constantly sent out a video stream. The distributed students could therefore always see what happened in the loft. The Swedish students also set up a
camera in their work space, so that the Stanford students could see them at work.

Except from using email to communicate, the Orange team used the videoconferencing system that was set up between Stanford and KTH. It was interesting to notice that they didn’t really know why they were using the system. In the fall, it barely worked at all. Before the Stanford students got support from a person from KTH that knew the system, and helped the Orange team to install an IP phone, the audio didn’t work well enough, which took away most of the advantages of the system and prevented the team from establishing a good communication. The Green team was not really using videoconferencing for collaboration, and TMIT had firewalls that made it even harder to try to establish any video communication.

Once the Orange team started using an IP-telephone for the audio and the VIP-camera for the video, it actually worked, but it was still not easy to communicate. The conferences in especially the Orange team seem to have been a little confusing, with a lot of people on the Swedish side (both team members and other staff and faculty). The students in the Orange team had a feeling that the videoconferencing system was a compulsory part of their project, and they never questioned using it or talked about not using it (discussion with Orange team, 06-06-2000). When asking them directly it seemed like they probably wouldn’t have kept using it, if they had not felt that it was something they should do, but when they finally got it to work better, they thought it was useful; to keep in touch, have discussions, and keep the other side of the team updated, and they thought it was a good tool for collaboration. It had the advantage of keeping them visible to their remote teammates, and, as they pointed out, it helped keeping the motivation and energy up. But the technology was too unstable to be used as the main tool for collaboration in a setting like this, when the team had to rely on it to make the collaboration work. And even when the equipment worked, it required a new way of communicating that they had to get used to. To make an experimental technology compulsory for a class or a team, like the videoconferencing equipment for the Orange team in ME310, definitely caused problems for the team, especially since the class was demanding and complex in itself, and there were just not any extra time for experimenting with technology.

4.3.3 Results
The results from the investigation focus on trust- and teambuilding, the differences of being co-located and working in a distance team, and on team communication. The issues concerning the use of ICT are also covered, but not as extensively as in the investigations in IE264.

Communication and Collaboration in Distributed Teams
Working in a distributed team forced teams to document their work more continuously, which proved to be useful for the project work. The students had an opportunity to learn about what information that is important to communicate about to make a team work well, and how to communicate it so people understand. Being forced to document made the whole learning process, the end product and documentation much better, and forced the team to work more continuously (paper bike debriefing, 22-10-1999; Orange Focus Group 28-01-2000). They had
to make assumptions explicit and noticed, and this was excellent practice not only for international teamwork, but for cross-disciplinary work and teamwork in general. OrangeS1: Yeah I think in terms of the documentation, the aspect that maybe is the most different and they see our, they always mention well when we have these big reports that are due, they, I mean they take, they take the time to read them and they send me, it’s very different than the documentation that they do, and, because our course emphasizes very detailed documentation of the whole process and not just the technical specifications. So I think that seeing that different perspective on documentation and like our, the drawings we’ve done, concept sketches, and that has been something different than maybe they’ve benefited from.” (Orange Focus Group II, 20-04-2000).

Problems also arose because of the need for documentation. When teams needed information from people that already started working on-site, they often did not have everything documented, or in the worst cases did not have anything documented about the work that had been done. Even when there was documentation, some things were still simply harder to explain at a distance, even if it was not impossible. The students in the Orange team definitely had problems because of the lack of documentation in their sponsoring company and they also experienced problems when trying to find out why they couldn’t get the information. This problem arose also partly because the students were not visible enough to their sponsor, so the sponsor didn’t see the importance of helping them. The part of the team that was far away from the sponsor felt very dependant on the part of the team that was close to the sponsor. The students found it hard to try to communicate via a second party, and that was what both the Orange and the Green team at the Stanford side had to do, at least in the beginning.

The Green team had problems communicating with both their Japanese teammates and their sponsor. Only one person at the Stanford side of the team knew Japanese, and the problem got even worse since he had to act translator and couldn’t be as active in the discussions because of that. The team definitely had a language problem, and since the communication was not open enough, they didn’t resolve their issues until meeting face-to-face. The language barrier was even harder to overcome since the objective of the collaboration was not entirely clear, the situation was not equal between the two sites, and the motivation to really collaborate was not apparent. It showed that when the language barrier was big it mattered even more how comfortable team members felt about the situation and the people they were communicating with, how much fun they had together, and if other communication barriers were present or not. In very formal situations where people barely wanted to admit that they had problems, the language barrier was hard to overcome.

The distributed teams had problems acquiring information from especially their sponsors before seeing them in person. There were e.g. miscommunications about what the sponsors in fact wanted and what the teams needed to do. Email proved to be a bad way of communicating this kind of information, even though it seems to be pretty straight forward information that should have been able to be communicated easily electronically. One problem was that the written word came across much harder than speech, and suggestions tended to be interpreted as
absolute truths or strict guidelines.\textsuperscript{xliv}

Lack of communication wasn’t only a problem because the students couldn’t get information from the sponsor, it also led to that the team and the sponsor had different expectations and goals about what should be done. It was hard enough for the teams to try to do something they found interesting, which satisfied the demands of the class and was what the sponsor wanted, without having to guess what the sponsor thought or chase the sponsor to answer questions. When the students didn’t have an open and satisfying communication with the sponsor, it was hard for them to get the information needed to do a good job.\textsuperscript{xlv}

It was not only the goals that differed between the sites, the schedules and time plans were different, and it took a while before the students even realized that, so they could adjust their work to the situation.\textsuperscript{xlv} The differences in the courses led to that the level of participation and motivation differed between the sites. Information about what the differences were was absent or not clear enough, so misunderstandings arose between students.

The students in the Orange team said that they liked having the cultural exchange with their teammates and that the distributed collaboration brought more energy to the project (discussion with Orange team, 22-02-2000). The international components added diversity to the project and gave the participants an opportunity to broaden their views and get new perspectives.\textsuperscript{xlvi} When the students collaborated with people from other places in the world, they got impulses from other cultures, disciplines and new ways of using technology. The other schools were sometimes using different equipment and had different ways of approaching their field of study (Green Focus Group, 09-04-2000, Orange Focus Group II, 20-04-2000). By getting exposed to other ways of thinking and working, they thought that it was easier to see both the advantages and disadvantages of their own system, and that was a good ground for self evaluation and analysis.

The Stanford side of the Orange team thought that their design was more influenced by the Swedish team’s design, than vice versa, because of the way they choose to define their project and because the Swedish side of the team was so much bigger and had the sponsor on their site, but they also thought that they influenced each other in other, more subtle, ways. The Stanford students also used some of the Swedish students’ engineering knowledge that was needed for the area they were working in.\textsuperscript{xlvii} However the students thought they got even more indirect advantages from the distributed work. When working at a distance, they had to be able to explain what they were thinking, and therefore had to structure their thoughts more. To be able to explain something to somebody who has not seen the whole process, it is necessary for the team to clarify the process to themselves and be sure to document and know about all the steps they have gone through. Clarity was necessary both in the communication with their teammates and with their sponsor. They learned a lot about communication and documentation from working in the project, knowledge that is more generally applicable than any mechanical design knowledge they got (discussion with Orange team, 02-02-2000).

One thing that was apparent in the conversations in both the Blue and the Orange team (that was considered successful teams) was the mix of social talk, project work and administrative tasks, with a suitable mix of work and fun.
Another factor that was noticed in the teams was the ability to have an open conversation and that the team members didn’t hesitate to speak their mind, something that is normally associated with good collaboration.\textsuperscript{viii}

The students in the ME310 class realized how important it is that the decision making gets done in the group, so everybody feels included and everybody is working in the same direction. They noticed that it is advisable to involve also the client/ sponsor in the decision making process. A sponsor is much more likely to like the design if they have influence, or at least think they have influence over what happens and have been an active part in the development process. And if they end up not liking the end result, they see themselves as partly to blame (paper bike briefing, 22-10-1999).

Time, both getting other people’s time and not running out of time, is yet another difficult parameter for the students that were working distributively. It was not only difficult to get people’s attention to get some of their time, the students also had to put in more time themselves to make it work, since it generally takes more time to work in a distributed team. Even if the distributed teams had to put in more time, they thought that when it worked, they got more out of the collaboration, they learned more and the outcome was better. If the ICT would have worked well, the extra time they put in would have decreased, but they still thought it will probably always be more time consuming to get a functional team relationship going at a distance. “OrangeS3: There are no real negative sides of it [being in a distributed team]. This is more of a real world experience. The only negative thing, that I don’t see as something negative, is that we had to put more time into our project, but we also get more out of it. We learn more and the outcome is better.” (discussion with Orange team, 02-02-2000).

Comparison with On-site Collaboration
When team members see each other almost every day, as the local students in ME310 did, it is comparatively easy to collaborate. When they wanted help, they just walked over to their teammates or the teacher and asked. Even if not working together on the same things, they knew they could get fast answers and help with what they were doing (Blue team meeting, 09-02-2000). This doesn’t necessarily mean that all local teams did this, but at least this behavior was observed in successful teams, and local teams have the possibility to do so. Another advantage with being located in the same physical space was that it was easy for teams to keep track of the progress and see what the others were doing. It might be possible to do the same in a virtual space, but it demands more effort; to set up a virtual team space, post things, and to go there regularly to check the progress, instead of simply always being in the space. At a distance people had to actively work to keep track of the work.

A relatively small local team that is working well together can develop a communication that is not as explicit. They know what to do, understand each other, know who the best is for what task, and can all take individual initiatives.\textsuperscript{viii} The Blue team in ME310 was completely local, and the team definitely used that they didn’t have to plan things in advance and that they had learned to work very closely together.\textsuperscript{vii} Making teamwork work well without being explicit is definitely not a level of communication all teams can be expected to reach, and it can be
very dangerous even for local teams, since people might think they agree when
they don’t, as well as it is harder to interact with people outside of the team about
what they are doing. Being explicit is especially important for distributed teams;
since they don’t see their team members, they have a hard time getting a feeling of
what is actually done and what the others know (and it is harder to reach their
team members when they need to), so everything has to be more explicit.

“BlueS2: That’s pretty much just decided like as the day goes. It’s like okay we
got to do this, and then we figure out when and who can do it.
BlueS1: Yeah I mean, we’re, we don’t have schedules where we can say okay a
week from now on Monday, I have time for you from 1 to 4. It’s like, we like to
keep them pretty flexible.
BlueS2: Yeah, I think -
BlueS1: -So everyday we’ll decide you know what are we going to do tomorrow?
What’s the plan for the next couple of days?
BlueS2: I think it just goes like unsaid that we all assume that we’ll see each other
that day, usually. And like the only time we make any plans that last like more
than a day is when the weekend comes up.” (Blue focus group, 23-02-2000)

There were both advantages and disadvantages observed with being close to the
sponsor. Advantages were that it was easier to communicate and get a sense of
what the sponsor really wanted and it was relatively easy to make sure that
everybody had the same goals, and both team members and sponsor had the same
expectations about what to get out of and expect from the project. One noticed
disadvantage was e.g. that the Blue team’s sponsor wanted to influence the project
too much, decide details and use the students as cheap labor and part of their
regular staff. Just because the sponsor was close by, it didn’t mean that the
students could spend a lot of time seeing them. There were on the other hand
sponsors located very close to the students that did not care about the project, and
then the project didn’t benefit much or got the disadvantages from the closeness.

“EJ: And then how are you keeping in contact with the sponsor?
BlueS2: Usually weekly meetings, like every Monday we go and meet with them.
BlueS1: And e-mails in-between.
BlueS3: And occasional phone calls.
BlueS2: Yeah. Mostly through meetings once a week.
BlueS3: We’re kind of like the exception to the other teams there in that we
actually try to avoid our sponsor vs. the other people are always trying to talk with
them.” (Blue Focus Group, 23-02-2000)

The Blue team had a very close contact with their sponsor, who was a small
company with a lot of interest in the development the students did on their
product, and the company was also located close to Stanford. Perhaps it was
because the sponsor wanted to decide too much about the project and used them
too much in their everyday work, but it all ended with the team getting into a
conflict with their sponsor when they didn’t want to do exactly what the sponsors
wanted. They believed that they would probably not have gotten into this conflict
if they had not been in such close contact with and located so closely to their sponsor (Discussion with Blue team, 30-05-2000).

Site Visit- Getting Closer to the Remote
After a successful site visit, like the Orange team’s, the team members knew each other, which made the communication smoother and made it easier to handle for example failures in technology. Knowing each other better led to a more relaxed communication, and the common experience provided a common ground for jokes and social discussions. Instead of trying to be as diplomatic as possible and trying to constantly figure out what the other party wanted, it was easier for the students to be themselves and have a much more open discussion.iii

After meeting face-to-face it was easier for the teams to communicate without misunderstandings, it was easier to see when people didn’t understand something, and misunderstandings could be solved or clarified immediately. iv People often thought it was hard to talk about feelings over email, because it was so easy to be misunderstood. Back and forth discussions about requirements also seem to be much easier to do in person and most of the distributed teams seem to have used the site visit to clarify what was wanted and expected from them.v

What the site visit provided, that might be really hard to get without actually making a trip, was to give a feeling of who they were working with and a basic understanding of how some things were different on the other site. That is something that is hard to build into an exercise and it normally did not come up in discussions, since those differences were not deemed important, or noticed at all, especially if people were not very familiar with both sites. Just a simple fact like that the students in Sweden and Japan don’t have access to cars in general, (interview RedK6, 27-03-2000), or to understand how long it takes to go to shops or to the sponsor, or that there might not be any outlets for parts on the other site. This might seem like minor details, but they were important to gain better understanding for each other’s situation and work, to organize the work and to be able to use the strengths of all locations involved as much as possible. These things are important, but might be overlooked unless the students have actually experienced or seen them first hand (interview RedS1, 18-02-2000). When actually having visited a place people also have an image of what it looks like at the other site that they remember when seeing fragments of it from a distance.

When having seen the differences, the teams had an easier time understanding what to do and how to improve the communication and collaboration. How problematic it was to communicate in a foreign language for somebody can be hard to tell over email. It e.g. became apparent in the Green team that it was the person on the Japanese side with best knowledge of English that wrote all the emails, and that he used a dictionary, spelling control and had a lot of time to think about what to say and how to say it. By meeting it became clear that there truly was a language problem, and it became easier to figure out ways to improve the communication and make it easier for the other site.

“GreenS3: One of the things we realized is they don’t really speak English that well and it’s good to have pictures and everything, so like the least we can do is take pictures of all designs we have and like all the things we built up. Might not like work perfectly or anything, but at least they have some idea of what we have
been doing. So that’s what happened. And another thing is I would feel like we should discuss with TMIT, have more ideas and then we can talk to Green Company. So we have like schedules after the discussions together and some rough sketches of devices we want to do and when we built and also we send kind of like e-mail, has […] all the questions we need to ask and all the devices we thought of. Because we feel like they don’t speak English that well either.” (Green Focus Group, 09-04-2000).

When discussing with the students it became clear that it is important to not ignore the fact that a site visit can work as an extra motivation for a team. The teams in all studies knew they had to be able to present something of high-quality at a certain time, they had people that they were working with or sponsoring their project that would take time to listen to their ideas, and perhaps pay for their trip, and that was a concrete sign that somebody cared about what they were doing. It was not only a grade or learning, but the students felt they actually accomplished something real that would be used, and that was an excellent motivating factor. And not to forget, they got to go on a trip, perhaps to a foreign country, and that was rewarding in itself. It was common that teams that went away came back with a new kind of energy and it also motivated them to work harder before they left (discussion with teams at SUDS; TA Focus Group 10-03-2000).

The importance of being visible and the troubles when not being visible became apparent to the distributed teams when it came to the interactions with the sponsor. Before meeting the sponsor, the miscommunications seemed to be endless for the distributed teams, and a lot of it seemed to be based on the fact that the sponsors didn’t have the necessary time to put in and didn’t take the students seriously until they showed up. Both the Orange and the Green team experienced a dramatic change in interest in the project from the sponsor after actually talking to them in person. The students also saw something that they characterized as a different level of trust after they met face-to-face, both with their teammates and their sponsor. At a distance it was hard to get attention from the sponsor and prove that they were trustworthy and they believed that the sponsor had more confidence in them after they met. The sponsor started trusting that they actually were worth their time. An example is that the Stanford side of the Orange team had to go through their Swedish teammates to get any information from their sponsor, before they had a meeting with them in person in Sweden. The sponsor basically ignored them and didn’t want to communicate at all. Because of this the Stanford side had not managed to work actively with the sponsor before they met, but managed to establish a good relationship with them after the meeting, so the change was drastic.

Another problem was that the sponsors didn’t know what was demanded from the students in the course and what assignments they had at different times. The distributed teams seemed to use the site visit to clarify what was wanted and expected from them. The students noticed that after meeting face-to-face it was easier to communicate without misunderstandings, it was easier to see when the person they were talking to didn’t understand something, and they could clear things out immediately. The teams that gained the most from their site visit prepared the trip carefully. With less preparation before the trip, as in e.g. the Green team in
ME310, trust was if not diminished, not improved as much. The site visit was not thought through, it was conducted at a bad time, not all team members went, but it was still useful to clear things out with the sponsor and start the collaboration. If meeting each other is going to lead to more trust, participants have to be able to show the sponsor and the distributed teammates that they are trustworthy, have the right expertise and know how to use it.

It became clear that it is very important to decide when to go. If the teams left early, the meeting was not as productive, because the proper preparations had not been made. When the teams waited, the different sides of the team sometimes developed different goals or started something that was not what the sponsor intended, or not aligned with what the remote teammates were doing, because of misunderstandings and problems communicating. Meeting face-to-face was also a really good way to get to know each other, so teams that saw each other early got additional teambuilding.

To say exactly when the best time would be to see each other is impossible, since it depend on the team, the task, and the situation.

ICT
All students used email a lot. It was fast, easy, cheap, and a familiar way of communicating. The students in the Blue team didn’t even use the email list they had been provided with, because they thought it was easier to just reply to all (instead of trying to remember the name of their email list), since there were only three of them in the group. They didn’t really use the Drop Zone (file storage) that much either, because it didn’t work well enough for the CAD-program they were using (Blue Focus Group, 23-02-2000).

With distributed components in a team, the usability of file storage increased. It made it possible for the students to share information immediately and get their measurements right. Team members on one site would post a document and the team members on the other site could make changes, mark them and put it back up (paper bike debriefing meeting, 22-10-1999). This was very helpful for the collaboration and made the documents and knowledge more shared. The web pages where the students kept their information were also a convenient source of information for the sponsor to keep updated. When the teams used this tool both the team members and the sponsor got a feeling for the actual process, it was a way of keeping updated, and prevented the sponsor from only seeing the final documents and the final product.

The videoconferencing equipment was useful once the students started using an IP-telephone for the audio and the VIP-camera for the video, and it actually worked. It took them a while to learn how to communicate with the tools, which might not have been the easiest thing to do, but they thought it was a good learning experience. It was not only the technology that didn’t work, though. The organization of the meetings added to the confusion of the media. There were as mentioned a lot of people on the Swedish side (team members and faculty as well as other staff) during the conferences. The Stanford students sometime didn’t even know who everybody on the other side was, and the people participating changed between the sessions and came and left during the sessions, without even introducing themselves.

The most important reason for if a technology was used or not was; how easy
it was to learn and use; how comfortable people felt when using it; and if it actually worked. This did not only apply on the communication tools, but on the technology used in the class in general.

Distributed Team- and Trust Building
Alumni, faculty and students all said they saw the importance of teambuilding. When team members were not visible, and not part of the class community, it was easy that they were left out of the actual teamwork and were only used as “consultants” to do the “dirty work” or routine tasks, as several of the alumni pointed out had happened in their teams when they took the class. When remote team members were not trusted and involved, they often got separate tasks for material not crucial to the final outcome. When teams used their remote teammates like this, they did not gain that much from the multiple perspectives that existed in the team and it was common that the “consultant” lost interest in the project and did not put in any extra effort to do a good job, which in a way made the distrust self-fulfilling. This use of remote team members was especially common when there was only one remote person in the team. When people didn’t have to involve their remote team members (for example because they are not taking the same class), it was easy to simply leave them out. When the students met in person, they got a chance to see their remote team members’ skills for themselves and how they could add competence to the project.

One of the TA:s had exactly that experience. “RedS2: The year I took it, I had a Japanese, we had a Japanese team member and we really didn’t get much collaboration going until he actually came over and visited us. And suddenly we got to know each other and we realized what his skills were and put him to work. And even when he went back we could tell him what we wanted him to do and we knew what he could do. He came back for presentations and presented with us, and it was the times that he was here that we really got a lot done. And then but we were still able to get things done, prior to the site visit and getting to know him, we sort of left him out of the loop, basically. We didn’t feel like it was helping us at all, so the site visit ends up I think being kind of important for the global teams.” (TA Focus Group 10-03-2000).

The alumni of the class were convinced that team- and trust building is vital for a team’s development. They had suggestions of how to create a team feeling; for example by playing games, drinking together, using cameras for awareness, etc. This because they had noticed that to get the communication started, it is important to have something to chat about, making small talk about, some kind of common background or meeting point. A game experience can provide that, and it can also make people feel that they have gone through the same thing, suffered together and it can make them recognize that they have things in common.

Using a camera that is constantly filming the work space, like the students in ME310 did, can provide visual means to get access to each other’s work and can help create a feeling of the efforts everybody is putting in, and also create more awareness of each other and each other’s work.
4.4 Case Study 3- Global Project Coordination 2000

4.4.1 Research Questions

- What kind of demeanor, skills and behavior are productive when communicating and collaborating at a distance?
- What can be done to promote desired behaviors?
- What problems and disadvantages do people encounter when separated from their teammates in time and space?
- Is it possible to help distributed teams prevent and get passed problems?
- How can teambuilding activities be created for distributed projects?
- How can the usefulness of various tools for learning, knowledge documentation and sharing work in a distributed environment be improved?

4.4.2 Research Methodology

4.4.2.1 Methods of Collection and Analysis of Data

- Minor observation and analysis of teamwork and meetings
- Minor observation and analysis of course lectures
- Faculty interviews and informal discussions
- Testing of virtual teambuilding activities (see Chapter 4.5)

Analysis was made by comparing results and observations in this study with results and considerations from previous studies, analyzing differences and similarities regarding the distributed project work environment and effects on communication, collaboration and individuals.

4.4.2.2 Course and Research Context

For more general information about the course, see the description for IE264 1999 in Chapter 4.2. Only differences between the courses are covered here. For the year 2000, the faculty decided to have no more than 15 students from each country, for a total of no more than 45, to decrease the workload. The course included a face-to-face meeting for the teams and the instructors in Singapore in the staring phase. In 1999, no exercises for virtual team-building were held in advance of this meeting. The year 2000, faculty experimented with making the course more scalable, that is, establishing trust and building team understanding, context and camaraderie outside of face-to-face meetings. Therefore, based partly on evaluation results, faculty planned exercises for virtual teambuilding in advance of this meeting and used an exercise called the Virtual Broken Squares developed at SLL. The students also got advice about what ICT to use for their team communication and collaboration, since choosing ICT had proven to be too time consuming for the students of the class 1999.

Minor observations and tests were done in the IE264 course during spring
2000, but the focus of the study was testing the virtual teambuilding activity. The attempt to use a teambuilding activity didn’t turn out as positively as it could have. The important follow up was canceled and the activity was not completely supported by the faculty in the end, which diminished its importance and value.

4.4.3 Results

The students said that the Broken Squares activity was fun, but the impression was that both the students and the faculty saw it more as testing a new tool, than actual teambuilding. It also became clear that the exercise was presented in the wrong phase of the project work. The Broken Squares turned out to not be primarily a team- and trust building activity, it was more suitable for starting a discussion about communication, collaboration, and the importance of sharing, and should have been used later in the collaboration, when the students knew each other better. The importance of having the right activity in the right phase became obvious. The conclusions from the observations were that the exercise was experienced as too formalized, it didn’t promote exactly what was expected, and the timing for the activity was also wrong. For results from the use of Broken Squares, see Chapter 4.5 and 4.6.
4.5 Case Study 4- Virtual Broken Squares

The Virtual Broken Squares, also called Global Collaboration Exercise (GCE), is a virtual version of the well known teambuilding exercise The Broken Squares, and was developed by the DCL team at the Stanford Learning Lab. The first version of the GCE was introduced to the students in the IE264 class spring 2000.

The original Broken Squares exercise was invented by Dr. Alex Bavelas in 1973. This teambuilding activity has been widely used with executive and management teams, engineers, sales and support staff, production personnel, and administrators in face-to-face settings. In the original Broken Squares exercise, there are teams consisting of 3-6 persons, and each member of the team is given different pieces of a square. The goal is for each member to put together a complete square. In order for this goal to be reached, team members need to exchange their pieces. The exercise is about giving; that is, pieces can only be given away to others but can never be taken away from others. Everyone on the team has to have a completed square in order for the exercise to be finished.

The Broken Squares exercise promotes understanding and development of interdependence. It is an activity, based on the notion that teamwork does not “just happen”, but needs to be supported, facilitated and trained. The Broken Squares exercise makes teams aware of common pitfalls and perhaps helps them develop the patience and energy required for increased interdependence. Connections between the exercise and the following teamwork issues have been drawn:

1. Building trust in each other’s judgment, and willingness to provide assistance when needed.
2. Commitment and awareness of the difficulties that arise when members have “hidden agendas” and/or personal goals that conflict with the team effort.
3. Sensitivity in looking beyond individual concerns to become fully conscious of the team. The exercise illustrates the balance between individual competence and successful group effort.
4. Opportunity to practice providing feedback for members and to give each other continuous, constructive information about perceived individual behavior and reactions. For example, following the exercise, a facilitator asks the participants to talk about how they felt when someone finished their square, then sat back and did not help the team.

4.5.1 Research Questions

- How can teambuilding activities be created for distributed projects?
- How can the usefulness of various tools for learning, knowledge documentation and sharing work in a distributed environment be improved?
- What kind of demeanor, skills and behavior are productive when communicating and collaborating at a distance?

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5 DCL team- Distributed Collaborative Learning team, consisting of Carolyn Ybarra, Eva Jansson, Reinhold Steinbeck, Claudia Engel, Brian Luehrs.

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• What can be done to promote desired behaviors?
• What problems and disadvantages do people encounter when separated from their teammates in time and space?
• Is it possible to help distributed teams prevent and get passed problems?

4.5.2 Research Methodology

4.5.2.1 Design Considerations and Development of the Prototype

Throughout the design phase, several tests were conducted engaging members of the Stanford Learning Lab as well as members of the Swedish Learning Lab. Since it was decided not to develop a new tool to support this teambuilding activity, one of the goals was to select the best off-the-shelf tool. Different versions of the exercise were explored to find a good technical solution as well as testing the conceptual problems in the exercise.

Based on the prototype tests, the Microsoft NetMeeting application was used as the underlying technology to support the Global Collaboration Exercise. The NetMeeting whiteboard component was used as the shared workspace for the exercise itself and the NetMeeting chat facility was used for communication before and after the exercise. The graphical elements as well as the rules and procedures were then finalized. Team members were in the virtual version not allowed to communicate with each other or take pieces from others. Some of the design considerations necessary to keep in mind through the design phases included:

• Transfer from face-to-face environment to virtual environment: How does it change the exercise? What elements can remain the same, which ones should be dropped or added due to the virtual environment?
• Tool requirements: Support of remote collaboration in real time, possibility to use graphical elements, different operating systems, etc.
• Rules and protocols: Is it necessary to introduce additional rules in order to adapt to a virtual environment (e.g. a pointer)? Is it necessary to add a protocol in order to ensure adequate use of the tool (e.g. prohibit deleting elements)?
• Integration: In order to have an impact on team activities during a project, how should the exercise be integrated in the project work and activities in the best way?
4.5.2.2 Methods of Collection and Analysis of Data
The students in the IE264 class 2000 got access to the exercise via the NetMeeting conferencing system from their respective locations. Students on the same campus accessed the online exercise from different rooms. Additional information about the exercise was obtained by videotaping a think aloud protocol of one of the Stanford members of each team during the exercise. The rules for the exercise were handed out beforehand. The team exercises were scheduled at the beginning of the course, with the activity being split into four phases:

- Warm up: Participants log in, greet each other, chat informally, play around with the whiteboard, technical problems get solved, if necessary;
- Preparation: The facilitator uses the chat to repeat the rules and answers any questions about the rules;
- Exercise: The facilitator loads the simulation game onto the NetMeeting whiteboard. The team does the exercise and until they are finished with the task, there is no chatting and the facilitator does not intervene;
- Debriefing: The facilitator opens the discussion. Via chat, the team exchanges ideas, impressions and experiences. The following set of questions served as a guideline for the facilitator:
  - What do you think of the exercise?
  - How did you decide what moves to make? (How did you proceed?)
  - Was anything frustrating?
  - Was anything confusing?
  - What have you learned from this exercise?
  - Any other comments? Have I heard from everyone?
Additional information about the exercise was obtained by videotaping a think aloud protocol of one of the Stanford members from each team during the exercise.

Objectives of the debriefing were to:
- receive feedback from the students about their experience;
- stimulate reflections of students about their attitudes and reactions towards collaboration within online environments;
- raise awareness about particular characteristics of online collaboration or coordination;
- obtain outcomes to be referred to or tied in later in the course, during the lectures held via the video conference system or during the actual project work.

Objectives of the video/think aloud protocol was to:
- have a history of the movements of the pieces during the exercise;
- relate movements to thoughts of players;
- relate specific situations during the exercise directly to certain feelings or reactions;
- obtain information about usability or technical problems of the application.

Analysis of the data was also made by comparing results and observations with results and considerations from previous studies when testing the exercise.

4.5.3 Results
Four teams of six students and one team of five students participated in the design study. Completion times for the exercise were 6, 9, 11, 15 and 18 min (the longest time for the team with five students). Mixed strategies for the moves were used, with some students looking at the big picture, while others looked at their own pieces first. Several students saw giving and taking as a reciprocal action. Major causes of confusion were:

- Not knowing the rules;
- Lack of understanding of the motives of the moves of other team members;
- Technical issues, like screen or window size.

Here follows a brief summary of team problems the students discovered or addressed while trying the GCE.

Communication in a distributed environment
The participants had to communicate without words and also without visual cues in the GCE, since they didn’t see each other, only their moves and their pieces. They therefore had to figure out new ways of communicating. This implied being more observant to what the others were doing, to what was happening in the setting, and on what the team needed to finish the task. They also had to deal with the confusion and frustration in an environment like this. To actually accomplish
the task they had to figure out ways to help others understand. They also saw the importance of knowing what rules that was valid in the environment, since there was no one to ask.

A major cause of frustration was the lack of verbal communication. Interestingly, some students got very impatient and broke the rules in order to overcome this obstacle, while others tried to convey messages with other means available (giving a piece, displaying their own pieces in a certain way). Also shortcomings of the application (e.g. problems with rotating the pieces) and technical glitches (when team members got disconnected) caused frustration.

**Collaborating in a distributed environment**

To accomplish the task the participants had to share responsibility and help each other. The task can’t be finished without giving. This includes waiting for others, trusting that they can figure things out, and handle the impatience when having to wait for your turn; it does not mean that a person has to give a piece to a person, simply because they have just gotten a piece from that person, i.e. that giving is not necessarily equal and reciprocal.

Discussions about control and leadership came up in the debriefings; respecting strengths of others and how to keep the motivation in an unclear situation. Also how to see the big picture of a problem, see what is best for the team and try to figure out how to reach a good solution without doing everything yourself.

**Decision making**

Connected to leadership are issues of ethics and creativity. When is it okay to break rules? When is it creative and a good thing for the team, and when is it just unethical and wrong? The students also discussed problem solving tools (strategies, seeing the big picture, team thinking) and what to do when not having all the information, not being sure what is important and what is not (e.g. colors of squares), and the students saw similarities with their relationship to the sponsors.

**Usability**

The exercise didn’t bring up much discussion about team spirit or getting acquainted. This is not a suitable first exercise for people to get to know each other better, but might be a good tool to start a discussion about collaboration, team goals and norms, and the effect of the lack of cues on communication once the participants have gotten to know each other. Without a follow up discussion the exercise loses most of its value, since people often need help to reflect on what they have done. It was also apparent that this kind of structured exercises don’t in any way replace more random encounters, but it might give the participants something to talk about, a common experience. It is important that these more structured exercises are presented in association with an environment that supports random social encounters.
Conclusion
There were some perception of development of team spirit and trust according to the students themselves. It is not clear, however, if this is based on their actual experience during the exercise or rather by how they thought they “should” answer the questions. The responses pointed to that the activity raised issues around roles and rules, leadership, sharing, and problems with communication at a distance. The teams did get a common experience by doing the exercise, but the teams would have benefited more if it was conducted in an environment with support for socializing.
4.6 Case Study 5- Second Version Broken Squares

After conducting our first experiment with the Global Collaboration Exercise, our next step in designing a teambuilding activity for internationally distributed teams was to refine and build upon the GCE prototype and identify additional factors that go into forming and maintaining successful team communication and collaboration.

4.6.1 Research Questions

- How can teambuilding activities be created for distributed projects?
- How can the usefulness of various tools for learning, knowledge documentation and sharing work in a distributed environment be improved?
- What issues came up in prototype 1, and which of these should be the focus?
- What areas are important to influence through teambuilding activities?
- What kind of demeanor, skills and behavior are productive when communicating and collaborating at a distance?
- What can be done to promote desired behaviors?
- What problems and disadvantages do people encounter when separated from their teammates in time and space?
- Is it possible to help distributed teams prevent and get passed problems?
- Do we want the exercise to address one or two very specific outcomes, or to introduce a variety? What aspects of face-to-face teamwork can be approximated virtually?
- Through what activities, events, or tools can various elements of face-to-face teamwork be approximated?
- What problems and uncertainties can be mediated or eliminated to enhance the relationship among distributed team members?
- Through what activities, events, or tools can the situation be improved for distributed team members?

4.6.2 Research Methodology

4.6.2.1 Methods of Collection and Analysis of Data

- Testing the prototype
  - Speak aloud
  - Observation of participants
  - Discussions with participants after the test
- Focus groups and Interviews
- Discussion with faculty
The data from the testing was compared with previous tests. The usability of teambuilding activities and the specific exercise was analyzed by comparing results from all previous studies with results and considerations derived in this study.

4.6.2.2 Considerations for Version 2

The teaching team suggested the idea of limiting the possibilities for participants, so they were only able to give away one piece per person per turn. The question is; would this make the situation more or less frustrating? Doing this might limit the thinking of the participants and take away some of the possibilities for communication. Keeping the exercise slightly unclear and frustrating may give the participants a sense of problems that can arise when collaborating. The question is what to make clear and what to leave unclear. It was decided to try using a “pointer” or a baton that was passed on, and only the person having the pointer could give away pieces, and had to hand the pointer over to the next person after he or she had made a move.

Would it be useful to know what moves everyone have made (a record), to be able to know how many times the “rules” were broken? This could help when writing guidelines for the debriefing and discussion for when the tool is going to be used by others. This record would not be necessary in a handoff version of the GCE. What is the best way to provide information about rules? We considered waiting to hand out the basic rules to when actually starting the exercise. Participants did not remember the rules they had read earlier anyway, and it only made them listen less carefully in the repetition of the rules just before the exercise (since they thought they remembered them).

The first test of the GCE pointed to that the exercise covered issues like communication, collaboration, shared norms and rules, and in a small way, building of trust (since discussing and learning how others behave and think will in general lead to trust building). If this exercise best addresses the problems of working together and communication issues, and not trust and getting to know each other, it might be better to use it after the team already is acquainted. It could follow a teambuilding activity and initial project start-up.

4.6.2.3 Research Context

When the second version of the GCE was done, it was tested on volunteers, mainly people working at, or in connection with the SLL. Observe that the participants in this test were mainly employees at the lab, and not students. The second version was programmed in Java, to avoid the problems connected with NetMeeting. We also wanted to be able to design the exercise exactly after our wishes and requirements. The Java applet turned out to be fairly unstable, though, and in the first tests the participants were annoyed because of the large amount of interruptions due to technological issues. People lost their connection and “disappeared” from the session, and there were other general instabilities and problems. It was furthermore hard for participants to see when there was a system breakdown. It was hard to tell why people didn’t do anything, if their connection was down or if they simply were slow. The participants “died” so often, and the implications were so big, that there should definitely have been guidelines for
what to do, and how to “ask” somebody if their computer is out.

One comment on the design for this second prototype was that the participants wanted a dedicated place to put things. They didn’t know where to put the pointer or how to arrange the squares and were annoyed that it was too hard to align the pieces with each other. It was not even clear that the dot symbolizing the pointer actually was a pointer. The participants saw the exercise very much as a game, and it was easy that a competitive feeling raised instead of collaboration. Some participants had not even understood that the goal was to have all squares done, which if it occurs naturally is something that has to be discussed in the debriefing afterwards. “I have more space than the others! Look, I have all top part of the field to move my pieces around.” “I got the worst pieces, they have a lot that fits together. I don’t. Hers is done already!” (Testing of prototype 2)

There was also a feeling of anticlimax after the exercise was done, since nothing happened, and there were requests for a clearer start and ending. “Final dance has to be done, you can tell them that!” (Testing of prototype 2). Some even wanted to see a score in some way (time or something else), to tell them they had done a good job. “I don’t know what to do when we are done, the instructions don’t say anything. We should know who was the best one. Helen put hers together the best!” (Testing of prototype 2). This only shows that the whole point of the exercise was misunderstood, but this will probably be a very common misconception. To clock the time for the whole team might be a solution, so the teams can compare their results with the other teams, but then the debriefing has to focus on the actual meaning of the exercise, and point out that this is supposed to help them reflect on distributed work, and not to get a good score.

When the participants were doing the exercise, they were still very unclear about the rules, even though they had received a paper copy of the rules that they had with them, and the rules had been repeated to them before the start. If participants don’t have the rules available on paper, they have to be available on the screen in another window during the session, to make it easy to check them when needed. There was a tendency to not read instructions thoroughly, people didn’t listen, and didn’t ask when they were not sure, and they didn’t have anybody to talk to during the session.

When a program is as unstable as this second version of the Virtual Broken Squares still was, the participants lost attention and the whole exercise lost its value. It will annoy people more than help them with their teambuilding. In the long run it is of course not acceptable with frequent breakdowns, but problems similar to what the participants experienced can occur, especially since people are not allowed to communicate. If you are running an exercise globally over the Internet, guidelines and rules what to do when somebody gets disconnected would be useful.
4.6.3 Results

It turned out to be difficult to use a formalized exercise and especially to get it to be considered seriously, exactly as the first test of GCE showed. People had a tendency to treat it as a “game”, which led to that they came out of it with the wrong ideas and perceptions, or competed against each other instead of collaborated. The exercise was also ineffective without a debriefing and discussion to support the participants in reflections of their experiences. If the exercise is considered a game, it is better that is a more pure game and less formal, so people get the incitement to start socializing in an environment where there is support for this.
4.7 Case Study 6- Product Design 2000/2001

4.7.1 Research Questions

- What are main differences between on-site and distributed teamwork?
- What problems and disadvantages do people encounter when separated from their teammates in time and space?
- What changes occur regarding communication when ICT is used in distributed project work?
- How should ICT be utilized to create a good work and social environment?
- How can trust be built when people don’t see each other or meet on a regular basis?
- What affects teambuilding in distributed teams?
- What effects do teambuilding and trust have on distributed communication and collaboration?
- What kind of demeanor, skills and behavior are productive when communicating and collaborating at a distance?
- Is it possible to help distributed teams prevent and get passed problems?

4.7.2 Research Methodology

4.7.2.1 Methods of Collection and Analysis of Data

- Observations of student team meetings
- Interviews with students
- Handing out Distributed Project Team Suggestions
- Conducting Video Introduction

The data was analyzed by matching results with results from previous studies, comparing observations and statements by participants.

4.7.2.2 Course and Research Context

Minor observations and tests were done in the ME310 course that was held fall 2000 to spring 2001, with the focus of testing distributed project team suggestions and a video presentation developed from the observations in the class previous year.

Distributed Project Team Suggestions

A list of distributed project team suggestions were handed out to the distributed team in the ME310 class 2001. This was a compilation of common problems that had been proven problematic in previous courses (see Chapter 7.3). The students prepared their first video conference according to the suggestions and the session ran surprisingly smoothly and was also very productive.
Video introduction
The team did a short video to present themselves and the environment they were in. To find the instructions handed out to the students, go to Appendix II. One problem with the exercise was that it took too long, the video was complicated to make, and the students didn’t know how to use the editing equipment, so they put too much effort in the cutting and editing of the material that they had filmed. Another problem was that part of the faculty on one site was part of making the film, which took away some of the teambuilding side of the activity.

There were also problems with the format of the film and how to send it to each other. Since USA and Sweden uses different video formats and the file was too big to send as an attachment, the students had to figure out a way to solve that. This kind of problem made the students more aware of problems they might encounter in their actual project, but since it wasn’t anticipated or the purpose of the exercise, it was definitely a problem. The students did enjoy making the video and watching the others’ video, but the organization of the activity has to be handled differently for it to be a really successful and useful teambuilding exercise.

4.7.3 Results
The students said they found the suggestions and information in the distributed project team suggestions useful, but also thought that some things were obvious. This is interesting to notice since the problems listed were common in previous studies. The first video conference went well and even if the participants naturally were a bit tense, they all seemed more relaxed and had things from the suggestions that they could focus on, and that in itself made them less nervous and more focused on the task. Things that were very clear that they had adapted was for example; be proactive, have an agenda, start discussing a concrete next steps and by doing all of this they started to get to know each other. Observations pointed to that the guidelines were very useful.

The video introduction was considered fun and definitely helped the teambuilding, especially in the local sub-teams. It was observed that this kind of activity is a little too time consuming for a project under time pressure, if editing is needed, but could be valuable in the right situation and with appropriate support and equipment.
4.8 Case Study 7- Communication Systems Design 2001

The research on the Communication Systems Design 2001 (2G1319) was conducted mainly from Stanford. The course was held at KTH, with only a few specially recruited students at Stanford. The investigation was minor, mainly consisting of self observation, informal questions and interviews. In the course held winter and spring quarter 2001, two teams were working distributively, and only one of those teams was observed. The team observed had eight members at the Swedish side, and three at the Stanford side, of which one was Swedish. The students had meetings over video conference, telephone and IM before they met in Sweden at the midterm seminar in March.

In this study the same research focus was continued, teambuilding and distance collaboration and communication, as well as some of the findings from earlier studies were tested.

4.8.1 Research Questions

- What are main differences between on-site and distributed teamwork?
- What problems and disadvantages do people encounter when separated from their teammates in time and space?
- What are important advantages of having distributed teams?
- What changes occur regarding communication when ICT is used in distributed project work?
- How should ICT be utilized to create a good work and social environment?
- What ICT is actually used in distributed teams and what are opinions regarding usefulness?
- Which factors in the psychosocial work environment are vital for the outcome and satisfaction in distributed projects?
- How can trust be built when people don’t see each other or meet on a regular basis?
- What affects teambuilding in distributed teams?
- What effects do teambuilding and trust have on distributed communication and collaboration?
- What kind of demeanor, skills and behavior are productive when communicating and collaborating at a distance?
- How does the project stage affect collaboration?
- What organizational and managerial aspects are important to consider supporting distributed teams?
- Is it possible to help distributed teams prevent and get passed problems?
4.8.2 Research Methodology

4.8.2.1 Methods of Collection and Analysis of Data

The data was gathered mainly by self observation, since I was part of one of the distributed teams. Data was also gathered in discussions with team members and from the compulsory lessons learned paper (one of the deliverables in the class).

Analysis was made by comparing results and observations in this study with results and considerations from previous studies, analyzing differences and similarities regarding the distributed project work environment and effects on communication, collaboration and individuals.

4.8.2.2 Course and Research Context

The 2G1319 course was held for fourth year students at KTH. The students came from different programs; Electrical engineering, Computer science, Industrial Management and Engineering, and from an International Master’s Program. In-between 60 and 100 students are accepted to the course every year. The course started after the Christmas break, but the students had to sign up for the class and get assigned to teams already in the fall. The teams normally consisted of 3-6 students. Each team had at least one coach that followed it throughout the whole project, but the coach was also part of the grading.

The objective of the course was to offer students an opportunity to learn about advanced emerging technologies and the associated market and business development by working in teams together with students from different programs (and for a few even from different universities), having an interdisciplinary teaching team, and getting input from representatives from industry in projects where specialist knowledge from different disciplines is blended.

The course implements problem based learning driven by projects. By solving “real-world” problems in project teams, the goal is that students will learn advanced technology issues and at the same time become aware of the many other aspects than technical which are relevant for problem solving, design, teamwork, project management and for taking technology to the market. Besides the problem based, project driven approach, the course includes a set of methods facilitating learning, including peer learning, learning from other team members, vicarious learning, to exploit experiences from earlier offerings of the course and “bench-learning”, to learn from the best existing solutions to similar problems and the problem solvers behind them.

Organization

The organization and the design of the project were a cause of problems in the observed team; the team size, the unevenness of the distribution, the complex and disperse parts, the information and communication structure in the organization, etc. The fact that the project in itself was confusing definitely provided a less than optimal work situation; e.g. the project had been three separate projects from the beginning, the idea of having a distributed part came in after a while, the team goal wasn’t clear, and the students had no say in the changes. The reason why the team was successful was that there were some very motivated and ambitious
students in the team that didn’t let the circumstances bring them down. Another contributing factor was that the participants were fairly used to communicating through ICT in different ways and were therefore not as negatively affected by the distribution as well as the fact that a lot of the work could be done locally.

One of the major problems with the collaboration was that the students on the Swedish side didn’t choose to be in a distributed team and didn’t know that they were supposed to be distributed until after the course started. Another problem was that the Swedish students didn’t see the value of adding more team members (since there were so many of them already), and they never really had time to reflect on what to use the distribution for. There was also a resistance because this was decided over their heads, so they didn’t really want to see the value. Since one side was so much bigger than the other side in the team (8 people on the KTH side and 3 on the Stanford side), it happened that the big group left the smaller distributed part out of important and emergent discussions. The team tried to get pass this by dividing into different sub teams, but especially since the sponsor also was on the Swedish side, it was definitely a struggle to keep it equal.

The team was divided into smaller subgroups of three to four people working on different parts of the project. This means the team was divided into the two local groups, four different subgroups with a mix of students from both sides with responsibilities for different areas, special group formations for working with different assignments, etc. The different team formations were beneficial for the teambuilding for the whole team, to avoid just staying in the subgroups and to keep updated about what everybody was doing. Everybody got to work with different parts of the team, sharing knowledge and information across the different subgroups, and it made it easier for the team to work towards the same goal. These different team formations meant that there were team meetings, sub group meetings, local meetings, and special meetings for the people responsible for certain tasks (like developing the project plan, writing lessons learned papers, producing a video, etc.). The whole project was discussed during conferences with the entire team which meant people got a chance to see the process of the different parts of the project, and not only end products, which increased the team feeling and prevented team members from blaming each other for things that had not been done, or not “done right”. By really working together as a team, they became a team. Even with this amount of meetings most students got to know the persons in their subgroup much better than the rest of the team, since those were the ones really working closely and consistently together.

ICT
The team observed in 2G1319 used all kinds of technologies; videoconferencing, email, chats, instant messaging, telephone, cell phones, web board, team webpage, FTP, NetMeeting, etc. Videoconferencing was used for group meetings, discussions of how to work, what to do, and for general discussions and updates. The telephone was used for sub group- and local meetings, for clearing things out and finding out what was really happening on the other site, for brainstorming and for discussions. IM was used mainly for social purposes, but also for questions, updates, and lightweight discussions. It was a very important tool for awareness and worked really well as a teambuilding tool.
The IM tool used was basically ICQ. IM discussions made it possible to get to know at least the members in the subgroup very well before actually meeting them. IM was a very good medium for mixing personal matters, discussions and work. It also provided a possibility to see who was around. It was very useful to keep the motivation up, to get the feeling that you get to "see your teammates" almost every day. Problems that arose in connection with chatting were for example that it was hard to type fast enough, especially when having two conversations going at the same time. Participants are supposed to know what common abbreviations mean (like lol – laughing out loud, asg – asgarv, etc.). This is something most people learn fairly fast, especially if they have the courage to ask when there is something they don’t understand. Another problem was that people have a tendency to assume others have time to talk, just because they are logged on, but that was easily handled, by simply telling people that you were busy. There was a tendency to keep using ICT to communicate even when being co-located, since that was the way people were used to communicate.

Videoconferencing didn’t work as well as phone conferencing for the subteam discussions, since it created a formal feeling, and made the whole setting too strict. It was easier to have a conversation over the phone, and with the setup (described later) available in the videoconferencing room the participants didn’t really see everybody anyway (bad view and angles in monitors in combination with too many people). Another reason why telephone worked better was that the telephone conferences were conducted in smaller groups, which made it easier for the participants to get an overview and have a more structured conversation, even if they couldn’t see the persons they were talking to. The video lectures available for the class were in general pretty tiring, since there was no interaction for the distributed students. The video transfer also suffered from bad resolution and the lectures were most of the time not prepared enough, so the distributed students didn’t always get the slides that was used sent to them in advance of the session, which made the lectures really hard to follow.

One problem with forming a good picture of the remote team members depended on the specific situation and environment in the videoconferencing room used, since it was really different from the situation in a regular meeting. People didn’t know how to behave, what to say, and this particular set up also made it difficult by having individual cameras that weren’t even pointed at the individual seats, but forced people to lean over and most of the time only captured fragments or halves of two persons. The participants also needed to switch them on themselves to be seen by the other site, which even more decreased the motivation to participate actively in the sessions.

The team had a team web page that was used as a front, but also as a place to gather material and communicate. Only some team members socialized on the team web board. The lack of continuous input on the web board made it less valuable, but it was still an added benefit and a way to communicate more informally. There was a real attempt to create a virtual team space, and the team reached some first level of doing that.
Team- and Trust building
A problem was that I came in a couple of weeks late to the project. I tried to share with the others some of my knowledge of distributed teambuilding, e.g. that it makes the collaboration easier if the team knows what problems they might encounter, but knowing about them definitely does not prevent the problems from happening, or prevent people from making them. As just another team member, that in addition came in late to the project, it was hard to do this without creating a feeling of taking over, but at least some attempts were made and the team actually actively tried to get to know each other, even if not extensively, in the beginning of the project. But in a busy class like this, there was not really time to do extra things, and activities will probably not be done if not somebody in charge says so, even though the few teambuilding activities that was done was appreciated and made the team get to know each other more.

4.8.3 Results
The results pointed in the same direction as and added to conclusions drawn in previous studies. Issues that was more apparent in this study, perhaps because of the closeness to the project work, was problems regarding communicating sensitive issues through ICT. Not discussing problems in time and the tendency to hide problems was apparent, not because of any malicious intent, but because team members didn’t want to admit problems they had to people they didn’t know that well and the lack of a suitable forum to do so.

Distributed Collaboration and Communication
A problem that became apparent was how easy it was to get the false impression that everybody agreed on everything in team meetings. Misunderstandings arose because people were humming and nodding in agreement, instead of clarifying what decisions were made and what conclusions were drawn. Everybody thought that their point of view was the one people agreed on, which was something the team members noticed was not the case when starting to actively work. It was very useful for the team to have a Swedish speaking person on the Stanford side to help with language, culture, and most of all to provide a natural connection between the two sites. It was naturally also easier for the Swedish students to simply forward emails they got in Swedish, without having to think about translating them, and summaries and updates could be done verbally on the Stanford side.

The team really used the time zone differences, and worked in shifts when necessary, which made it possible to work almost 24 hours a day when close to a deadline. The time difference was not seen as a big problem, especially since a lot of the Swedish team members normally were up and logged on late at night. This meant they were easily reached and the team could have at least some joint business hours, even in spite of the nine hour time difference. Things were very unorganized in the beginning of the project and it was hard to figure out what was really going on and what the goal was with the project (especially since the team consisted of three from the beginning separate projects who had been combined into one big one, with different goals, wishes and interests). It didn’t help the collaboration that the situation, class and project were very complex.

People tended to be time optimists and a problem frequently noticed in the
case studies was the lack of understanding among students that administration, writing reports and having meetings take time. When planning their projects they tended to calculate how many hours they had, and e.g. use it all for programming or designing. And even when they did not underestimate the time it would take to do a task in the planning, they tended to put in too much time in areas they found interesting, and not enough in others when actually working.

**ICT**

As mentioned, several ICT was used. Email, telephone and IM were considered especially useful, but it was the complete mix of ICT that made it work well. The only thing that was not satisfactory was that there was no good tool for file sharing implemented on the team web page and no real space to socialize, but IM was used for that and worked fairly well to interact, but it didn’t provide a visual image of people.

**Distributed Team- and Trust Building**

There were different implications of lack of trust noticed in the team, increased partly by the distributed situation. A very concrete problem that students encountered, that is partly connected with trust but also with lack of experience of working in projects, is that it was hard for them to delegate, especially to people on the other site that they didn’t know. Even when the team members got to know each other a little better and the collaboration increased, they still didn’t tell each other everything. People tried to hide problems and lack of motivation for as long as possible. More sensitive information, discussing for example problems with the coach or the teaching team, lack of motivation, or problems with individuals in the team, were hard to discuss in the very public videoconferences, and there was not really a good forum for that kind of discussions. Even though a lot of the problems were mentioned briefly, some things didn’t come up until the team met on-site.

Lack of cues made it harder to deal with things and see the real causes of problems. Since it was so hard to figure things out, and the team members didn’t really know the competence of the others and what people were really doing before meeting face-to-face, things changed radically after the team met in the midterm seminar. Just from my own personal experience, I noticed that I trusted some people more after I met them, and others less. Even if I had established a good, open communication with especially some of the team members before meeting, I saw their skills and personality much clearer when meeting in person, I saw who was actually working and who was a slacker, talker, complainer, taking credit for other people’s work, etc. It was hard to get this information through the different ICT used in such a big group. In the videoconferences it was difficult to see or hear some people at all, because they were not in picture, didn’t like to talk, etc. It didn’t come through in email, chat or phone conferences either.

A very noticeable problem when using videoconferencing in particular, and for working at a distance in general, was the magnification of regular problems, since people didn’t see causes, only the end results, e.g. the effect of not keeping meeting times and deadlines. When being far away from people, and especially when not knowing them, it was hard to see the reason for being late, not showing up, or missing a deadline. Was it a technical fault, have people overslept, are they
not interested in seeing me, have I mistaken on what day or time the meeting is, etc? It is very frustrating to not know how long it will take before getting a response or finding out what is wrong, if ever.

In spite of the small amount of teambuilding, the communication within the sub teams worked well. To mix social interactions with work, especially across national boarders, was really helping the work. It made it easier to be more open, people were allowed to get annoyed or be grumpy, and responded if they thought somebody else was grumpy, without feeling that they were harming the working relationship. Socializing was mainly done on the team discussion forum and with ICQ (IM), but also in telephone conferences and in small doses when having videoconferences. During the conferences there were too many people to really get a relaxed atmosphere that encouraged jokes and having fun.
4.9 Case Study 8- Use of IM for Professional Communication 2003

Is IM (Instant Messaging) a useful communication’s tool for professionals? 2003 there were over a million users of IM in Sweden alone (Computer Sweden, no. 8, 2003) and the number increases constantly. For a lot of younger people this is a natural way of communicating. The question is; will it take the step to become a work tool?

The words IM and chat are often used for the same phenomenon. Chatting is the activity and IM is a particular way of chatting and a specific type of programs used for chatting. The word chat is often used when more than two people communicate and IM when only two people are chatting with each other. Both these functions are available for users of IM-programs. As you can see the vocabulary can be confusing. Discussed here are the programs for synchronous text chats between two or more people where you have the possibility to choose chats for more than one person or sending a personal massage to one. In these programs you can see the “presence” of others, that is, if they are available or at least online. People are visible in a so called “buddy list”, a contact list where it is possible to see if a person is online and the person’s status (availability).

4.9.1 Research Questions

The hypothesis was that IM is a useful tool for collaborating in work environments, even if the main use of it has been for recreation. The transition to a work tool might not be easy, since a lot of people see IM as something strictly social (and less professional), and people have to get used to the specific problems and opportunities that comes with the media. How useful it is also depends on the personality of the user.

The purpose of the case study was to find out how IM is used as a work tool today and what the communication patterns look like. What is it used for? Who do you talk to? What do you talk about? What does the communication’s structure look like? In what situations is it used? And what problems and opportunities come with the medium? Is IM a useful work tool? I tried to answer the question by enlighten the subject from different angles.

- What are main differences between on-site and distributed communication?
- What problems do people encounter when communicating separated from each other in time and space?
- What problems and opportunities come with the media?
- What changes occur regarding communication when ICT is used?
- How should ICT be utilized to create a good work and social environment?
- Do people use IM for work? Why? Why not?
- In what situations is IM appropriate? For what purposes is it used? How is it used?
The investigation was not conducted to see how much IM is used in work at a more general level, but the study has been conducted to see the potential of IM as a work tool and how people actually use it in their daily work. The aim was to use the study as a complement to previous studies, since the use of IM has increased during the last couple of years and was only covered briefly in previous studies.

4.9.2 Research Methodology

4.9.2.1 Methods of Collection and Analysis of Data

A smaller field study was conducted where professionals that actively use IM in their daily work was interviewed. The field study consisted of interviews of 7 users of IM. The interviews were based on set questions, but the aim was to get the interviewees to talk about their experiences, so the exact same questions were not asked to all participants. The interviewees were all men in the age of 28-43. We didn’t strive for having only men, but it was the access of volunteering participants that decided that. Of course that affects the results, but the participants still used IM in different ways, and it is likely that the attitude towards IM more depends on age, personality, how used the person is to computers in general and IM in particular, etc.

For the interviews people actively using IM for their professional work were chosen. All interviewees worked actively with people that were not physically located in the same place as they were. A lot of them were also in leading positions in their company. They all claimed that IM has enormous advantages and considered it as the major communication’s tool for the future.

The interviews were conducted in places the participants chose themselves, basically cafés or at their work. The interviews took in-between 30 and 90 minutes to conduct. Participants were recruited by sending out requests via email and by asking friends if they knew people that use IM for actual work. It seems like the use of IM for work is not that common yet, even if a lot of people use it for recreation since it was harder than anticipated to find subjects for the study. Before the interviews the participants were informed about ethical rule, how the information was going to be used and the purpose of the investigation was described.

4.9.3 Results

With IM new ways of transmitting emotions through ICT are used. There are other conventions for how to converse and what is necessary to say to be polite or correct enough differs immensely, not only from face-to-face interactions, but also from other ICT.

Between Writing and Talking

The participants in the study didn’t have any concerns about communicating with text instead of speech. They said that it doesn’t take that much longer to write, since the tendency to use abbreviations in IM makes the language more compact, and in general, IM users don’t care as much about formulations, spelling, grammar and syntax. The majority of the participants used smilies to show emotions and

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avoid misunderstandings. Smilies were considered necessary and especially important when they did not really know the person they were communicating with. Interesting to notice is that the one participant who had used IM the shortest period of time and had not started with it for social conversations claimed that he barely used smilies at all, and that he did not think it was necessary.

There was a tendency among the users to skip the normal polite introductory phrases, and that was seen as something positive, something that made it possible to make the conversations more efficient. It was not necessary to introduce yourself (as you do over the phone), since it is easy to tell who a message is from. Sometimes greetings were still used, as a method to see if a person was really available and sitting by the computer; e.g. people sent a “good morning!” and saw if they got a response or not.

In IM-programs users can clearly signal their availability, the so called status, if they are away from the computer, busy, don’t want to be disturbed, etc. The participants said that it was harder to say no to a conversation if somebody called or came by their desk than if they got a message on IM. The ability to choose if they wanted to communicate, at the same time as it was real time interaction, was seen as a huge advantage. Users thought that IM helped decrease the number of un-welcomed breaks during the work day. They felt that the “status messages” were respected in most cases. Not everybody used the possibility to mark their status, though, and the participants said that it was easy to forget to turn it on and of, but that wasn’t perceived as a big problem. If they were away from the computer for a while, that was automatically signaled in the buddy lists, which was seen as a helpful aid. The participants didn’t feel that they were disturbed by messages popping up on the screen, that they had learned to handle that. They were aware of people, though, that had stopped using IM because they felt stressed and felt obliged to answer immediately as soon as something came up on the screen.

Nature of Communication
IM was used for short notifications and exchanges of information, in situations when the participants needed immediate responses, to make appointments, or to brainstorm or try out ideas. Since many of the participants spent a lot of time in front of their computer, it was considered very convenient to send a message as soon as a thought occurred, and IM was seen as a very useful tool for trying ideas and getting immediate feedback. One user pointed out that a lot of the time this was ideas he would have forgotten about if it had not been for IM. IM was also considered particularly useful since a person can use it at the same time as he or she is speaking on the telephone, which meant that people could get quick responses and pass them on, answer questions they got over the phone by asking others simultaneously over IM.

Email was perceived as more formal than IM and a medium more appropriate for spreading information, compared to IM that is more useful for dialogue and interaction. The users compared the use of IM with the one of the telephone, with the difference that they used the telephone for longer conversations. Interactions over IM normally lasted a couple of minutes and they seldom lasted longer than 10 minutes. They also seemed to be very sporadic.
Conversations tended to last longer if people had not seen each other for a while. For longer conversations the most common media used was the telephone. A couple of the participants in the study had conferences through IM, and in those cases the sessions lasted around one hour. Even if the actual interactions normally were brief, the communication in itself could last for a long time, with sporadic messages now and then, when people felt a need to say something.

Work and social conversations were usually mixed, and a lot of the time more than one thread of conversation was running simultaneously. Most of the time the users interacted with only one person at the time, but sometimes they had several one-to-one conversations going on at the same time (up to five, depending on the participant). The participants pointed out the difficulties with keeping several conversations going simultaneously, at the same time as they saw the advantages of the possibility. Very rarely they used the chat function with more than two persons in one window. Even if some used IM for conferencing, it was mentioned that when using chats when interacting with more than one person, it was most of all useful for somebody to inform a group of people about something and after that open the chat up for questions. Some participants used IM to send files, and some even started to discover more of the special functions available, like shared whiteboard, speech chat, etc. IM was also a useful complement to cellular phones, especially in areas without coverage.

When is IM used?
The people the participants talked to via IM were naturally the ones they had on their buddy list. Most of them wanted more people they were working with on their list. They still noticed a resistance towards using IM, and that a lot of people had not even ever come in contact with it, but they thought that would change. IM was used frequently to communicate with distributed co-workers and associates, but also consistently with people locally. They stated that it was more the situation and personality that decided if IM was used to communicate, and not the distance, even if it was considered particularly useful across time zones.

Awareness
An important aspect of IM as a communications media was the fact that it showed when other people were online. The participants thought that this always was useful, but particularly useful across time zones. It made it much easier to get a hold of people and check if they were awake and available for conversations. The importance of presence was also emphasized, that the buddy list was a reminder of people’s existence, which led to meetings, telephone conversations or IM-chats.

Technical Issues
There are still some technical problems related to IM, like for example that participants need to use the same IM-program to communicate. There are programs nowadays that can connect different IM programs, but it is still limited to the biggest programs and it demands effort from the user to be able to do that. If fire walls are installed, IM can normally not be used at all. The IM users we talked to thought the advantages with IM as a work tool definitely surpassed the disadvantages. Unfortunately the safety is generally pretty low in IM-programs
regarding encryption, transmissions, intrusions, etc. Not all users were aware of this, but the ones that were aware said they had chosen to take the risk and get the advantages of being available.

**Conclusion**

In spite of problems all participants in the study were extremely positive to IM and believed that it will be the *next big revolution* after email, and it is already one of the biggest productivity improvements in a long time. The results from the study are in line with the hypothesis, but the extent of how positive people were and how important to their work their IM use was, was surprising. They all claimed that their daily work as it looks today depended on IM and that it has developed into one of the most important work tools. In spite of this there is still a very limited amount of people that seem to use IM *for work*, and it was hard to find participants for the study.
5. Discussion of Results

In the following chapter there is a discussion of the most interesting and vital results. In Chapter 5.1 results from the case studies according to the problem statement are recapitulated. In Chapter 5.2 and 5.3 results in areas that were demonstrated important for the distributed project work environment and affected attitudes and the communication and collaboration are discussed. These results are more thoroughly analyzed and occasionally also connected to the literature (Chapter 3). Far from all literature is recapitulated and discussed in this chapter, only a few selected ones where my results either contradict the findings in previous research, or become more strongly verified by the literature. In Chapter 5.4 the discussion is ended with a summary and conclusions. To recapitulate the general research context, to understand the framework of the results and to be aware of the generalizability of the discussion, please see Chapter 4.1.

5.1 Summary of Results According to Problem Statement

Results from Chapter 4 are recapitulated and summarized in this section, to gather results from all studies and more clearly illustrate what the results are according to the problem statements. There are a few new quotes to illustrate the results, but most of the material here is more thoroughly presented and exemplified in Chapter 4, and this should be viewed mainly as a reminder and summary of central results.

5.1.1 Effects of Distribution

5.1.1.1 What are main differences between on-site and distributed teamwork?

It was observed in all distributed teams that regular communication and collaboration rules did not always apply in the distributed project work environment. There were e.g. a lack of visibility, teams were demanded to work much more asynchronously using text based communication, and many regular ways to get to know each other and develop relationships were not present. It was observed that the distributed teams in the case studies went through basically the same stages as any other team. Some types of problems became harder to overcome and there were new obstacles as well, while a few problems decreased in magnitude, and new opportunities opened up. Because of the distance teams had fewer “natural ways” to perform team- and trust building, and fewer “natural ways” for random social interactions, with natural here meaning ways that people were used to from every day life.

It was observed and stated by participants in all case studies that there were fewer and sometimes distorted cues, which often led to more formal interactions, a
higher risk for miscommunications, and that the team members couldn’t interpret each other as well. *Visibility* was an important factor and team members in all studies mentioned that they lost awareness of each other; it was harder to “feel” the presence of their distributed team members and what work was actually done wasn’t evident. This meant e.g. that it was harder for the teams to keep track of and get a hold of each other, as well as it hindered team members from “feeling” close.

Confusion arose in teams in all studies because of the lack of knowledge and reflection about *norms and rules* at the other site. The differences weren’t obvious to the team members which led to that teams neglected discussing them. Even when participants were aware of the different systems, it was easy to forget about them or be unclear in communications. It was noted that people couldn’t always use the same methods to get *attention* and influence others and the need for *documentation* and clarity was much higher in the distributed environment. Since team members didn’t see each other, the *power structure* was affected. People that were used to talking a lot, wasn’t always able to do that; text and writing became more important; and looks, posture, and charisma was not as influential any more, etc. The rules for *turn-taking* changed and people had to learn new ways of communicating, e.g. a lot of the time the communication had to be much more explicit.

It turned out to be easier to *hide problems*, which was noticed especially in 2G1319, because of difficulties interpreting people and since work and activities were less visible. It was in one sense easier to hide and avoid working, since the distributed part of teams could not see what was really going on. At the same time the distribution made the communication more *traceable*, since there was a record of text-based interactions and promises. The distance made it harder for teams in all studies to keep the motivation, build trust, get to know each others’ strengths and weaknesses, get to know each other’s competence, interpret people’s actions and interactions, and know what people were actually thinking and doing.

5.1.1.2 What problems and disadvantages do people encounter when separated from their teammates in time and space?

It was intricate for the distributed teams to *keep the motivation* in the long run. It was observed that when the distributed project was the only work a person had, it was a little easier, but when people had a lot of “local” work it was normally prioritized, since it was more visible and concrete. Lack of awareness and visibility led to problems with motivation regarding the actual project work, but especially decreased motivation to communicate or socialize with each other. When not seeing each other the incitement for the teams to *get to know each other* decreased; which made it less likely that teams saw each other’s strengths, personality, competence, work ethics and weaknesses, and they had problems interpreting each other.

The fact that team members lost *awareness* of each other made as mentioned it harder for them to feel each other’s presence, they got problems keeping track of and getting hold of each other, and it was difficult to know what was really going on, and know what people were actually thinking and doing. It was noticed that
people were not aware of what others were actually doing or what they had the competence to do. This also affected trust building in the teams. Observations from all case studies showed that an important and real obstacle for the distributed teams was gaining trust; having confidence in each other and really understanding one another, especially when matters were complicated or sensitive. When people did not get to know each other trust didn’t unavoidably disappear, but it didn’t grow either.

The teams had difficulties dealing with if somebody didn’t put in their share, communicate or collaborate. A lot of the teams had problems getting hold of people and information, and sometimes people were even withholding information. When actually obtaining information, the teams had to deal with the logistics of the situation. They had to find good ways to transport data and artifacts, decide how to store them virtually so that they were accessible to everybody in the team, and decide rules e.g. for naming documents, and ways to avoid that two persons were working on the same document or artifact at a time. Logistics problems because of time zone differences and the necessity to always communicate through ICT added to the complexity of the situation. It was hard with ICT that worked, and very intricate with ICT that didn’t work or was difficult to use. It was observed in all teams that the fact that people were unaccustomed to teamwork solely through ICT led to problems handling information overflow, conflicts, getting to know each other, etc.

Working in a team with people with different personality, goals, agendas, etc., was complex, and when cultural differences, ICT and language problems were added, the situation became even more intricate. The language differences did not only make it harder for some of the participants to communicate, understand or speak, but it also affected the power structure in teams. Team members who were less fluent in English were not always able to express their ideas as effectively. It became obvious how important it was for everybody to try to use words that everybody understood, ask when not understanding something, and make an effort to improve the communication.

Distance made it harder for team members to get a feeling for who others were. Before they got to know each other they e.g. didn’t know about each others’ knowledge and competence. This was partly overcome with the help of presentations, resumes, and introductory web pages, but these were only starting points and deeper discussions were demanded to really understand who others were.

It was mentioned by teams in all studies that it was harder to figure out the causes of conflicts and resolve them, since it was more difficult to tell when they started, why they started, and they were generally difficult to detect. The teams had to discover the problems in time and deal with them without getting into worse conflicts or hurting people. According to students it proved to be important to deal with conflicts early, since they easily escalated partly because of the lack of cues. A lot of the students, especially in IE264, mentioned that conflicts within their teams were caused mainly by communication problems, or differences in communication patterns and working style. Things got taken for granted, became misinterpreted, over-analyzed, people didn’t dare to say what they thought, or if they did, they sometimes offended others or took over the scene. Team members
always had to consider the possibility that various parts of the team had different agendas, different demands and goals, and different expectations. More concrete problems regarding personal planning was also considered hard to deal with, like having diverse time plans, schedules, and not being synchronized. See more examples in Chapter 7, Recommendations.

5.1.1.3 What are important advantages of having distributed teams?

An advantage of the distribution pointed out by multiple students was that the teams got access to international knowledge and information. When teams are distributed the likelihood for diversity increases within a team. The teams thought they broadened their views and got perspectives from other continents, countries, cultures, traditions, and disciplines by working in internationally distributed teams. By getting exposed to other ways of thinking and working, the participants in IE264 and ME310 thought it was easier to see both the advantages and disadvantages of their own system, and that was a good ground for self evaluation and analysis. Students said they got impulses that affected the way they thought about the way they were working that improved their skills more in the long run than the project work in itself and they got to see different equipment and different ways of working and thinking. When the distribution was considered beneficial for the actual project work it led to more creativity, reflection and a higher motivation. It also helped the teams document, explain what they were doing, and to be explicit in their communication. The distributed teams mastered communication through different ICT and how to handle interpersonal relationships when not seeing each other. In some cases the team members opened up faster, because of the use of media and since they felt it was necessary when actually meeting.

The teams in IE264 and ME310 mentioned that they learned about what information was important to communicate about, and how to be able to communicate it. When working in a distributed team, they had to be able to explain what they were thinking more thoroughly and therefore had to structure their thoughts more and because of this the communication and documentation improved. By having to continuously document things more thoroughly and explaining the process, the end product and documentation got better. To be able to explain their work to somebody who had not seen the process, they had to know about all the steps they had gone through, and make assumptions explicit and noticed. Some concrete obstacles were to a certain extent turned into an advantage, like e.g. time zone differences. Participants in all studies mentioned the possibility to work around the clock. The Orange team in ME310 emphasized that they liked having the cultural exchange with their teammates, that the collaboration brought more energy to the project and being distributed really added value to their team. Most importantly, most of the students really enjoyed working in the global teams, and the collaboration added motivation and knowledge to the projects.
5.1.2 Communication and Collaboration through ICT

5.1.2.1. What changes occur regarding communication when ICT is used in distributed project work?

When ICT is used communication and collaboration change. People get access to new channels with different possibilities and limitations. The communication doesn’t necessary become more limited, but there are limitations as well as new possibilities that have to be utilized to really benefit from the distributed situation. Sometimes it was the increased possibilities that denoted the atmosphere in a distributed team, and sometimes it was the reduced amount of cues that decided how people felt about their work environment. The main problem was most of the time not the ICT in itself, but learning how to use it to reach the best results, learning how to feel comfortable in the new work environment, and learning how to be social and get to know each other through ICT. Using ICT for collaboration also changed team members’ perception of and relations to other people, which is an issue that has to be taken into consideration.

One area that was challenging for the distributed teams was that they had to use ICT for all communication, which means that they had to be able to choose the right ICT for a specific purpose or activity and handle sensitive topics through technology and not only use it when it is the most suitable or convenient. The communication was different in different media and teams had to adjust the use and choice of ICT depending on the purpose and activity. Different media gave opportunities for different modalities, how much time people were expected to spend on socializing and formalities, provided a more or less formal environment, etc. The distributed teams had as mentioned to rely more on text-based and asynchronous communication. A problem for the distributed teams noticed in all case studies was therefore handling speed and amount of communication. It took time to get answers, and the time before getting a response was not always easily predicted. It also led to difficulties keeping the right level between too little information and information overflow. Sometimes the teams found it hard to get information at all because of e.g. lack of visibility, and other times they drowned in information, since for example the web and email encouraged people to post and send a lot of information. With ICT in general there is a possibility to record, save and send enormous amounts of information without much effort involved, which easily leads to information overflow, with plenty of work necessary to process, structure and find information. The teams were struggling to learn how to communicate with the new channels that ICT provided, but they also struggled to handle the immense amount of information and communication channels available.

At the same time as teams tried to reduce the number of communication channels, it proved essential not to rely on one medium when dealing with important information. ICT frequently failed, so the distributed teams had to be prepared with backups and choose media that made it easy to establish smooth communication, i.e. was stable enough, was suitable and felt comfortable for everybody involved. Some people preferred typing compared to speaking, especially when not using their mother tongue, since it gave them time to think and spell check what they had written. Others found it very hard to discuss via any
kind of written media.

Since ICT provided teams with fewer cues, they had to learn new behaviors and learn how to interpret other people with base in the cues and information they got. The lack of cues made it essential to be explicit when speaking, to be careful with jokes during serious discussions and forming action items to handle the distance. On the other hand it was noticed that doing so took away some of the directness, freedom and fun that is an important part of communicating. Even when the ICT was working well, there were less and sometimes distorted cues, providing only fragments of people; visually in e.g. videoconferencing or personality wise by showing different sides of a person than on-site. The distortion was sometimes even worse than the lack of cues; it increased the risk for miscommunications and gave people the wrong expectations of what people were really like or what they really meant. The loss of cues was especially noticeable in text-based communication. Even if people used e.g. smilies, supplementary explanations were needed and people were more careful, or misinterpreted each other. Fewer cues sometimes also had a positive side; that people focused on the task and the content, instead of the presentation of something. As mentioned, lack of cues also affected the power structure and level of influence people had.

5.1.2.2. How should ICT be utilized to create a good work and social environment?

It is vital to chose ICT depending on a team’s needs and not on what ICT is available. Learning how to use new ICT was time consuming which is one reason why it is important to really analyze why a team should do things or use a particular ICT, and what efforts are involved in the activities. According to the teams in IE264 it proved to be imperative to reduce the amount of communication channels that needed to be checked, to avoid fragmentation and the aggravation of having to visit a number of places to find information, as well as it proved important to avoid changing ICT during the actual project. Once selected, it was costly, difficult and time-consuming to switch tools. If an insufficient tool was chosen, it was naturally better to change it than to keep using the inadequate tool. It was hard for teams to evaluate what ICT to use before they started working, and most teams did not have a thorough discussion about what to use, when to use what and why. It was considered significant to have a common virtual team space, since when information resided in too many different places it was inconvenient and confusing and teams easily lost track of the latest information.

Using ICT to help record and document the team process was useful, but there was a downside of recording everything or too much, especially when the ICT was not easy to use or didn’t work, which especially teams in IE264 had a tendency to do. Besides from using too many different ICT, one specific ICT could also be overused. When there were too many emails, or too much information, the problem was not only that people didn’t have time to read everything, it was also hard to prioritize and find the most important or most recent information. Some teams were actively selective with communication and made summaries, which also turned out to be beneficial for the person making the summary, since it provided a chance to learn and in that way it also increased the knowledge in the team.
It was important to not overuse one ICT because it was familiar, if the medium was not suitable for the communication; choose stable technologies; have backups; and choose the right ICT for specific activities. Successful choices included adjusting the ICT to the tasks and the content of a project, what “personalities” the participants had (if they were spontaneous, planning, extroverted, introverted, detailed oriented, theoretical, practical, logical, etc.), how used they were communicating through different media, etc. Teams in all studies emphasized the importance of having ICT for storing information (a joint team space), for social interactions, and for both synchronous and asynchronous communications.

5.1.2.3 What ICT is actually used and what are opinions regarding usefulness?

The ICT used in the studies were telephone, email, videoconferencing, chats, instant messaging, cell phones, web boards, team web pages, web communities, FTP, other file sharing programs, NetMeeting, etc.

The most popular means of communication among the teams were unquestionably telephone and email. People knew how to use them and how they worked, and perhaps even more importantly, they were reliable. Email was used since it was a fast, easy, and a well known way of communicating. Even if email was frequently used, the teams still had problems associated with using it. One of the issues with email was learning how to deal with the subtle line between formal and informal conversations. It was easy to be too informal or send emails that were not really thought through. Even if people have learned, by using email for years now, to overcome a lot of the pitfalls and limitations, it is still a balance act that all users have to deal with.

There was a tendency to overuse email, send too much information, demand answers too quickly, and assume that people had constant access to their email accounts. It was also hard to decide the level of interactions, to not be too candid at the same time as making sure that the message was clear. Email proved to be a bad way of communicating requirements and suggestions, even though it seems to be straight forward information that should be able to be communicated easily electronically. The written word came across much harder and suggestions were easily interpreted as absolute truths or strict guidelines, especially between people that didn’t know each other. This was noticed especially in ME310.

Having joint file storage was valuable for the distributed teams. It made it possible to e.g. share information immediately, get measurements right and made documents more communal. Web pages where students kept information and documents were an opportune source of information also for sponsors to keep updated. Everybody involved could get a feeling for the actual process, and did not only see final documents and products. Web pages were also beneficial by providing the potential to support the creation of portfolios. A problem was that it was sensitive how much and what of the team’s work that was shared with other teams, companies, or future classes, and it was not always clear what to expect. Privacy definitely was an issue, as well as handling sensitive or secret information, and it was not always discussed; who was going to see the discussions and information on the web, when and where could participants talk freely, or should
they always feel like somebody could hear what they were saying, and that people could even go in afterwards and check what had been said? When students felt they were under surveillance, they didn’t speak freely, and probably never felt completely comfortable.

When the videoconferencing was working, the students in ME310 thought it was a good tool for collaboration. It had the advantage that it helped keeping the visibility, motivation and energy up. The students in IE264 in general preferred using telephone for conferencing, since the videoconference system was too expensive, too complicated to use, and needed support staff. The videoconference system was used in 2G1319 for the big team meetings, but telephone conference was in general considered more useful.

IM proved to be a suitable medium to provide awareness and support social interactions and brief discussions. One feature was that it encouraged people to open up and talk about more personal matters faster than they would even compared to meeting face-to-face, which was useful to get the communication started. Even if IM seems to have a lot of things in common with face-to-face discussions it proved to be far from the same. People could talk simultaneously, with several discussions going on at the same time, that could be saved and easily retrievable afterwards. There weren’t any problems in the teams in the case studies with flaming or inappropriate behavior as in open online chats. People seemed to be aware they had to deal with the consequences of their actions, but some of the informality in chats and email conversations remained, e.g. like being very open-minded and outspoken, even when moved to a work situation, and that sometimes caused minor predicaments.

5.1.3 The Psychosocial Work Environment, Teambuilding and Trust

5.1.3.1 Which factors in the psychosocial work environment are vital for the outcome and satisfaction in distributed projects?

It was possible for the teams in the case studies to work at a distance without regular face-to-face meetings, even if it was intricate. It was different, and the big danger and main problem was when team members didn’t think about that it was different or how it was different, and how that would affect the project work. Regular ways to work together were not always possible since teams communicated and collaborated through ICT and that demanded changes in behavior and affected how people perceived each other and what was communicated.

Significant objective factors turned out to be the structure of the organization, the power structure within it, how important the project was considered, the leadership, sufficient time management, the reward system, the organizational design of the project, the content of work tasks, communicational patterns, as well as the physical environment, distance between team members, the different stages teams went through, and the CT available for the teamwork. Several factors regarding the team composition affected the work satisfaction and team
development in the distributed environment. One of the first things that affected how the teams progressed was how they were formed and the actual team composition; what personalities were in the team; how well did they know each other from before; how much did they have in common; what competencies were there in the team; how was the team distributed (how many persons on each site, on how many sites, what the geographical spread was, etc); how many members were in the team; etc.

The *individuals* affected the outcome of projects in important ways, depending on their background, personality, attitudes and state of mind (partly affected by the objective environment). Teams with highly competent and *motivated* individuals could succeed despite obstacles in the objective work environment. If teams managed to create a *team feeling, awareness* of each other and the team process, *trusted* each other, managed to keep an *open communication* and enjoyed *socializing*, it affected the outcome, the level of communication and the satisfaction among individuals in essential ways. More detailed descriptions and examples of connections and variables can be found in the theoretical model presented in Chapter 6.

It became clear during the observations that one of the most important factors to create a good work environment was to have a *supporting organization and management* and a *clear information and communication structure*; so team members knew what to expect and how to behave (see more in e.g. Chapter 5.1.3.1 and 5.1.3.7). It was also vital to have sufficient team management; that teams set clear goals and rules, knew the direction and how to get there. To make collaboration at a distance work, all case studies pointed towards the importance of being well organized, structured and consistent so people knew what to *expect*. Predictability helped when teams had fewer cues to guide them and when the motivation faded. At the same time teams needed to be flexible, especially since the situation was new and things needed to be adjusted throughout the project.

Suitable *technology support* proved to be important. The teams needed to communicate synchronously and asynchronously as well as share and store files in an easy and organized way (see more in Chapter 5.1.2). The ICT was most of the time not the deciding factor, though. People adjusted to whatever was handed to them, but sufficient support and suitable choices of ICT made the collaboration and communication easier and smoother and provided an environment where the team could focus on things more directly associated to the project. When the environment had adequate support for the team to work, collaborate, and be social and have random interactions, without being too complex and confusing, it was a good base for collaboration. It was also beneficial when people got a feeling for what the environment, the people and the local systems were like at the other site.

Support to create *awareness* of each other, each other’s competence, as well as knowledge about what work was really done, proved to be an important factor. For people to feel comfortable it was imperative that the environment allowed them to display their personality, and that there was room for humor and *social interactions*. That created an environment where everybody was involved and working, which in turn led to higher equity in participation. When team members had the opportunity to get to know each other, have fun together, create common goals and build trust they started to *feel like a team* and enjoyed working together.
This in turn led to a higher likelihood that teams could handle conflicts and problems with ICT and a confusing environment better, and shape a work environment that was creative and productive (see more in Chapter 5.1.3.2-5.1.3.4).

5.1.3.2 How can trust be built when people don’t see each other or meet on a regular basis?

One noticeable factor was that an essential foundation for communication was trust and the foundation for trust was communication. This interdependence was important and played a major role for if the distributed teamwork turned out to be enjoyable and productive. It became clear that people collaborating at a distance can’t base their feelings of other people on instincts and impressions exactly the same ways as when meeting on-site, and more active trust building is important for distributed teams. It also became clear how important it was with some kind of leader that supported this kind of activities, brought up the topic, or started discussions, since people tended to be very task oriented, even more so when working in a distributed setting. It proved to be hard to implement non-task-related work for persons that didn’t have the necessary “power”, especially since there seem to always be a lack of time in projects. The leader has to help anticipate possible problems and conflicts and assist a team when trying to overcome them, to avoid the development of distrust.

As mentioned earlier, it became clear how important it was for participants to be aware of each other’s competence and see reasons for collaborating to get motivation to put in effort and actually try to get to know the people working on the other site. Learning about each other and hence build trust can be accomplished by meeting, making presentations, socializing, having teambuilding activities, etc. When team members didn’t get to know each other they didn’t reach the level where they were willing to be as open and take the risks necessary for truly good collaboration. Imperative was to show respect for each other and maintain a direct communication that was still considerate of other people’s feelings.

One way to build trust was as mentioned to conduct a site visit with the purpose to get to know each other in a situation more familiar to everybody. In the case studies there was a definite difference in trust both observed and mentioned after meeting face-to-face. Generally people trusted each other more after they had seen each other, but trust was also sometimes diminished after actually meeting. Expectations were sometimes wrong; people tended to hide information and problems, tried to look better than they were, preferred writing from talking and hence showed completely different personalities through media than face-to-face, etc. In the site visits that worked the best the participants were prepared and often also started the team building at a distance, and they tried to be honest and open, even when working separately. The site visit also gave teams a common experience that could be the first step to creating a common ground.

A way for the distributed teams to create trust and a team feeling was to focus on similarities, and in this way create a common ground for the team. When doing so it was on the other hand easy that they didn’t acknowledge differences. When this happened, focusing on similarities rather introduced more conflicts and
misunderstandings since it created the false impression that everybody thought 
and felt the same.

Trust was tightly connected to people’s expectations. Loosing trust normally 
was connected to miscalculations in other people’s behavior; that they didn’t 
behave as predicted or desired, etc. It was not necessarily exactly what people did; 
it was the way they did it or what they did in comparison to what was expected 
that was imperative. Especially before really knowing each other, to become 
trusted it was essential for team members to show that they had the necessary 
competence when it came to the tasks in the project, to keep deadlines, be on time 
for meetings and follow the norms and rules stated by the team. How people 
behaved really affected the trust put in them; if there was a consistency in 
behavior, structure and organization of the work, predictability of actions, 
awareness of differences, honesty in what was said, etc. For trust to be built it was 
important that people believed that a person could do what needed to be done, 
would do the necessary work, and didn’t use what was said against the team or 
took credit for something that the team or somebody else in the team had done.

To avoid misunderstandings and build trust there was a need for both 
technical and organizational support; to create an open communication and to be 
able to handle conflicts directly. It was important in the long run to be honest 
about problems. Verbal competence was useful and promoted trust, at least in the 
cases when it was not used to take over discussions or decide to much in a team. It 
was very important to be explicit, since there were fewer cues and non-verbal 
interactions in the distributed projects, which made it harder for people to read in-
between lines. It was considered vital to support humor, or rather having fun and 
having social interactions, to provide an environment where people felt 
comfortable and where it was easy to get to know each other better on a more 
personal level, since that was the best way to start a trust building process. The 
best way in the long run to keep the trust up was naturally that everybody actually 
was trustworthy and did their best to be an indispensable and active part of the 
team. Without people that are actually being worthy of trust, no environment or 
exercise helps.

5.1.3.3 What affects teambuilding in distributed teams?

Teambuilding normally takes longer for distributed teams and, as with trust 
building, demands more active work. A factor that really affected team- and trust 
building was how well the team managed to create a team identity, a feeling of 
belongingness and actually being part of a team that was working actively in the 
same direction. In the teams this happened more or less naturally. Diversity was as 
mentioned considered beneficial by the faculty for the results of collaboration 
regarding quality and richness, creative outcome, etc., but it was not always 
beneficial for team- and trust building. Diversity (regarding some aspects) within a 
team as well as physical distance can lead to an even greater feeling of distance. It 
was easier to form a team if people thought and behaved similarly. For the diverse 
teams it was important to actively try to get to know each other to be able to take 
advantage of the diversity and not only get stuck in the differences. Face-to-face 
meetings were not only beneficial for trust building, but also for building a team 
identity, since it helped creating a common ground.
Competition with somebody or something outside of the team was one way to increase the team feeling, even if there was a risk that competition within the team was developed. Some people pointed out the importance to suffer together, to feel that they went through something together that was worth remembering and working hard for. Awareness of each other and what the others were doing were also vital to start feeling like one team. One means of achieving this was to support visual information through a camera. Having a team space, a virtual or especially a physical one, was furthermore important to create a team identity and a common ground. How comfortable teams felt and how successful the social communication was depended a lot on the ICT used; not only that it worked, but that the right ICT was used and that team members felt comfortable communicating through the ICT. It was vital to have suitable technology for social interactions, to not create a completely task focused collaboration. When team members got to know more about each other they had the opportunity to create a common ground, a base to build their future relationship on. There was a radical change when actually meeting in person and the perception of people changed and developed in most teams. Sometimes the change was for the better, sometimes it wasn’t, but it changed.

5.1.3.4 What affects do teambuilding and trust have on distributed communication and collaboration?
Without a team feeling developing and participants trusting each other, there was less motivation to interact, socially and within the project, which in turn led to that the openness and level and amount of work interactions decreased. When teams were not strictly task focused people were much more willing to put in effort. A team feeling and creation of an open environment also affected how willing people were to take risks, dared to be open, come with suggestions, be creative, dared to be themselves, use humor and have fun while working together. When people didn’t feel associated with the team, the project and the environment they were in, they either became too cautious or didn’t care as much about the relationships, so conflicts and misunderstandings increased. Most importantly, creating a team feeling made people more satisfied with their work environment and kept them motivated through difficulties.

5.1.3.5 What kind of demeanor, skills and behavior are productive when communicating and collaborating at a distance?
According to observations in all studies several of the demeanor, skills and behavior important in teams in general became even more important in the distributed teams. It became apparent that it is even more important to actively get things started when being at a distance, since everything took longer and the energy from meeting and starting something together was not as strong. To keep the work going it was also even more important to be proactive and take initiative, and not just wait around for others to do things; to plan ahead and set goals, norms of conduct and rules that everybody agreed on in the beginning, but not be afraid to revise them when necessary. Since it was apparent how much easier it was to
loose motivation at a distance, being self-motivated and curious proved to be valuable traits. Since the work entailed dealing with other cultures (organizations, disciplines and countries), being open-minded was also beneficial, to really be able to take advantage of the different perspectives and differences in the team.

Communication skills are vital for all collaboration, but the communication skills needed were slightly different when the work had been transferred to a distributed environment. It was observed that team members needed knowledge about how to behave in different media, how to use different media and an important factor was also if they felt comfortable with the different media. This was noticed in all case studies and was something the teams struggled with and improved at during the course of the projects. The emphasis had to be even more on that communication should be clear, open and explicit, since it was harder to read between the lines when not having access to as many cues. Team members in all case studies thought it was more difficult to interpret people with the fewer cues provided in a distributed environment. Since it was harder to interpret messages, it was also considered important to be sensitive to others’ needs and feelings, and not take over because of advantages when it came to language, distance, experience with ICT, the project content, access to information and people, personality, etc. When team members became aware of this they sometimes became too cautious, since they didn’t want to hurt people’s feelings, but it was noticed that being too cautious inhibited work relations and things from being done as well.

It was demonstrated that time and practice to learn how to interpret and interact with people in a distributed environment was demanded; before knowing each other and with the fewer cues provided. Acquiring knowledge and awareness of cultural and personality differences turned out to be helpful to avoid misunderstandings and unnecessary conflicts, even if awareness a lot of the time wasn’t enough. It was even more important than on-site to not be afraid of dealing with conflicts, since it was so much easier to hide them, as well as it was harder to deal with them, in a distributed setting. Teams in IE264 declared that significant factors to prevent conflicts from escalating were to be open, expressive and in this manner reduce the opportunities for miscommunications in the team. A lot of misunderstandings occurred because people were afraid of speaking up when something was unclear or when they didn’t understand.

5.1.3.6 How does the project stage affect the collaboration?
The likelihood for problems differed between the stages of the collaboration, and for a leader, as well as for team members, it appeared to be useful to know what to expect, when to expect it, as well as how to deal with situations, to handle problems and plan activities and support. It became clear how important it was that teambuilding activities (exercises, lectures, site visits, presentations, etc.) were used with thought; to choose the right activity for a certain stage and a certain team; to not just waste a team’s time and make them loose faith in the organization and management. Stage specific problems were analyzed to get a clearer picture and to be able to handle and try to foresee conflicts and problems, as well as there were general problems common in all stages in a team as well. For more details about these issues, please see Chapter 7.1.
5.1.3.7 What organizational and managerial aspects are important to consider supporting distributed teams?

It was vital that an environment with open communication is created, that is predictable, and has a clear information and communication’s structure. It became clear in all case studies how important it was to have an organization that has knowledge about distributed work and gave teams guidance through communication difficulties and prepared for problems that occurred in the different stages of a team’s lifecycle. It also became clear how vital it is that the project structure supports the work, and that teams set or clarifies goals and decides the norms of conduct for the team, so there is a shared knowledge and agreement on what to work towards, what to expect, what to communicate about, when to do it, how to do it, and what rules to play by, so the focus in communication is not about clearing out misunderstandings. The teams needed to feel that the tasks were meaningful or “real”, and know what was wanted and needed from them. It was vital that people knew what to expect, even if that might be to expect the unexpected.

It was useful for the team members to be aware of different communication styles and personality differences to increase the understanding for and value of diversity and by that help creating a more understanding environment that was pleasant for everybody to work and socialize in. It proved vital for teams to get access to ICT that really worked, was adjusted to preferences and needs, and that the team knew or that they had sufficient time to learn how to use. The lack of cues also made the importance of explicit feedback apparent.

The size of the teams affected the collaboration and communications in many ways. It was important to consider that a team didn’t have more or less people than needed, the right competencies for the project were actually available, that the distribution actually was necessary for the project, that the distribution was not too uneven, and that the team was not too big, since it became hard to administrate. Problems regarding this were noticed in ME310 and 2G1319.

Team members always have different demands, goals and expectations. It became clear in the observations that it was hard to figure out the differences and negotiate goals when not seeing each other. More concrete problems concerning personal planning were also difficult to deal with in the distributed teams; like having different time plans, schedules, not being synchronized, and time management in general. Time, both getting other people’s time and not running out of it was a difficult parameter for the distributed teams. Everything takes time, and at a distance it had a tendency to take a little longer.

It was vital that the ICT and organization supported the team and not only individual efforts and work, to create a good environment for collaboration and communication. But it was also important that individuals were supported, motivated, and rewarded, e.g. by providing opportunities for different communication and working styles. The cases where the distributed environment and collaboration was really useful were when teams had tasks that needed different competencies and got real advantages from the different local access. Successful teams benefited from the distribution and had suitable individual and collaborative rewards that motivated individuals at the same time as it encouraged collaboration.
5.1.3.8 Is it possible to help teams prevent and get passed the problems?

Guidelines, seminars and teambuilding activities turned out to be helpful, but the results point in the direction that to really help people prevent and get passed problems it is vital to have continuous support and aid team members connecting theoretical knowledge to the problems they encounter, when they encounter them. When using guidelines and teambuilding activities it is essential to avoid making them too formal, since that prevents spontaneous socializing and can sometimes only make team members feel uncomfortable and the most important thing turned out to be helping people getting to know each other. The activities can’t take too much time from the actual project work, since that easily makes people annoyed, frustrated and make them loose faith in the use of activities, which counteract the intentions. Even more important than formal teambuilding activities is creating an open environment where people dare to ask questions, creativity is encouraged, there are opportunities for social activities and interactions, the information and communication structure is clear, and teamwork is truly encouraged through different measures in the objective work environment. Further results regarding action strategies for distributed teams can be found in Chapter 7, where concrete recommendations for how to improve the distributed project work environment are presented, as well as more indirectly in Chapter 6, where a model of variables affecting the distributed work environment is presented.
5.2 The Distributed Project Work Environment – Discussion of Results

In this chapter discussions are held around important issues found in the research material. Mostly the discussion covers results recapitulated in Chapter 5.1, but there is also an expansion of the results and a discussion around issues briefly mentioned there, with details directly from the case studies to exemplify and connect results from different areas. The main areas covered here are different aspects and implications of the distributed project work environment; issues regarding distance, physical space, team composition, leadership and team management, as well as influences of ICT on distributed communication and collaboration. The physical environment for the teams is briefly covered as a comment about team space, as well as under ICT. These are all areas that proved to be important for the distributed projects. Other areas were also proven essential, i.e. various background variables, attitudes and psychological variables, the organizational structure a project is situated in as well as the organizational design of the actual project (see a more complete overview in the model in Chapter 6). These areas can be considered background variables or part of the context for the specific research situation in my case studies, and won’t be covered in this discussion of the results, but will be part of the discussion and model in Chapter 6.

McGuire (1997) suggests that the opposite of virtually every psychosocial finding also is true. He also says that the production of opposite results sometimes leads not to confusion, but to a new and better understanding of the phenomena under study, and that should be the goal of investigations. I agree that the interesting fact is to see the different sides of phenomena; e.g. what negative and positive influences different factors can have on collaboration and communication, but it is important to be clear about that different facts are true under different circumstances. By acquiring further knowledge it will be easier to predict what will actually happen in a specific situation, be able to take advantage of the positive sides and avoid the problems. In the following discussion contrasting sides are brought forward and discussed, with an aim to provide a deeper understanding of the work environment for distributed teams.

5.2.1 Distance

All teams, distributed or co-located, are different and will experience different problems, because of the psychosocial and physical environment, the people involved and the type of work they are involved in. There are differences between on-site and distributed teamwork, and the distance was an obstacle in itself for the distributed teams. As mentioned, when people are far away from each other physically, they have a tendency to not feel as close on a mental level as well. This doesn’t mean it is impossible to help teams get passed the distance and prevent problems. It is significant to keep investigating what problems distributed teams encounter because they are separated in time and space.

The differences brought up in 5.1.1.1 regarding cues, awareness, and the lack of visibility, made it harder for the distributed teams to e.g. get to know each other, build trust, get awareness, and keep the motivation. These negative effects
were occasionally outweighed by a strong motivation, interest, or a sense of community. Generally the distributed teams had to work actively to make the collaboration work. At a distance it was intricate, but turned out to be even more important to keep an open and direct communication, be proactive, take initiative, make sure to document the work, and actively strive for a very clear and open communication.

After my research of distributed teams (see Chapter 4.2-4.9) and after being in distributed teams myself, I strongly believe it is more a matter of learning how to communicate and collaborate in distributed environments, than if it is possible or not (especially since the majority of the projects I have observed or been part of have been very successful). I also believe that face-to-face interactions will in general be the easiest way to get to know people, and accordingly will make it easier to collaborate. When working in a distributed setting, it is not possible to keep working as if co-located. People don’t have access to all cues; can’t make the same assumptions; everything has to be more explicit, etc., and that means there has to be a change regarding the way people work. That was one of the main problems observed in the teams in all studies, that people were not aware of that fact, didn’t have time to deal with it, or simply didn’t know how to deal with it. Even in regular working situations it is as a rule necessary to put in effort to e.g. create a team feeling, keep the motivation or build trust. At a distance it is necessary to more actively work to make it happen.

My observations pointed to that distance matters, but it wasn’t the deciding factor for how successful teams were. Problems were in most teams outweighed by a high motivation, a genuine interest, and a team feeling. There is a difference in the communication and collaboration when team members are not physically close to each other anymore, and management and organization of distributed projects have to be adjusted to that fact. Like Nardi and Whittaker (2001) declared (see Chapter 3.2.1), communicating face-to-face is something we practice practically since we are born, while distributed communication is a new situation for most people and can for that reason be perceived as uncomfortable. Even for people used to communicating through ICT, it is not common to be restricted to a situation where almost all communication has to go through technology. I believe that the more used people get to working through ICT and the more available and supportive of interaction ICT become, the less this will be a factor, but it will still not be the same as face-to-face, and the specific issues that come with distance have to be dealt with.

5.2.1.1 Diversity and Culture
As mentioned, the studies showed that when the language barrier was big it mattered even more how comfortable team members felt about the situation and the people they were communicating with, how much fun they had together, and if other communication barriers were present or not. In very formal situations where people barely wanted to admit they had problems, like with the Green team in ME310, the language barrier was hard to overcome. To overcome language problems it turned out to be essential to think about how language affects the work, and to create solutions based on how the team thought they could get passed them most effectively. It was proven important that everybody took responsibility
for overcoming language barriers, both the ones that did not understand and the person talking. Language problems were furthermore often underestimated. A lot of Swedish people speak English fluently, but it was still not the same as using a language they use every day. It turned out to be hard to see language difficulties, since people had a tendency to hide the problems they had, or at least not be expressive about them.

We live and interpret the world, as Winograd and Flores (1986) pointed out (see Chapter 3.2.1.1), according to our way of understanding, based on our background. It is essential to understand, as they pointed out, that these implicit beliefs and assumptions cannot all be made explicit. But I strongly believe that it is still vital to try to understand both one’s own background and how other people interpret and view the world. A problem noted in the case studies was the fact that some participants failed to see cultural differences. The students sometimes had so much in common, so they failed to notice that they got into disagreements because of the differences. Armstrong and Cole (1995) stated that confusion seems to be most insidious in routine exchanges, for example exchanges such as giving instructions to subordinates or participating in meetings, since there are e.g. unspoken expectations and assumptions about how to do things (see Chapter 3.2.1.1). This was exactly what happened in the case studies. Teams handled and were causations regarding the major and apparent cultural differences, but often failed to notice the subtle ones, and minor issues that were taken for granted and made people misunderstand each other.

When the diversity and distance was actually used, it became beneficial for the teams, but when they were unaware of the differences, or didn’t understand the point of view of having distributed team members or of the collaboration at all, it became a problem. At the same time as there are still differences, the world has actually gotten smaller, and the students in the studies were of the same age and worked in the same field, even if distributed all over the world, and they tended to have a lot in common.

5.2.1.2 Comparison with On-site Collaboration

There was, as declared in the case study in Chapter 4.3, both advantages and disadvantages observed with being in a distributed team. There was no clear distinction that the co-located teams worked better than the distributed teams, or had better results. The teams that could take advantage of the distribution and managed to create a team feeling at a distance worked really well, better than most local teams. But when teams didn’t manage to get passed the difficulties, they definitely had more to struggle with and a lot of effort had to be put into administrating and handling the distance. In the local teams it was easier to forget to have a discussion about what goals they had and to ensure that there was a common ground. It was easily assumed that everybody thought the same and that was never questioned. Even if the observed local teams didn’t get into a lot of conflicts and could communicate without being explicit, anybody that has worked in a team knows that on-site collaboration is not easy and demands a lot of work as well.

As Cheesman and Heilesen (1999; see Chapter 3.2.1.2) declare, it is not possible to simply transfer knowledge from face-to-face interactions and assume
things will work the same way in a virtual environment. They point out something else that is vital; as it is now distributed environments often demands a lot of extra effort, tolerance and goodwill from everybody involved. People might agree to that extra work because they find the ICT and the experience new and interesting in itself, and are willing to put in extra time and effort, but the level of effort could definitely have decreased with simple measures, without compromising the results, if only issues had been handled differently. If distributed collaboration is going to be scalable, or survive at all, that is not anything to depend on or expect in the long run. Some studies, like Knoll and Jarvenpaa’s (1999) and the ones presented in this dissertation definitely contradict pessimists and show successful distributed teams.

5.2.1.3 Site Visits

One way to help teams prevent and get passed problems and bridge the distance is seeing each other face-to-face. Meeting each other does not necessarily mean people will work well or get motivated, as Nardi and Whittaker (2001; see Chapter 3.4.4) reminded us. Routine face-to-face meetings without a specific purpose, or without the participants feeling the necessity of it, can be more demoralizing than helpful in a lot of situations. Having too many meetings only make people blasé, which in turn can lead to that they don’t pay attention to what is said in the meeting, and they don’t really socialize with others either. It is important to keep investigating what meeting somebody face-to-face provides that is hard to achieve at a distance, why meeting is important and how to take advantage of meeting each other when working in teams.

Before meeting somebody, there is not really any reason for trust and not much incitement to take contact, except for curiosity or a sense of duty. This was especially true for the conduct of sponsors in the case studies, but sometimes also for the relationship within the distributed teams. If it was not necessary to involve people (because they e.g. were not part of the same class or didn’t contribute much), it was even easier to leave them out. If people met in person, they got a chance to see other’s skills for themselves, got to know them as persons, started building relationships, and saw how they could add competence to the project.

According to Hollingshead’s studies (1996; see Chapter 3.3.1.1), knowing each other doesn’t matter as much to achieve successful communication at a distance and a lot of the advantages people have from knowing each other disappear when moving to a distributed setting, and it won’t be as easy to read what people are really thinking, even when knowing them from before. The results from my studies contradict these statements. As declared in the results, when actually traveling to see each other it was much easier for teams to really get to know each other and the participants themselves pointed out that was also when they really started working actively together. They could also interpret each other, in spite the lack of cues, in a better way when communication at a distance after they actually met. After a site visit teams had an understanding of the issues people dealt with and a basic understanding of how things were different on the other site, and could therefore utilize the differences more and avoid the pitfalls. They also experienced something together, hence achieving a common ground (see Chapter 3.4.4.3). The concept of having a common ground proved to be vital
for the teams for a lot of reasons and there will be further discussion around that topic in Chapter 5.3.

When knowing each other the communication became less formal and consequently became smoother. All case studies showed that the team members thought that they after the site visit more easily could be themselves, dared to take risks and could have a much more open discussion, instead of trying to be as diplomatic as possible, trying to constantly figure out what the others wanted. Knowing more about each other also made it easier to figure out how to improve the communication and collaboration and it increased the motivation to communicate.

It is important to remember the importance of simply making an effort, taking the time to see somebody. As Nardi and Whittaker (2001) say (see Chapter 3.2.3), face-to-face meetings reinforce social bond through shared experiences, and the simple fact that meeting occur at all can serve to deepen relationships. Technology cannot replace actually meeting, because a symbolic meaning derives from the fact that people offer their actual bodies in space.

To really take advantage of a site visit it became apparent that the trip should be prepared carefully, and the teams should have a discussion of when the best time is to go and what the goals are for the meeting. A lot of the problems teams had should be able to be solved, even if not as fast, without a site visit. The main solution for bridging distance was seeing each other face-to-face. It is hazardous to believe that meeting will solve all problems, and that things will work out automatically when seeing each other, but it did prove to be a good way to overcome a lot of the problems that came with the distribution, if conducted right.

5.2.2 Physical Environment

One of the big differences and disadvantages for the distributed teams was not having a physical team space. As described in Chapter 4.3, a team space can work as a central meeting place, a place where a community can be built, a natural place to meet, where team members can find each other, the equipment and the project work. Having a team space was vital for the teambuilding and socializing in the local teams in ME310. The big question is how to create an environment also for distributed teams. The local sub-teams in ME310 had local spaces where a team feeling was created, which they showed each other through a camera, but that didn’t replace having a joint space. The big issue is to find new ways to provide the same feeling and functions, not to necessarily replicate the physical space. Even if it won’t be the same as having a physical team space, creating a virtual team space could be beneficial even for on-site teams, that don’t have the opportunity to create a physical team space.

It was not easy for distributed teams to create a virtual team space. The distributed teams in 2G1319 had a team web page, with some of the same functionalities as a physical team space, but even storing information and work in a structured manner and getting an overview of the space was hard. The biggest difference was the communicative and social aspects. It was much harder to find each other, and see when others were around, but it was at least one step on the way. In combination with creating local spaces, forming communities and trying to transmit positive feeling over email, IM, videoconferences, video presentations,
it is possible to at least get closer to the feeling of having a shared space. Virtual communities, virtual worlds, and networked games are good examples of that it is not at all impossible to create a feeling of belongingness and a sense of community in distributed settings.

5.2.3 Team Composition
The team composition has consequences on the organization and management of teams and is consequently important to consider establishing the best possible conditions for a distributed team. Issues that became very important were e.g. formation, size, distribution, skills, diversity, etc.

5.2.3.1 Team Formation
The results point to that it is hard to predict the outcome regarding how productive or obstructive diversity in a team will turn out to be. It is easier to predict the outcome of the degree of fragmentation. If there is a very unequal distribution with a majority of participants on one side, the power structure is affected and it is easy that the smaller side gets left out of important decisions and always has to struggle to really become part of the team.

I believe it is hazardous to assign teams after personality type, like the teams in ME310 formally had been formed. Doing a test like Myers-Briggs can help people see themselves and others clearer, perhaps value differences more, and can hopefully be an aid to avoid conflicts since it gives people information about how others work and react differently in various situations. But an excellent team needs so much more than diversity regarding personality, and sometimes diversity can be a hinder for collaboration as well, and the outcome is hard to predict. I believe it is more important to look at how teams are diverse, as Bruffee (1999; see Chapter 3.1.2) also declared.

To have a diverse team doesn’t mean avoiding conflicts. On the contrary, diversity can lead to more conflicts and wills of doing things in different ways, as well as it can be the source of more energy in a team. Doug Wilde’s way of forming teams after personality has been questioned by many, and is, as mentioned earlier, not used as much for the team formation in ME310 any more. By assigning this big value to a test, instead of having a discussion around personality types and group dynamics, it can also make especially engineers more suspicious and make them believe that there is no value in personality test at all, or even worse, might make them fall into the supposed “roles” they get from the personality test. These tendencies were noticed, but fortunately most students in ME310 at least did not overrate the tests. To make people understand the value, and limitations, of personality tests, it is important to not us it in too strong a way.

It is always beneficial to know more about yourself and others when working in a team. Doing a personality test can in this sense help the teambuilding and understanding within a team. Most people also enjoyed doing the test, and thought it was fun to compare their results with others (especially since this is a test where nothing can be “wrong”, just different). Using a test and having a discussion around personalities and what the different ways of thinking and acting might entail can therefore be a good idea, as long as it is pointed out that the team
shouldn’t put too much weight on it or draw conclusions from it about who is supposed to do what in the team.

5.2.3.2 Distribution and Size of Team
A very important aspect for how a team develops is the size and how team members are distributed between the sites. It affects the team organization by influencing e.g. the power structure, the communication and how hard the team management and administration will be. The issue of team size therefore has to be considered when forming distributed teams. Administering big teams is elaborate on-site, and it becomes even worse when time zones and cultural differences are added. When teams are too big it is hard to schedule, administrate, and keep everybody up to date. What researchers seem to agree on is that too big a group is never good, since it makes real collaboration so much trickier (see Chapter 3.1.2). An active decision on how teams are formed should be made, consciously thinking about how to get a balanced team with the right competencies, knowledge, and personalities.

Regardless of what theories and researchers to believe regarding optimum team size, it’s vital to consider effects of the size, since it influences the dynamics in a team. A problem that did occur because of the very uneven distribution of team members on the different sites in ME310 and 2G1319 was that the power structure was affected and it was hard for smaller sub-team to feel like an acknowledged part of the team. If one site is much bigger than the other(s), the power structure became unbalanced. As Coleman (1997) mentioned, a team has to feel that they gain something from collaborating or using a specific tool (Chapter 3.2.1.3). When e.g. one side of a team is too big or has all the power, it is easy to ignore the distributed side, since trying to keep the local team going is work enough.

Even if it would have been easy for the teams in the case studies to split up tasks instead of actively working together, that was not the case. The teams in all studies chose to divide themselves into sub-teams, but kept working actively together. One problem that was noticed was that it became harder to administer the work and some members didn’t get a chance to talk, and others acted like “free ride” and worked as little as possible on the project. In the smaller teams the problems were more connected to that skills needed for the project were not in the group and sometimes it was too much work for each person, but they normally had an easier time than the bigger teams anyway, especially since their projects were smaller, so the big teams had to deal with a heavier work load as well as the added administrative work.

If the size of the team can’t be affected or an uneven distribution of participants can’t be avoided, the issue should at least be discussed, and a team manager should be aware of the possible impact of the choice of distribution. Especially in combination with other factors that can impact the power structure, like language knowledge and access to the sponsor, an uneven distribution can be the deciding factor for what the collaboration will look like, and how the work environment will be perceived by the team members.
5.2.4 Leadership

The organizational structure and the leadership were important for how the work was perceived by the distributed teams in the studies. The distributed environment places new demands on the organization and leadership, regardless of if a team is in an educational or corporate environment. Having the necessary backup and an understanding organization was central to make the work environment pleasant and to improve the chances for success.

First I should define what I mean with a successful team. What people consider to be a successful team might differ depending on in what environment the team is in. In a professional setting the most important thing is that the product turns out well. In an educational setting the learning process might be more important, that everybody in the group participates and learns something. The best thing is, naturally, that everybody participates, contributes, develops, and learns something and that there also is a successful product. That is my definition of a really successful team. Since I in the definition of collaboration stated that it implies interacting, using each other's knowledge, and affecting each others thinking, behavior, and how the work is conducted, a team cannot be considered successful unless the team members are really working together, and the teamwork should move past just splitting up tasks for it to become true collaboration.

It is beneficial to analyze what problems are likely to occur in different stages. Bruffee (1999) stated that students working together in small groups go through a fairly predictable process of adaptation in which they relate to one another differently in different times during their collaboration. I don’t believe the process is that predictable, but it is still advantageous to look at theories about team process and team stages, to more easily predict what guidance teams need at different times of the project (see Chapter 3.1.3.1 and 7.1).

If teams have support from a project leader or a teacher with sufficient knowledge of distributed work, they should be able to get passed most of the problems they encounter, especially if there is an organization with an infrastructure to handle distributed work. It is vital that teams get support both to find the obstacles and learn how to handle them. A manager should inform teams about problems, team stages, teambuilding, etc., to make team members more aware of what they might expect and encounter, so they can handle problems and situations better if they actually do encounter them. It is important for teams to get continuous support and guidance, to be able to choose the right ICT and use it in a suitable way, handle conflicts, manage team- and trust building, etc.

The reason why a team is distributed is an important factor to reflect on for a teacher, an organization or a project leader, to be able to motivate the participants and make them realize why they should work with a group of people they don’t know, don’t see and don’t know anything about. This discussion is vital to make the work environment creative and motivated. When teams didn’t see the point of collaboration and the distribution, it affected the teamwork negatively. People, and especially students under time pressure, have a tendency to be time efficient, and choose the fastest way to do things, which isn’t always the best way. At a distance it is easier to avoid collaboration and split up tasks, at the same time as it is more important to be explicit and really work together to make the pieces fit together,
which makes it fundamental to really make the collaboration valuable and valued.

It became clear how important it was to inform participants about what to expect; to avoid having participants coming out of the experience with an unnecessary negative view of project work in general and distributed work in particular. It was hard for some team members to see the value of the collaboration and then it was difficult to justify the extra work they had to put in, since the purpose was never discussed and not clear. This was something the Swedish students working with Stanford students in ME310 and 2G1319 mentioned, that they did not know why they were supposed to collaborate, and that it was more given as an order to them and they had no way of controlling or influencing the situation.

The focus when it comes to distribution shouldn’t only be to look at how to overcome problems with it, but to look at what new opportunities it offers, and how some of the problems actually can be turned into useful learning and working experiences, and possibilities to improve work routines and the actual project work. It is vital that the management knows what it is doing and why, to not confuse the situation more for teams, and be available for support along the way, helping teams uncover problems and deal with them. Problems become worse when the situation is unclear and it easily leads to unnecessary tribulations.

5.2.4.1 Course Alignment
An important aspect of the project work environment is alignment and coordination of work and it does not become less important in a distributed setting. When dealing with complex tasks it is basically impossible to plan everything ahead of time, but that doesn’t mean organization and planning is unnecessary. Lack of planning does not necessarily have negative consequences, but the likelihood that the collaboration is a pleasant experience for everybody involved increases when thought has been put into the structure and goals of a project before it starts.

When the different sides of teams were not aligned, like in ME310, it was difficult to set common goals, have an equal collaboration, and feel like one team. When the preconditions differ, it is hard to reach an equal collaboration. If different parts of the team have diverse goals, structure or timelines, it is vital to at least be aware of the fact. It was hard for the teams to communicate well even within the team when the different sites were part of different courses, sometimes without common goals and dissimilar schedules and time plans. Information to everybody involved about differences between the teams and their goals should be carefully devised. To achieve equal participation, it was important that goals were negotiated and participants became motivated, and at least knew the schedule for the team members on the other site, to be able to adjust the teamwork to the situation.

5.2.5 Team Management
Even if there is an organization that supports a distributed team, teams have to be able to handle the everyday work and regular team management, e.g. make sure to set norms and rules of conduct, and support the development of skills that are productive for the team. Managing teams require effort, and the work load doesn’t
decrease when moving to a distributed environment. Examples of areas mentioned in Chapter 5.1 that become more demanding are documentation, getting hold of people, time management and logistics.

When working well the distribution can also make the team work better, because it is necessary to structure and document the work, and a team has to be able to explain their work to people that have not seen the process. Some problems can really be turned into advantages. In some teams in IE264 they independently developed group norms, roles, and rules for meetings, to overcome some of the difficulties with distributed meetings (see Chapter 4.2). Continuous support and meetings with faculty helped the teams in ME310 by setting milestones, deadlines, forced them to document, gave them a possibility to try ideas on faculty members, forced them to be explicit about what they were thinking (since they had to explain what they were doing to somebody else), etc., and the meetings were proven very useful for improving the planning and communication also within the team.

The distributed team members not only had to make sure to get people’s attention to get some of their time, they also had to put in more time themselves to make the collaboration work. Time is an important factor for distributed work. Nardi and Whittaker (2001; see Chapter 3.2.3) pointed out that more management time is demanded to work in a distributed team, since it is harder to keep track of what is happening, it takes time to set up meetings, and it is harder to see the process. Planning the time for the team work with all the unknown factors; handling time zone differences, getting attention and other people’s time, estimating time delays because of asynchronous communication, etc., all adds to the complexity and make the need for time imperative. As mentioned in Chapter 3.2.1.3, Coleman (1997) stated that sharing knowledge, i.e. working together, often is seen as a sure way to lose power. In the case studies it was more the issue of loosing control over end results or loosing valuable time, than of loosing power, which seemed to hinder collaboration.

It was common that the part of the team that was far away from the sponsor at least at times felt outside and very dependant of the part of the team that was close to the sponsor. Both the Orange and the Green team in ME310 had to communicate via their distributed side in the beginning. Trust, personal relationships, getting to know people as friends, learning about other people’s knowledge, and seeing their competence in action, were all extremely important aspects for making teams work well, and much easier to accomplish face-to-face. Knowing each other better made it easier to clear out misunderstandings, and the communication often became more open and unambiguous.

It was by making mistakes, and learning how to handle them, that people learned how to deal with working in a distributed team. Project work can’t be completely planned and the time needed to accomplish things is often underestimated. The team members in the studies learned exactly that. It is important to remember that working in a distributed setting is a new situation for most people, and there are even more unknown variables than in regular project work which make it even harder to estimate time, and manage the time available. Some of the advantages should be able to be reached without the distribution (like continuous documentation), but they were not in the case studies, probably
because people have a tendency to do what they have to, but not extra work, especially not if that work is administrative or documentation and not in the area of interest.

5.2.5.1 Conflict Management
As mentioned many times earlier there are fewer cues available in distributed settings and therefore a higher likelihood for misunderstandings and conflicts, as well as the conflicts are harder to detect and handle. The reasons for conflicts are more or less the same as on-site, even if some are enhanced because of the unusual situation and the lack of cues. The predicament is detecting conflicts and avoiding misunderstandings before they get out of hand, and know how to deal with them. Armstrong and Cole (1995; see Chapter 3.2.3) found that members of distributed work groups experienced more misunderstandings in communication and strangely escalating conflicts. Conflicts were also unexpressed longer, unrecognized, and addressed more slowly, which is what was found also in the case studies.

Conflicts are not necessarily something bad, only if they are not recognized and sorted out. Unresolved conflicts are never beneficial, but the need to negotiate and resolve problems can provide a potential for learning and developing our thinking. Without having productive disagreements all aspects of a problem might not be brought up and the optimal solution might be missed. It is therefore useful to minimize some problems, but not take away the challenges. To deal with conflicts when they do arise is hard, and an instructor or project manager has to be observant and guide participants before a situation gets out of hand. The fear of conflicts turned out to be more dangerous than conflicts in themselves. The fact that people tried to avoid getting into conflicts, were hiding problems, and weren’t open, never improved solutions or the work environment. It only delayed difficult decisions or measures that needed to be taken, and created more tribulations in the long run.

5.2.5.2 Demeanor, Skills and Behavior
Working in projects demands certain skills from team members and the distribution adds to the complexity. When moving to a distributed environment some skills became more important and needed to be focused on when forming teams and when supporting and developing the skills and demeanor of team members; as mentioned it became even more important to be proactive, get things started, be self motivated, and plan ahead. In addition to this it was important to learn how to communicate through different media, feel comfortable in the new situation, learn how to interpret others with fewer cues, be aware of the differences within the team, and learn how to value those differences (see Chapter 5.1.3.5).

When supporting teams or handing out guidelines, it is important to be aware of that the assumption that people are rational and actually think about the outcome of their actions and behavior is not always true. It is not always, like Fishbein (1997) says, that a person must believe that he or she has the skills and abilities necessary for performing something to actually volunteer to do it. Sometimes people try things anyway, and do things without thinking. Part of developing team skills is making people aware of their own behavior, start to
understand how their actions influence others, as well as learn about how other people think and behave. The skills and demeanor covered here and in Chapter 5.1.3.5 showed to be important in all case studies, but simply knowing about what behavior that is beneficial, didn’t always make people change or act differently. Even after making people aware of valuable behavior and skills, there is still a question of how to make them change and act in accordance to the guidelines.

5.2.6 Communication and Collaboration through ICT

Communicating at a distance is not an entirely new phenomenon. People have been using the telephone for decades and have been writing letters for centuries. Communicating through ICT is becoming more and more common; people chat and send email to business partners and friends on a daily basis. It is important to remember that this change takes time to adjust and get used to, especially since it is not only the media that change, but the whole communication’s structure.

When communicating in distributed environments, the ways of communication and the amount of cues available are very different from communicating face-to-face. Consider e.g. the phone; people don’t talk or act the same way as they do when they are talking face-to-face, or even less, when leaving a message on an answering machine. Most people are so used to communicating through ICT like the phone that they don’t even think about that they are using a technology, and in what way it is different from face-to-face interactions, even though the way they talk and behave might be very different.

When people start using ICT they are not completely comfortable with, this changes, and all of a sudden there is a “filter of technology” between the persons communicating. Using ICT for communication is not the same as communicating face-to-face, and this is a reality that has to be considered when choosing and working through ICT. Mankin, Cohen and Bikson (1996) stated that “Technology that supports collaboration will by its very nature create shared understandings; these shared understandings will in turn increase trust among collaborators.” (p.249). I wouldn’t put this much trust into technology, but an environment and ICT that supports collaboration (and works) will increase collaboration and communication among participants and shorten the time needed to build trusting distributed relationships.

5.2.6.1 ICT and Communication

The notion that communication is generally slower when working at a distance is an important one, and that is crucial to take that into consideration when making time estimates and dealing with time management in distributed teams, at the same time as people have to find time to learn how and when to use what ICT. The time to do this has to be considered, so there is still time left to communicate and work with the actual project after the learning process is over. The impact of asynchronous communication and the potential devastating effects it can have on teamwork if not considered was also mentioned by e.g. Knoll and Jarvenpaa (1999; see Chapter 3.3.1).

One noticed effect of the combination of ICT, distance and that people didn’t know each other was that it often led to more formal interactions, a higher risk for miscommunication, and it became more complicated to seek confirmations or
explanations, since team members couldn’t read each other as well. With fewer cues, the teams had to learn new behaviors and learn how to interpret other people with base in the cues and the information they got. The use of text for communication was not only a disadvantage, and some team members in IE264 declared that communication became more thoughtful and clear when people structured their thoughts and wrote them down before communicating them, and it also made it easier to keep track of what had been said.

Lang (see Chapter 3.3.1.3) claimed that there are other advantages with text since it is more static than spoken words. Unlike face-to-face participants, who are often competing for the attention of the moderator, online participants have a more equal opportunity to speak. The opportunity itself lasts longer and the participants aren’t interrupted. Thus, while the time lag can reduce the spontaneity of a discussion, it can also provide opportunities and means for thoughtful exchanges. This was noticed in the case studies, but it didn’t appear to be true for all text-based communications, since people can easily be interrupted in e.g. IM, and the one who types the fastest have a definite advantage, but it might be true for more asynchronous media, like discussion boards.

The lack of cues made the importance of more explicit feedback apparent. People didn’t get much body language feedback, couldn’t see other people’s facial expressions and reactions, so the explicit feedback was the only feedback they got. This was also true when it came to responding. One important issue to avoid feelings of loneliness, frustration and anxiety for distributed teams was to get responses. It didn’t have to be long replies, or exactly the one wanted, but not getting any reaction could be devastating, since people tended to over interpret e.g. lack of responses at the same time as it was much easier to forget to answer when not seeing somebody on a regular basis. For the person responding it is easy to think too much about how to write things and what to say, and forget that the recipient don’t know if he or she is making an effort, or just don’t care. Team members in the case studies sometimes thought that they were forgotten or not prioritized when responses took too long or didn’t take place. Since they didn’t know the reasons for not responding, and it was sometimes not even certain if a message had been received, it easily created feelings of hopelessness. Most teams didn’t have explicit rules of conduct for responses, at least not in the beginning.

It is hard to say exactly how and how much the communication changed, and how that affected the teams. The reduced amount of cues was a definite obstacle for the teams, and they unquestionably felt restricted by having to use ICT for all communication. It seemed to take them by surprise how much effort it took to learn how to communicate efficiently through ICT. Since basically all participants were experienced users of ICT, they probably didn’t see it as a big obstacle before they tried to use ICT that they had not really used before, like e.g. videoconferencing, or tried to use ICT for all communication, and with people they didn’t know that well. The ICT was far from transparent, and the teams continuously had to think about issues like information overflow, problems getting information, having backups, how to document, where to find information, etc., as well as dealing with how to behave, and how and when to use what ICT.
5.2.6.2 ICT and Collaboration

The use of ICT (and consequently lack of cues) affected not only the communication, but affected also the teamwork more directly; the power structure, the openness, information sharing etc., and had as mentioned implications on team management.

The variables that one team in I.E264 concluded had been the most important for them to ensure a good collaboration, and that they came to value the most, was reliability, supporting quick decision making, and file-sharing. Analyzing these three aspects more thoroughly, it becomes clear that they facilitate communication in the sense that they help people disregard the ICT and the distance, help them stop thinking about it. That both information overflow and lack of communication were problems indicates that a lot of problems were caused by lack of experience communicating through ICT. This can point to that at least some problems will disappear or decrease in magnitude once people get more used to working through ICT.

All teams in the case studies used ICT for more than simply sharing information, but also for socializing, really working together, developing a team feeling, and getting to know each other. A problem was that most people were not used to doing that, at least not to that extent. This often created a feeling that the distributed environment was more limited than face-to-face, and some gave up or lost motivation before getting passed the learning threshold, and simply waited for the face-to-face meeting to sort things up. People didn’t know how to behave, how to communicate, and they thought it was much harder to express feelings when communicating through ICT. In face-to-face interactions there were more possibilities for personal differences to show and take effect, and most team members felt that they didn’t really get to know people before they met face-to-face.

One crucial problem with working in the distributed teams was therefore that the main way of judging each other was by product, because it was so much harder to see the process. It was therefore hard to know if people were making an effort or not since they were not visible most of the time. The process was long, and often there was no concrete product to show for quite a while, and the teams didn’t have a good way to check in with each other, so they didn’t know exactly what was going on until they saw a product. Even if they didn’t only judge based on the product, but also considering fragments of the process that they could actually see, like behavior in meetings and in the communication process, it was much harder to track slackers and realize problems before it was too late. It was furthermore difficult for the participants to delegate, since a lot of them didn’t trust the other site to do the job, or do it well enough.

There was no evidence that hierarchies generally changed in the teams, just because the communication was moved to a new media. Power structures seems, as mentioned, to change because of the size, distribution, and closeness to information. American students were normally more talkative and took more space, but that was not different from the on-site experiences. Some people e.g. typed fast and gained advantages in chatting environments. It was hard to draw conclusions with certainty from the data, but I believe that is because it is basically not about the media, but about how people use it.

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Palloff and Pratt (1999) claimed that introverts have less difficulty entering a virtual community than extroverts, since extroverts feel a stronger need to establish a sense of social presence and therefore may have a harder time in the virtual world. Although face-to-face contact can be useful and facilitate community development at some point of the community-building process, the contact is not likely to change the group dynamic created online. It is an interesting thought, but I can’t say that I agree. A distributed environment will probably change the hierarchy, but it doesn’t turn the scale upside down. Some people like to talk and other like to write, some like both ways of communicating and some don’t like either of them; at the same time as others immediately feel comfortable in a virtual environment. For most people it is still easier to build trust, get to know each other and build a team feeling face-to-face, and a face-to-face meeting will most of the time make it easier to collaborate at a distance.

Problems arise when people think they are going to get the same feeling, or that they can act the same way, when using ICT. To even try to completely replicate face-to-face is probably futile, and that is the main mistake also according to Kvan, HungYip and Vera (1999; see Chapter 3.3.3). The new distributed environment is not always easy to adapt to. It turned out to be tough to get to know people, it was difficult to see the actual project work, and what was visible was distorted because of the reduced amount of cues. People don’t change the way they are over night, if ever. I believe collaborating through ICT is something that will become easier the more people start to work at a distance and use different kinds of ICT. Helping people out, giving guidelines and lessons learned is advisable, at least to help them avoid the worst mistakes. Even when people are used to communicating through ICT, they are as mentioned normally not used to be limited to interactions solely through ICT; not used to handle conflicts and dealing with sensitive topics with a filter of technology.

The distributed environment provides a very analytical and reflective world, with thoughts filtered and analyzed through text processing, at the same time as it leaves room for chatting and interaction without any thinking at all. I believe that conducted right, when the distribution really adds value to a project, distributed collaboration provides a tremendous opportunity to engage people, but conducted the wrong way or in the wrong situation it will only make team members frustrated and they won’t see as much of the advantages.

5.2.6.3 The ICT Facilitated Work Environment
When choosing ICT for a team it is not only necessary to look at the big picture. To be able to see what the best combination would be, it is necessary to know what different ICT can contribute with, what needs they fulfill, what problems and opportunities come with them, and when they are appropriate or not to use. And not to forget, the different kinds of communication and collaboration necessary to make a team work well has to be analyzed, to be able to make sure that everything necessary is available. An important aspect that was considered when the teams decided what ICT to use and what to use for what purposes, was the differences between synchronous and asynchronous communication media (see Chapter 4.2).

One angle of analyzing the needs is making a temporal division of ICT, focusing basically on the pace of interactions. The first is real time exchanges of
ideas that are relatively short by nature; for example, having a discussion with questions and answers, or having a meeting to disseminate information and get feedback quickly. The second type is information exchange that does not require an immediate response; for example, a memo or a newsletter. The third type is the sharing of work, or information-rich content, that takes time to develop and understand, and requires resolving storage and distribution issues.

To improve distributed teamwork it is therefore indispensable to figure out what kind of media is suitable in what situations, and try to mix the technologies with face-to-face in an appropriate way, to serve everybody involved in the best possible way. Nardi and Whittaker (2001) phrased it as to form a media ecology; a combination of media with face-to-face that functions as a whole for a specific situation. I have the same opinion that this is the best solution. When working in a distributed team it is as mentioned necessary to analyze not only what ICT to use, but how to use it, and when to use what, and in particular, how to combine ICT to create the best possible ICT environment for a team. The ICT should fulfill the needs of a team and help them with e.g. communication and information storage. From the case studies it became evident that once a team found ways of communicating that worked, it was most of the time better to avoid introducing new ICT, if there were not very good reasons for changing the existing ones. If a team kept the ICT constant it was much easier to overview the work and it increased the ability to follow the progress of the project. It also made the information flow much more efficient, due to the fact that all team-members knew where to look for and send information.\textsuperscript{xxxv}

It takes time to learn new ways of communicating and it requires practice. One of the most important influences on if ICT was used and appreciated or not, was how easy it was to learn and use, how comfortable people felt using it, and that it actually worked. This was noticed in all case studies. Certain tools were sometimes made compulsory, but when the technology wasn’t easy enough to learn or not useful, people didn’t take the time and effort to really learn how to use it in a good way, even if they kept using it. This is especially true in a situation as demanding and complex as the projects in the studies.\textsuperscript{xxxv} This doesn’t only apply on the ICT, but also to technology and “supporting tools” in general.\textsuperscript{xxxvi}

All tools had their advantages and disadvantages, and it turned out to be easy to overuse especially email and telephone, probably since these are ICT that all participants felt comfortable with. Another issue was the scattering of information. A virtual team space with easy access to everything the team needed, including guidelines and support on how to use things, would most likely have been beneficial. It is indispensable that a joint place like this really satisfies a team’s needs and doesn’t limit the work or communication, at the same time as it should be easily adjusted, and fit together with what people already use, e.g. that they don’t need to check their regular email in one place, and the team email in another, at the same time as all team email should be collected in one place. More information about specific problems and opportunities connected to different ICT can be found in Appendix III.

As mentioned, the most popular means of communication were telephone and email. The question is what this means. That they were the best means for communication, that they were the most stable ICT, or that the students were just
used to using them and knew how to communicate with them, and therefore kept using them? “You stick to the technologies that settle your needs most effectively, and that do not require much effort to use, but still you experiment to push the limits you face today. It is always about technology versus function.” (IE264 Lessons Learned paper).

I concur as mentioned with Nardi and Whittaker (2001) that the best solution for a distributed project will be a combination of different ICT with actual face-to-face meetings, when that is possible. The ICT should be adjusted to the particular team’s needs, i.e. to what the tasks and the content of the project are, what “personalities” the participants have, how used they are to working with different ICT, etc. There should be ICT available for all forms of communication in distributed projects; storing information (a joint team space), personal information, formal and informal interactions, social and work related interactions, synchronous and asynchronous communication, etc. The base should be what tasks the teams need to perform, and not on what ICT is available, and it has to be ensured that the team has access to ICT that works well and supports all different team activities.
5.3 Effects on Individuals – Discussion of Results

In this chapter there is a more comprehensive discussion around six areas that had noticeable effects on individuals and how the work succeeded. The areas are 1) motivation 2) openness 3) awareness & presence 4) team feeling 5) social interaction and 6) trust. These aspects were affected in important ways by the distributed project work environment as well as affected the outcome of projects in imperative ways, and are therefore important to consider and give special attention to when trying to improve the distributed environment and when analyzing effects of a specific environment. Some of the issues have been mentioned in previous chapters, but since these aspects are fundamental for the success of distributed teams, a recapitulation of what has been said as well as an expansion of the discussion is appropriate.

5.3.1 Motivation

The issue of motivation has previously been covered in Chapter 3.4.1. Motivation, or rather lack of motivation, is one of the biggest problems in work environments. What drives people? What makes them learn and develop? Grades, money, a will to learn, a will to get a good job, do a good job, be promoted, a demanding environment, curiosity, habit?

There are many different aspects of motivation that are affected by being in a distributed work environment. Lack of motivation to communicate and collaborate because people don’t know each other and don’t see each other is one apparent difficulty for people when separated from their teammates or sponsor in time and space. People also enter a project with different motivation and diverse personalities that make them approach the work and problems they meet in very different ways. It is hard to affect that, but things can be done to keep the motivation that is already there, and increase the motivation to improve the teamwork. It is harder to keep the motivation when not seeing each other constantly, but actively working to keep up motivation can help teams prevent demotivation from happening. At the same time as this is true, the cross-cultural collaboration can also bring energy and motivation to a project.

When looking at the teams in the case studies it became apparent that when everybody in a team was motivated, the collaboration worked much better and the work became more fun. The Orange team was seen as very successful, both in their teamwork and with their final product, and they expressed a high degree of motivation. Motivation gave people the extra energy needed to deal with tasks that were on the edge of their capability, and demanded of them to learn and develop. Lack of motivation, on the other hand, was devastating for teams and could explain failure in teams that should have been flourishing, if taking into account skills, mix of personalities, and tasks.

Motivation in the distributed teams was closely connected to trust and having fun together, and if the environment was relaxed and open. Other things that was observed increasing motivation in the distributed teams in all case studies was; having common goals; knowing how to deal with project work and conflicts;
having inspiring, interesting and complex tasks; having well defined milestones; seeing concrete results; having a supportive organization and guidance when needed; getting continuous feedback; seeing the prospect of rewards (e.g. grades or a trip), etc.

One of the advantages of the distributed project work connected to the learning environment that was mentioned by teams in all case studies was the fact that they got to solve real problems, learned skills needed to work in a group as well as skills needed to solve the assignment, they practiced skills they thought they would need when working out in the “real world”. The project work prepared them for their future work and they saw it as a tremendous opportunity to practice working in distributed settings. Students in ME310 and IE264 expressed that they realized that working with people they don’t see on a regular basis and communicating through ICT instead of face-to-face, demanded different skills than ordinary teamwork, and as one student phrased it, “there is really no substitute for actually experiencing things” (IE264 Lessons Learned paper). It was by making the mistakes and seeing the problems the participants learned how to avoid them.

Lack of the issues stated above could naturally have a negative effect on motivation. When the project and tasks weren’t considered meaningful and “real”, and the team didn’t know what was wanted and needed from them, the motivation to collaborate decreased. It was essential for the teams that it was clear what the comprehensive goals were and what to expect, even if that was to expect the unexpected. Some teams felt powerless and that they didn’t have any control over the situation, which affected their motivation and comfort with their work environment. In ME310 and 2G1319 it was not entirely apparent if the distribution was really necessary and it was not obvious what was gained from it, which naturally led to less motivation.

Even when students saw the situation as advantageous, keeping the motivation was still a problem for a lot of the distributed teams. When team members went to a project web page where there had been no activity for days, they easily felt discouraged or abandoned, so creating an environment where things happen and progress is visible turned out to be beneficial for motivation and keeping the energy up. Without regular feedback, a slower pace of interactions, and lack of awareness signals, it was hard to keep the motivation up. Different ways of motivating people worked depending on who it was, what the situation was like, and on the environment.

“CY: Are there any problems that stand out that teams have had this year?
RedS3: Motivation seems to be a big one. Like I mentioned. The requirements type students, students who need requirements to do work are kind of having a hard time. So that’s actually what I was just thinking about, I’m trying to think about how, how we could be a little more accommodating for students who need direction and maybe use that direction to steer them towards open ended-ness. I don’t know? I’m not really sure how to do that. So, but that would be nice. I think personally I’d like to raise the level of expectation in the class.
RedS2: Yeah.” (TA focus group, 10-03-2000)
The teams had to be challenged on the right level. When it was too complicated, or looked too complicated, people sometimes got discouraged. When it was too easy, straightforward or obvious, it didn’t encourage interaction, effort and collaboration. One of the problems with very complex project courses, like the ones observed, is that a lot of people don’t understand what it is they have learned until long after the class is over. This is good in one sense, since it is more “learning for life”, but it can has a negative effect on motivation, and it means faculty has to be even more aware of possible motivational problems.

One of the reasons why it was sometimes hard for teams to keep the motivation was as mentioned that they did not see each other regularly. This was prevented partly by the fact that all teams had local sub-teams. In the cases where the distributed project was the only work for people, it was easier to keep the focus, but in the cases where people had a lot of other “local” work, that was normally prioritized, partly because it was more visible. There are situations when this is not true, when e.g. people get a phone call they tend to prioritize that and not the person sitting next to them. But in the long run, for more asynchronous communications, it tends to be the case.

It is difficult to motivate people to interact when they don’t really know each other. Why spend a lot of time with somebody you don’t see and don’t know? If people know each other it can be fun to communicate simply because they like each other, but when they don’t know each other, don’t know what the other people can contribute with and what expertise they have, it is easy to prioritize other things. Students in the studies said exactly that, and problems because of lack of visibility were noticed with both sponsors and distributed teammates more or less in all case studies.

Teambuilding activities, whether it was presentations, meeting face-to-face, playing games, socializing, or something else, improved the visibility, the communication and collaboration, and that in turn increased motivation.

“OrangeS2: Well the level of communication was much improved. We haven’t had to teleconference after them since we’ve gotten back. We know each of the twelve members personally, and on a pretty personal level, so when things like the communication link is failing, we can laugh, we can [to tears], whereas before it was kind of strange, you know. We met up, they were really fun people. And we just really hit it off all together. And we’re, you know, we’re more than just like working partners, we’re pretty good friends I would say. So I think it’ll allow us to transcend the difficulties of communication that have come up a lot better.” (Orange focus group, 28-01-2000).

Making the collaboration work well and keep motivated is hard in distributed projects if team members do not even share the same goals, and if it is not in actuality necessary to work together. It is often difficult for teams to keep motivated even when seeing each other and when the work is going well. If some of the regular motivational factors are removed, as it is in a distributed environment, it definitely does not get easier. It is therefore, if possible, even more important to actively try to get to know each other and gain trust in distributed projects. The input from the distributed team members was considered inspiring and motivating for especially the teams in IE264 and the Orange team in ME310, but it was still hard to keep the motivation up in the everyday work. Having
meetings regularly and seeing each other over the videoconference link helped to keep the momentum and not forget about the distributed team members.

5.3.2 Openness

Creating an open environment with open communication is a significant problem for any team, and it didn’t become easier for distributed teams. In some situations people have a tendency to open up more when being at a distance, e.g. when using IM, but that is generally connected to the fact that they don’t have to handle any consequences of what they say (see Chapter 3.4.4.2).

There can be many reasons for why people are not open. Noticed in the studies were e.g. fear of sounding incompetent, feeling uncomfortable with the situation or communicating through ICT, not knowing people so not knowing what to talk about or how to say things, politeness, lack of trust, etc. Even if the intention for not being open was not to be deceitful and create problems, the outcome of lack of openness was generally that people were perceived as unreliable when the truth was revealed or that it created problems in the long run because issues were not dealt with in time. There are no easy ways to make environments more open and allowing and help teams get passed their problems, but it is still achievable.

Something that was pointed out as imperative to create an open environment by a lot of students, especially in IE264, was the importance of humor, to bring laughter and fun into the work environment. It was especially important when first meeting to break the ice, and also made the work environment more pleasant and open to be in. A problem was that people sometimes had difficulties using humor since they had a hard time “feeling” if they offended somebody or if a joke was misinterpreted or not understood. Since people could not see the reaction directly, some didn’t dare to make jokes. The opposite problem also arose, that people made inappropriate jokes, e.g. part of a team on the Stanford side in IE264 made jokes about the others’ culture by showing a clip from Austin Powers, mocking Swedish and Asian culture, but that was unusual and not a very conspicuous problem.

There were indications in 2G1319 that people didn’t bring up issues because they didn’t want to complain, or didn’t want the feeling of hopelessness and lack of motivation to spread to the other side of the team. The predicament was that a lot of the time problems could have been resolved in a better way if they had come out in the open earlier. The lack of honesty and clarity was noticed also in meetings. Team members got the false impression that everybody agreed on everything. Humming and nodding in agreement about everything tended to be the normal scenario, and it was not clear what decisions were made and what people actually thought. Everybody thought that their point of view was the one people were agreeing on. In Chapter 3.2.1.2 it was mentioned that O’Dwyer, Giser and Lovett’s (1997) had found that people often see the importance of inquiry, but they do not actually ask the questions. That was sometimes true in the case studies, but a lot of times people actually thought they agreed or thought they were the only one that didn’t understand, and consequently didn’t see the reason to ask questions.

When observing the teams it became clear that the success of teams was
tightly connected to if there was an open communication. Students in all case studies mentioned that not discussing problems could have positive sides, like showing politeness and courtesy, but that it could also have devastating effects if it continues for a long time and misunderstandings are not sorted out. When this “carefulness” influenced the openness in the discussions it had harmful effects on the collaboration. When everybody was too amiable or accommodating, didn’t dare to say what they really thought and felt, problems arose because e.g. decision making took much longer than it had to and people weren’t working in the same direction. Something mentioned in the literature is the notion of disagreement and how important that is in team discussions (by e.g. Bruffee 1999; Sharples et al. 1993; Jarvenpaa & Leidner 1998). Disagreement may be what is needed to disrupt complacent or trivial decisions, but it can also be the cause of unsolvable conflicts.

One thing that was noticeable in conversations in successful teams in e.g. ME310 was the mix of social talk, project work and administration, which was a sign of an open and functioning communication and collaboration where everybody spoke their mind. Another very important issue noticed in successful teams was the ability to challenge each other and that people said what they wanted. This normally occurred when people were mixing work and social interactions and could be relaxed together.

The results of not being open were not always devastating, but it definitely didn’t help the collaboration. When people weren’t open, problems weren’t dealt with and even when the reason was to spare distributed team members from a feeling of hopelessness, it rather created a feeling of distrust. When problems finally came up people that hadn’t been consulted felt like they had been excluded, and not trusted. They moreover lost trust in the others for not discussing with them earlier. Even if a lot of literature point to the direction that the absence of face-to-face contact can make some people feel less constrained to remain within the confines of socially appropriate behavior (see Chapter 3.2.3.1), it was cautiousness, like Knoll and Jarvenpaa (1999) also observed, that denoted the atmosphere. As mentioned the opposite problem also arose, that people made inappropriate jokes, but it was more common that students were overly cautious, avoided speaking their mind and hid problems from their team members.

5.3.3 Awareness and Presence
Lack of visibility might seem a fairly obvious problem when being in a distributed team. Surprisingly little was done to overcome this vital disadvantage. The lack of feeling awareness and presence are closely connected to problems with both motivation and openness. Motivation normally decreases when the awareness is low; people haven’t met for a while, haven’t talked, and don’t know what the others are up to. Without awareness of each other’s actual work and competence, it is more intricate to be open. Another tribulation that can arise when not being present is that it is more difficult to affect the situation and get people to do things. If somebody at a distance doesn’t pay any attention it is hard to influence that person and get his or her attention.

A lot of the disadvantages of being at a distance noticed in all case studies were connected to visibility and awareness, and have already been mentioned. If you don’t see somebody, it is easy to not prioritize that person, especially if it
demands effort. Some teams in especially ME310 had problems getting especially the sponsors’ attention, and because of this they didn’t get their time, and was not able to prove what they were capable of, until they met face-to-face. If the subparts of the teams didn’t naturally fit together, the students had to put in effort to get attention even from their distributed team members. That happened basically in cases where the level of participation and motivation varied extensively between the sites as occasionally in ME310. If awareness was not sustained, the motivation and level of participation decreased. Most people today have a limited amount of time, and everybody has to choose whom to spend their time on. The motivation to take contact when not knowing and not seeing somebody decreases. It is easy to ignore people or at least not spend a lot of time with them.

Because of lack of visibility it was hard for the distributed teams to get a feeling of what was actually done and what the others knew and it was also harder to get a hold of distant team members. This meant everything had to be more explicit. Since distributed team members don’t see each other constantly, it is useful to know what the other members of the team are going through. As mentioned in Chapter 4.3 alumni and faculty in ME310 mentioned that when people were not visible, not really part of the team, not trusted and involved, they were often given separate tasks for material not crucial to the work.

It is also true, as Whittaker and O’Conaill said (1997; see Chapter 3.1.3.4), that having common knowledge is crucial to achieve reference in communication, to be able to identify objects and events, and acquire a common view, so everybody sees basically the same things, in the same way. The VIP-camera used in ME310 was an attempt to creating more awareness and helped the teams to see each other working. It was part of creating an understanding of the efforts everybody was contributing with, and supported awareness and the feeling that people were actually working together. It was beneficial for them to know what the distributed members of the team were going through. Even if not communicating all the time, team members then saw that their distributed side was going through basically the same things as they where. By being aware of the importance of awareness, actions and activities can be used to decrease the feelings of distance. By increasing the awareness of each other, creating a feeling of presence, and making the process more visible, people are more likely to feel like one team and actively collaborate together.

It is not only awareness and visibility that are important. Something difficult to accomplish with the limitations of ICT is the presence of a body, even if avatars and projections of people are starting to become more common. Physical presence has according to Nardi and Whittaker (2001; see Chapter 3.4.2) a value in itself, to show dedication and commitment. They therefore put emphasis on shared bodily activities in facilitating social bonding and showing commitment; like e.g. touching, eating and drinking together. This kind of experiences was achieved in the teams in the case studies by conducting site visits.

5.3.4 Team Feeling
The importance of teambuilding and creating a team feeling shouldn’t be ignored since it is significant for creating good conditions for teamwork. As stated several time before; being in a distributed team makes it more intricate to feel like one
team. A lot of variables affect how successful a team will be achieving a team feeling. Regardless of the preconditions, there are always things that can be done to improve the team feeling and help people get to know each other. If team members really feel that they are a group and belong to the same team, it helps enhance the collective work.

It is harder to get a feeling for whom people are in a distributed setting, especially before meeting face-to-face, and when not getting a feeling for the individuals, it is more difficult to achieve a team feeling. Distributed teams can’t take regular coffee breaks together, since they are not located in the same space, and they can’t just go out for dinner or a beer together after a hard days work. It is difficult to replace this in a virtual environment, and it demands effort to find a forum where people can talk about what they did last weekend or find out common interests. As mentioned earlier the teams in all case studies thought that getting to know each other on a personal level does not only make the work more fun and make it easier to keep the motivation and energy up, but it was important for them to e.g. be able to trust each other, know what to expect, and to ensure an open communication.

For the teams to be successful and feel as a distinct unit it was vital to create a common starting point, a common ground (see Chapter 3.4.4.3) to get everybody motivated and working in the same direction. This proved to be difficult for the distributed teams in the case studies to achieve before meeting. One advantage of having awareness of the difficulties with distributed work was that when the teams met face-to-face they normally tried to really utilize the site visit, since they knew that they only had a limited time together, and knew it was important to get to a common understanding in that single meeting when they were gathered in one place and actually got a chance to see each other. As Armstrong and Cole (1995) stated (Chapter 3.2.1), face-to-face meetings appear to be particularly important when forming a group, and the teams in the case studies stated exactly that. It was when meeting they got to know each other and really started to work together. Meeting provided teams with a common ground, a feeling that they had gone through something together; worked hard as well as had fun, and it provided a common experience they could talk about.

There were several factors that affected the teambuilding in the distributed teams observed in the case studies, discussed previously. One of the first issues that influenced how teams developed was how they were formed and the actual team composition; i.e. what personalities were in the team, how well people knew each other from before, how much they had in common, what competencies there were in the team, how the team was distributed (i.e. how many persons on each site, how many sites, geographical spread, etc.), how many members there were in the team, etc., as well as the atmosphere in the organization and the leadership.

Some distributed teams really managed to create a team identity, a feeling of belongingness and being part of a team with common goals that was working in the same direction. This happens more or less naturally in teams, but it was clear, as stated earlier, that distributed teams in general need more active teambuilding. The teams in the case studies hardly used any distance teambuilding activities. Minor attempts were made with presentations, resumes, introductory web pages, and they all arranged at least one face-to-face meeting. The activities were only
starting points and deeper discussions were demanded to really understand who
the others were, and these discussions generally didn’t occur until the teams met.
The image people had of each other always seemed to change when meeting, for
better or worse, and most teams came out of the meeting with a higher degree of
team feeling.

It turned out to be naïve to assume that a team feeling would develop by
itself. It was often assumed that the actual teamwork was enough to ensure that
teams had common goals and struggled together, but some team members never
felt they truly had anything in common, or a common goal, and didn’t realize what
they could gain from their distributed team members, since they didn’t know each
other and wasn’t motivated to actually get to know each other and work together
(this was noticed especially in ME310). Even if the tasks were designed to
promote collaboration, some teambuilding activities to get the teams started, to
give team members a possibility to get to know each other, and build some kind of
team community or identity, would have been useful, particularly since a lot of
problems disappeared after the site visit (that was partly used as a teambuilding
activity).

Competition with somebody or something outside of the team is a well
known way to increase a team feeling, as long as it doesn’t develop into
competition within the team. The alumni and part of the faculty pointed out the
importance for teams to suffer together, to feel that they go through something
together that is worth working hard for. As mentioned, awareness of each other
and what others were doing were also vital to start feeling like one team. A way to
reach more of a common identity was to create a virtual joint team space or
support visual information of the local space through a camera.

5.3.4.1 Teambuilding Activities

Teambuilding activities are one way of increasing the team feeling and help teams
get passed problems they encounter. With teambuilding activities it is possible to
make people more aware of common problems, but it is also an important aid to
build trust, form a team identity, and to help team members get to know each other
better. For activities to actually work in the time pressured environment most
projects exist in, it is essential they don’t take to much time from the actual work,
they are not too formal, and focus on topics vital at that specific time.

There are different kinds of teambuilding activities, whose goals are
dissimilar. This is essential to reflect on if deciding to have teambuilding
activities, to be able to choose the right kind and achieve the right effect. The aim
of an activity can be teambuilding (to create a team feeling) or to learn about
teamwork; find out more about each other professionally (competence and
knowledge) or about each other personally, at a more private level. This can be
achieved with both planned and formal activities, as well as informal. Exercises
where teams experience situations and face some of the things that might happen
in their teamwork can make them more willing to believe other things that they
only learned about theoretically. Informal teambuilding activities give team
members the possibility to socialize and spend time together in a more relaxed and
spontaneous way. By doing something together team members get to know each
other, learn how other team members behave, get to know a little more about what
to expect when working together, as well as getting a joint experience.

To support teambuilding at a distance there are e.g. activities where team members can complete personality inventories that reveal how they prefer to work and communicate, and there are games that point to the value of teamwork, but this is an area that definitely can and should be developed. By having teambuilding aiming to improve the teamwork, teams can get assistance to reflect on the team process by activities that are not directly connected to the content of the project. Especially at a distance, but even on-site, it can be useful to have teambuilding activities where people can discuss, encounter problems and get guidance, without affecting the actual project.

It is especially the more informal activities that are hard to replace when working at a distance, e.g. spending time together, socializing. There are some classical on-site informal activities that normally work well, mentioned in previous chapter, but it is not always possible for distributed teams to have a face-to-face meeting, though, and the everyday face-to-face socializing is definitely absent. Doing things together, playing games or having teambuilding activities, helped some of the distributed teams, since it provided some kind of shared experience for them, and it was something they could talk about. These activities were also concrete and limited in time, which made them easier to overview than the actual project work.

Even when teams had teambuilding activities and got information about team issues (in lectures or guidelines), it was noticed that they had problems connecting theoretical knowledge to their actual problems. This was mentioned by the faculty in IE264, but observed in all case studies. When team members learn about mistakes they are likely to make and see problems they might encounter before they start to really work together, the anticipation is that they see problems and solve them faster when encountering them in the actual work, but information turned out to be far from enough. Unfortunately it was not as easy as throwing out some guidelines and conducting various teambuilding activities. The teams had to actively work on their team- and trust building and as mentioned before often needed to get continuous support from a project leader or teacher throughout the project.

The teams didn’t take initiative to do teambuilding voluntarily, partly because they were busy with the actual work, and partly because people felt uncomfortable making suggestions like this (perhaps even more so since this was for the most part a male engineering environment). Activities were definitely something that had to be implemented by an instructor, or the coach or team leader, or it didn’t happen. People tended to be “time efficient” and only do what they had to for the moment, even when they knew (which most people didn’t) that they would work more efficiently together during the whole project if they took time to get to know each other in the beginning. Because of the problems connecting exercises with actual teamwork it became clear that formal teambuilding activities needed to be followed up properly, with debriefings etc., to help teams make the connection between theory, exercise and reality. When this was not done, the teams didn’t learn much from the activities, even if it sometimes still helped them get to know each other better and gave them a shared experience.

It is hard to say what the impact of teambuilding activities could have been,
since none of the teams really used distributed teambuilding in a structured way, but relied on the face-to-face meeting. It turned out to be harder to take initiative to have both formal and informal activities at a distance. Observations showed that the minor teambuilding activities used was not integrated enough to be really useful, even if participants said they appreciated them. For people to get to know each other it seems to be preferable with more informal teambuilding activities, where people don’t think too much and simply get to know each other, but they are the hardest to implement at a distance and there are no established ways on how to do it.

5.3.4.2 Team Identity and Community

One part of teambuilding is creating a team identity. This can be done without the team members really getting to know each other. For example, something as simple as having the same T-shirts, bandanas, or having a name can help giving a group of people an identity; it is easier to tell who is on your side, people feel they share something, perhaps a goal and an interest, have something in common, belong together and bond faster; everybody is involved and feels like they are part of the team. This is commonly noticed amongst e.g. soccer supporters. This brings us back to the issue of having a common ground. When people don’t feel they have anything in common, it is hard to motivate collaboration and create an environment where people support each other. It is obviously better if a team really gets to know each other, but having a team identity is a good start to make people want to get to know each other.

Even if working often is not enough for distributed teams to develop, as mentioned earlier, major elements of the identity for the distributed teams was the actual work, starting with discussions about goals, ethics, liabilities, communication styles and norms. It became clear that assumptions about norms can’t really be made in distributed teams, and to collaboratively negotiate norms became even more critical since it formed the foundation for the team identity.

One example of a setting where people really take care of each other, without meeting face-to-face and before really knowing each other, is (virtual) communities, partly because of the feeling of belonging together. One big difference between projects and communities is that communities are driven by people engaged in a specific question; it is a “place” where they get to meet kindred spirits and discuss things they love. They don’t have to be there at specific times and they can choose their level of activity. The more interested they get, the more time they spend there and they put in as much time as they have at the moment. Some like the anonymity, while others get friends in the virtual environment. People normally don’t have a specific goal or concrete product that they have to deliver at a certain date, but strive to learn more about or do something with others in a specific area that they are interested in. This differs a lot from the situation for distributed teams. A distributed team should at least have a team goal, even if that goal might differ from the individual goals. Before getting to know each other there isn’t normally a high motivation to communicate or work together, at the same time as it is compulsory to be present and actually accomplish something. Actively trying to create a feeling of community is hard and it is not necessary to create an excellent environment for a project.
I generally believe that it is hard to create a community. The base for communities lies in the fact that they grow by themselves. A community is based on the interest of the community members, and therefore sustains itself (see Chapter 3.4.3.2). It is possible to create a better or worse environment for community building, and that is almost the same things as creating a better or worse environment for teambuilding. But it is not necessary for a team to create a community. A project is normally more limited in time, has more defined goals, has to deliver something at a certain time, and should be motivated at least partly from that. Thinking about the team identity and if there is a possibility to create a feeling of community is still important.

5.3.5 Social Interaction
As mentioned, social interaction in itself is not an effect on individuals, but the desire to interact socially is affected when people move to a distributed environment, and social interaction in itself affects individuals in important ways. A way to increase motivation and establish a common ground is social interaction, as mentioned several times earlier, and the desire to interact socially generally decreases when people move to a distributed work environment. Since people that know each other tend to open up more and share more of their thoughts, feelings and ideas, this is an imperative effect on individuals to consider. By interacting, people discover that they have common interests, learn about each other’s personality, and start caring about each other, since the anonymity decreases. Task orientation is sometimes desirable, that teams focus on what they are supposed to do, but it is not always advantageous. A depersonalized environment can in the long run lead to less satisfied and motivated team members, and probably to less creative ideas. There is nothing that says that an environment has to become depersonalized in a distributed setting, though, even if it is more likely when being restricted to virtual interactions. To avoid creating a depersonalized environment, getting to know each other also on a personal level is vital for distributed teams.

The distribution had a direct effect on the more social sides of interactions in the distributed teams in all the case studies. As mentioned earlier, having fun together was considered an important foundation for feeling comfortable, but e.g. using humor was difficult since the lack of cues implied that people’s reactions were not as accessible and it was more difficult to know if somebody had been offended or if a joke had been misinterpreted. According to the literature (presented in Chapter 3.3) ICT doesn’t really support informal communications. The research that states that if fairly old, though. With IM, chats, email, this has changed. But even if it has changed, it is still hard to do the classical teambuilding activities when located in different sites and that is a fact that Nardi and Whittaker (2001) say have been ignored.

Many of the students in all studies put emphasis on the importance of doing other things than working together to really start working well together. This included having personal introductions, socializing, having fun together, etc. It was when the teams got to know each other they really started collaborating, became motivated and the communication became more open. When people got to know each other they learned about each other’s competencies, strengths and weaknesses and could utilize the diversity and strengths of the team better. As
Cheesman and Heilesen (1999) mentioned, it is hard to replace a real life meeting with photos, CVs, home pages and the like. I completely agree, but all of these examples are static ways of giving personal information and does not really give any opportunities for team members to interact. I guess that many people with me, that have spent nights chatting with a person on the other side of the globe knows it can be very social. It is not the same thing as meeting in person, but it is definitely social interaction, and a reasonably good way of doing it, especially if you already have met the person you are talking to.

Even if pictures and biographies doesn’t replace face-to-face, it is still valuable. The lack of creativity when it comes to socializing was apparent in the distributed teams in the case studies, but there are no easy solutions. It is important to remember that getting to know each other sometimes also led to that people realized that they did not like working with some of the team members, but once people knew each other they at least knew what they thought and felt about each other, and could adjust the work and their behavior to the situation.

The distribution was a hinder for being social for the teams, since they to a certain extent had to learn new ways of how to socialize and how to interpret signals. A lot of the participants were used to being social though e.g. IM and email, but the situation was still not the same as they were used to. They normally used ICT to communicate with friends and people they already knew, and when using ICT to communicate with strangers, the purpose was generally not really getting to know each other on a deeper level. So, it was not being social that was the new situation, it was getting to know people and keeping the communication on the right level when talking to strangers they were supposed learn about and work with. As Haythornthwaite, Wellman and Garton (1998) said (Chapter 3.4.4), it is more a matter of time before people learn how to use ICT and make the media more social. But even if people will eventually learn it is important to create an environment with opportunities for social interactions and suitable ICT support, to not create a completely task focused collaboration.

Diversity was as mentioned considered beneficial by the faculty in all case studies for collaboration regarding quality, richness, creative outcome, etc., but it was not always beneficial for social interactions and team- and trust building. In teams where people understood each other easily, where they thought and behaved similarly and felt they had something in common, it was easier to find a common ground. One of the reasons why it is important to get to know each other is to be able to see through the differences and be able to take advantage of the diversity and not only get stuck in the differences. After team members had gotten to know each other, the distance didn’t matter as much any more. After meeting face-to-face e.g. the Orange team in ME310 even managed to transfer their team feeling across the ocean and the participants enjoyed each other’s company across time and distance, and that made the communication more open and improved the collaboration.

A problem that occurred, which in a way is the opposite of the problems mentioned earlier, is that computers and communicating via ICT can become people’s social life. It is easy to chat with people through IM instead of meeting face-to-face, it is easy to use the phone instead of going to see a friend. One student made a remark of how he really noticed this happening and realized that it
is important to find a good balance in the behavior and not only live in a self-created “virtual world”\textsuperscript{xel}. According to Hewes (1986; see Chapter 3.1.3.3), people have problems focusing on tasks and managing relationships and conversations simultaneously, so they often pursue one at the expense of the other, which can pose serious problems for a team. The aim has to be to achieve a balance between task-related and social realities. Teams with too much social interaction don’t perform well, but even if this is true, no team in the studies was too social in the sense that they didn’t get the work done because of it, and the social interaction improved the actual work and increased the energy, rather than took away focus. So, on the contrary it definitely didn’t affect the work negatively, but showed to be very important with social interactions in these long, more complex projects that demanded a lot of creative thinking.

Dirckinc-Holmfeld and Sorensen (1999) stated (Chapter 3.4.4) that without reestablishing a social and shared context, it is not possible for the participants to communicate or collaborate. I am convinced that knowing each other and having a social part of the collaboration is helpful in a lot of ways, but not that it is impossible to collaborate without it. I believe projects can work without social interactions, but the openness and level of the work interactions won’t be the same without it. If the teamwork is strictly task focused or include some social interactions affect e.g. the communication, the motivation, the openness, and how willing people are to make an effort to make the communication work. How important it is depends on the task, e.g. if the work is complex, demands creative thinking and open discussions. The big problem for the teams in the case studies when it came to social interactions through ICT, was getting to know each other and keep the motivation up to communicate in the long run, because as soon as the motivation was there to communicate socially, people found ways. If there is motivation to get to know somebody or if somebody is already a close friend, people are generally willing to put in a lot of effort to succeed with the communication.

5.3.6 Trust
Establishing trust was one of the primary and most challenging tasks for the globally distributed teams. Without really trusting each other, it is hard to work actively together. People are generally not used to actively thinking about trust issues, but at least a team manager should consider possible impacts of trust in a distributed project; what can be done to improve trust and what are the obstacles for building trust. One problem is that trying to hard to build trust can in worse cases be devastating for the same (see Chapter 3.4.5.3). Since the distributed team members couldn’t base their feelings of other people on instincts and impressions exactly the same ways as when meeting on-site, it was necessary to have a more active trust building, i.e. getting to know each other as well as actively trying to show competence, good will, and motivation, as well as discussing factors that are potential obstacles for trust.

Normally people seem to start on a basic level of trust when going into a project. When people belong to a team they automatically have some kind of basic trust to the other members of the team. They have to assume that people in the
team are there to do a good job as well. This starting point for a trusting relationship is very fragile, though, and from this point on trust can either be built or taken away, depending on the behavior, actions and results of the participants. How people behave and act then decides if the level of trust will slowly rise or be transformed into distrust. Team members judge each other after e.g. what they do, what results they produce, what they know, and on if they seem to make an effort or not. The identity and teambuilding make people trust each other more and in the end it will hopefully make the team collaborate better.

Mankin, Cohen and Bikson stated (1996; see Chapter 3.4.5) that without trust, virtual organizations can’t work at all. I am not convinced that people can’t work at all, but it certainly limits the collaboration and the level of the discussion. Sometimes people have no choice, but have to work with people they don’t trust, but they will probably not work as well as they would if they trusted the people they were working with and it won’t be a sustainable or comfortable working situation. The best way in the long run to keep trust at a high level is naturally that everybody actually is trustworthy and does their best to be an important and active part of the team, but what is done also have to be visible to the rest of the team. Without people that are actually being worthy of trust, there is no environment or exercises that can help build trust in a team.

5.3.6.1 Functions of Trust
The more set and less complex a task is, the shorter the time frame, the less teambuilding and trust is needed. When people have to open up, take risks and really need each other to be able to undertake a task, trust becomes vital. It can be a daunting experience to not be able to see the whole process or the actual work that is being done, and still be forced to believe that a good job is done and that results will be delivered on time. If people don’t know the persons they are supposed to collaborate with and have never met them, it is hard to know what they can bring into the project and if they can do what they say they will do or if they have any intention of doing anything. For people that have never met, there is no reason for trust. In the case studies this was observed to be the case especially for the relationship with the sponsor, but in some cases also for relationships between team members. This does not imply that there was necessarily distrust, but just not a high enough level of trust for effort to be put in to make it work.

One reason why it was so important for the teams to get to know each other and build trust is that it is hard to take risks when communicating at a distance. As Shaw (1997) said, that “Without risk, there is no need for trust. Trust and risk give rise to each other; it is rare to find one without the other.” (p.24). This actuality might be one of the reasons why people seem to “trust” each other more easily in virtual worlds and on-line chats. They don’t have to reveal their true identity, but can use an avatar face and a taken name, or simply choose to only show certain personality traits. If people don’t have to see the people they are interacting with ever again, and have nothing to loose, there is no risk involved, and therefore no real trust. This is not true for distributed teams. There is a risk involved, and therefore people need trust.

The risk factor was apparent e.g. when it came to openness and conflict management. Since it was harder to predict how other people would react, instead
of pushing things too far and risk annoying people and cause conflicts, as mentioned earlier, teams often tried to keep the communication safe and conflict free. To really get to know each other, make good decisions and get a lot out of discussions it is not really possible to keep it safe, though. Students in IE264 realized exactly that, and noticed a difference in their actions after they met, when they knew each other better and dared to take more risks. How a person behaved affected how trustworthy he or she was considered to be. Consistency was a good base for trust, and helped when there were fewer cues, as well as organization of the work and honesty in what was said.

An issue often discussed in connection with interactions through ICT, is that it is hard to be sure of people’s identity. In the situation for distributed teams, identity is not a big factor though; people know who they are talking to, even if they don’t know them. If people are in long term relationships in a team, it is very unlikely that they are deceitful about who they are, even if they sometimes show fewer sides of their personality, more or less intentionally. In the case studies there were also incidents when somebody, e.g. the owner of a computer, looked available on IM, but had only lent their computer to somebody else and was in reality not even around. These things were quite easily resolved and never led to distrust, at the most to awkward confusion.

At a distance it was sometimes hard to get attention from sponsors, so the teams never got a chance to prove that they were trustworthy. The Stanford side of the Orange team had to go through their Swedish teammates to get any information from their sponsor before they met them in person in Sweden. Students in all studies said they definitely noticed a difference in the level of trust after they met face-to-face. This was especially noticeable for the Orange team when it came to the sponsor. The sponsor became interested in their work and started communicating, so the change was drastic.

When team members trusted each other, they dared to take individual decisions, act on their own, trusted the decisions taken by others, and didn’t feel the need to check in with each other for all small details, which made the work much smoother and efficient. When team members trusted the capability of others, they focused on working instead of supervising or controlling each other. “BlueS2: And I think it’s because we trust each other too, but, like I have confidence in BlueS1 and BlueS3 and I think they have the same confidence in me too, so I think it’s, we know that they can go off and do it because maybe it’s not perfect but it’s the right thing to do. And in the same shoes, we probably would have made about the same decision.” (Blue focus group, 23-02-2000). The Blue team in ME310 felt a freedom because they trusted each other, they dared to make decisions individually, and they did not feel the need to always ask the team.

It was noticeable in especially the more uneven projects in ME310 and 2G1319 that it was difficult to trust people enough to e.g. delegate important work when they didn’t know them; when not knowing their personality, skills, capacity or knowledge, especially if one site had much more power or access to people than the other so they didn’t really have to collaborate. Even if this wasn’t necessarily distrust, it sometimes came through as e.g. difficulties delegating work or ignoring the other site when making decisions. For the people on the other site, it was also hard to volunteer to do things, especially details, since it was impossible to know
particulars about what needed to be done at a specific moment on the other site. When people trusted each other they were more willing to share information, put in effort, and help each other. This was true both within the distributed teams and for the relationship with the sponsoring companies.

“EJ: But it wasn’t, if you work at a distance, that’s when it’s, ’cause that’s what I think is it’s harder to trust somebody you don’t like at a distance. ’Cause see it’s harder to see the skills and actually-
PurpleS7: -For us it never even got to that point. We didn’t even know the person well enough to like him or not like him. To know their skills, not know their skills, just they were kind of like-
EJ: -How did you use ‘the consultant’?
PurpleS7: They had different assignments. [pause] He would go out and get us data.
EJ: But you trusted that. Trusted that it was-
PurpleS7: -We trusted that we didn’t want to do it. It didn’t matter what he was bringing back because we were going to use it.
PurpleS8: For one, to build on what, ’cause only ’cause he’s told me, from what I recall he said that typically their group gave him stuff that if he didn’t deliver it didn’t matter, it didn’t affect the outcome of the project that much.
CY: So you didn’t trust him really.
PurpleS7: Probably not, yeah. He was not on any of the critical paths. Let’s just put it that way.
PurpleS8: Right and so that kind of says in itself.
PurpleS7: All his stuff went in the appendix.” (ME310 SLL alumni focus group, 04-02-2000)

The implications on collaboration if team members didn’t trust each other were clear. If they didn’t have to work together, they didn’t; if they had to work together, they tended to involve the other side as little as possible, before they got to know each other and got a base for trust. The need for more active trust building became evident, since teams couldn’t count on getting to know each other and build trust as in an on-site setting.

5.3.6.2 Influences on Trust

As mentioned earlier, it was important that some kind of leader supported trust- and teambuilding activities, brought up the topic, or started discussions, since people tended to be very task oriented. A lot of the teams would have benefited from having a leader that anticipated possible problems, tried to actively find possible causes of distrust and problems before they happened and handled them before they became an issue, as well as assisted the team when trying to overcome problems. The assigned team project manager or team coach normally didn’t have the necessary experience and power to do this, and there was not enough support when it came to problems related to the distribution from the faculty in especially ME310 and 2G1319. As stated earlier, it was difficult to implement non-task-related work for persons that didn’t have the necessary “power”, since there, as it normally is in teams, was always a lack of time.

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It is naturally preferable if the whole team is aware of difficulties and problems that can arise because of lack of trust, lack of knowledge about each others capacities and background, lack of motivation and interest in working together, etc., but at least the leader or teacher should know enough to help teams get passed difficulties, and it is vital to have an organization to support these issues. A lot of the time it would also be beneficial to have a discussion in teams of what can be done to build trust.

Trust is tightly connected to expectability and predictability. Loosing trust in the observed teams was normally connected to miscalculations in how people behaved, i.e. that they didn’t behave as predicted. It wasn’t necessarily exactly what people did; it was what they did in comparison to what was expected that was important. This is why clarity and honesty are so important, and why unpredictable behavior is important to avoid. There is a mutual dependence here. To dare to be honest and have an open communication trust is required, and trust requires an open and honest communication. Since it is hard to tell what the cause of actions and problems are when being at a distance, it is even more important to avoid unnecessary conflicts because of lack of planning or confusing messages.

As mentioned earlier, Misztal (1996) stated that trust can be said to be based on the belief that a person, who has a degree of freedom to disappoint our expectations, will meet an obligation under all circumstances over which they have control. If circumstances arise which prevent the fulfillment of obligations, through no fault of the person concerned, it won’t be perceived as a case of betrayal. This means that although we are willing to forgive mistakes or unintended consequences, the intended betrayal of our trust is a cause for enormous pain and distrust. One problem not mentioned by Misztal (1996) is the difficulty to tell if something is intended or not, especially at a distance. It becomes much harder to analyze why people are late or why they have not done their tasks on time, when people don’t see the process, only the end product or effects of actions.

To collaborate it is important to trust that people are competent and knowledgeable enough so that the effort is worth spending time on and there is a reason to actually build a relationship. It is also important that the person is not only able to do what he or she says he or she will do, but also that he or she will actually do it, and preferably on time. The third most important part found for trusting somebody, and to be able to get a really good collaboration going, is a feeling that it is possible to discuss freely, without even considering the possibility that what is said might be used against you in any way. This doesn’t mean that people in a team have to like each other to be able to work together, but they have to at least trust the competence of others and be able to anticipate their teammates’ behavior to even come close to take pleasure from the situation.

To avoid the likelihood for unevenness it is important that participants are aware of each other’s competence and really see the benefits of collaborating to really start trusting each other. The case studies showed that when people didn’t see the reason for collaborating, there was no incentive for them to put in effort and actually try to get to know the people working on the other site. There was a difference in trust after meeting face-to-face in basically all the teams. Generally people trusted each other more after they had met, but trust was sometimes also
lost when people actually met face-to-face. Expectations might have been wrong, people hid information and problems, tried to look better than they were, etc. To be trusted it was important for team members to show that they had the necessary competence, could keep deadlines, be on time for meetings and was willing to follow the norms and rules stated by the team. It was also important to be honest about problems and to try to have an open communication. Verbal competence was useful and promoted trust, as long as it was not used to take over discussions or decide what should be done in the team. People in the case studies tended to trust a person when:

- They didn’t think a person would betray them.
- They didn’t think that a person would take credit for what they had accomplished.
- They didn’t think that what they said would be used against them.
- They thought a person had the competence to get the right information.
- They thought a person could do what they said they would do.
- They thought a person actually would do what they said they would do.
- They thought a person would actually do it on time.
- A person had proven to be trustworthy before.

A way used by the distributed teams to create trust and a team feeling was as declared earlier to focus on similarities and what they had in common, and this way create a common ground for the team. One student in IE264 gave the advice to concentrate on similarities that exist, and claimed that his team reconciled their differences and built the team’s foundation on the things they had in common, therein defining their own culture. The danger with focusing too much on similarities is that it is easy to neglect the differences that do exist in the team. When focusing on similarities it is naturally important to acknowledge the differences and be open about them and the value of diversity. If not doing that, focusing on similarities might only lead to conformity, or to more conflicts and misunderstandings, since it creates the false impression that everybody thinks and feels the same. Some teams in the studies got into conflicts because of the fact that they failed to see that the team members actually were different in a lot of ways. This was diversities regarding nationality, personality, educational background, or something else. There was also a danger that especially American students believed that there were no differences, just because the other students were used to American culture and adjusted to them. There were clear signs that this happened in some of the teams in IE264.

A way for the teams to build trust was to actually meet face-to-face, to do a site visit with the purpose to provide a good ground for trust and getting to know each other. It is important to not confuse trust with how much people enjoy themselves or if they fit together as personalities (even though it is easier to trust somebody who acts and thinks the same way as you do, since that person becomes very predictable and easy to read for you). As mentioned, having too much fun can also turn into a problem, since it can prevent people from working. Since it is harder to work with people that you don’t like, there is a fine balance between work and play that all teams have to learn how to handle. As mentioned in the
discussion about conflicts, having problems is not necessarily a bad thing; but not acknowledging problems or leaving them unresolved can become really dangerous and counteract the building of trust.  

To create an environment where trust can be built, it is not only important to trust each other within the team or to trust the sponsor. The team has to trust the organization and management as well, to really work well. There should be both technical and organizational support to create an environment with trust and open communication. If teams don’t trust the environment and the organization they are in, the work environment will never be considered supportive and pleasant. As mentioned, it is important that an organization supports the team and provides an environment that is predictable and reliable.

Lack of trust limits the collaboration and the level of discussions. Sometimes people have to work with people they don’t trust, even if they probably won’t work as well and won’t be happy with the working situation. Because trust depends on our expectations, how much we trust somebody doesn’t necessarily have to do with exactly what people are doing, but how well we know them and what we expect of them. You can trust a person without having high expectations, and you can change the expectations without loosing trust. It is therefore important to separate these two things, trust and expectations. This is one of the reasons why it is important to get to know people and learn how they behave. When people got to know each other they knew what to expect and didn’t loose trust because of minor details. If you don’t know a person it is easy to transfer bad experiences in one area to other areas and develop a general distrust. Trust grows (or disappears) when really getting to know a person, for example seeing his or hers strengths, weaknesses, personality, competence, and work ethics. When not getting to know each other the trust might not disappear, but it won’t grow either.
5.4 Summary and Conclusions

All teams, distributed or co-located, are different and will experience different problems, because of the psychosocial and physical environment, the people involved and the type of work they are involved in. When moving to a distributed work environment some problems become harder to overcome and there are new obstacles, but there are also problems that decrease in magnitude and new opportunities open up. It is possible to successfully work in a distributed team without regular face-to-face meetings, even if it is more intricate. *It will always be different, and the big danger is believing that it won’t.*

When team members don’t see each other frequently, *the foundation for collaboration and communication changes*, and the organization, leadership and support has to be adjusted to that, as well as the communication, collaboration and organization within a team. Working in a distributed work environment is not necessarily worse, but there are no effortless solutions for replacing face-to-face encounters.

Teams working in distributed projects go through *basically the same stages* as any other team. An important conclusion was the necessity to analyze what problems and issues that generally arise in different phases of teamwork, and what kind of teambuilding activities and support are suitable in different phases, to be able to support teams and handle problems proficiently. It is also essential that somebody has knowledge about distributed work, and actually gives *guidance, information and support* to teams; to increase awareness of common tribulations, help teams through difficulties, prepare for problems, as well as provide support to keep teams motivated. Learning about specific concerns for distance communication, collaboration, conflict solving, etc. is essential for the project work, and awareness of communication styles, personality differences and the value of diversity increases the understanding for and helps creating a pleasant environment, even if it doesn’t necessarily diminish all problems.

Different areas in the *objective work environment* are vital to consider when forming and managing an effective, creative and comfortable distributed project work environment; the organizational structure, leadership, team composition, organizational design of the project, team management, distance, physical environment and ICT. Distance and the need to incessantly communicate and collaborate through ICT affect all these areas, as well as they affect each other in essential ways. Teams have to learn how to handle all kinds of interactions, conflicts, to delegate work, and get passed language barriers and cultural differences at a distance. For more discussion around factors and variables that affect the distributed project work environment, please see *Chapter 6*.

When teams use ICT to communicate and collaborate, the different *ICT demands changes in behavior and affects how people perceive things*. When communicating though ICT the relation between the senses changes as well as our perception of and relation to other people. To establish good collaboration it is important for teams to use ICT that works and that team members know or have time and support to learn how to use. It can furthermore take time to learn how to feel comfortable communicating through a novel media, which is something that should be considered. One area that becomes difficult when working at a distance
is that people have to use ICT for all communication, which means they have to e.g. handle sensitive topics, decide what ICT to use and get to know each other through ICT. A lot of problems are caused by lack of experience with collaborating through ICT and using common communication tools for new tasks. People have to learn new communication skills, establish rules for when to use what media and adjust the norms of conduct to the specific media. Issues that people normally take for granted suddenly demands effort.

Since the use of ICT affects communication and collaboration, it is important to carefully consider what ICT to choose for a distributed project. What ICT to use have to be adjusted to the environment, the project, the needs, the participants, the budget, etc. Even more imperative is how a team uses the chosen ICT, though. To choose the right ICT for a specific purpose and activity, make sure it works well enough, make sure that people know how to behave in different media as well as learn how to feel comfortable with the media. Teams benefit from ICT that provides file storage, sharing information, and asynchronous and synchronous communications, as well as supports socializing, awareness, and more formal meetings. It is beneficial if the ICT provides the team with an image of what the environment, the people, and the local systems are like at the other site and makes the team process more visible.

For people to feel comfortable it is important that the ICT allows them to display their personality and that the ICT can be adjusted to different preferences and needs, as well as that there is room for informal and social interactions. The main problem with distributed work is frequently not the ICT in itself, but learning how to use it to reach the best results, how to feel comfortable in the new work environment, and how to be social and get the motivation to get to know each other through ICT without meeting face-to-face. ICT is in general not the deciding factor for the success of a team. People seem to adjust to whatever is handed to them if other aspects are working well in the team, but sufficient support and suitable choices of ICT make collaboration and communication easier, more friction-free and provide an environment where a team can focus on issues more directly associated to the project.

In distributed work environments it is more difficult for team members to get to know each other, keep the motivation, build trust, know each other’s strengths, weaknesses and competence, and interpret each other’s actions and interactions. Because of this it is vital to actively strive for an open and direct communication, be proactive, take initiative, make sure to document the work and visualize the process, and actively work to maintain and build relationships. More active team-and trust building is needed in distributed projects.

It is vital that team members get to know each other, on both a professional and personal level, since how well people know each other affects the comfort level, trust, expectations, communication, motivation and willingness to be open and take risks. To relate on a personal level and interact socially makes the work more fun and increases the motivation to interact and collaborate, but it generally also improves the actual project work and supports in creating a more open environment, where people have more awareness of each other and a greater sense of presence. Informal interactions are fundamental when creating a common ground, to dare to be open, bring up suggestions, be creative and dare to use
humor when communicating. Getting to know somebody better can also be a reason for loosing trust, so if somebody is not competent and trustworthy trust won’t be built, but a project will on the other hand not be as impaired if troublesome team members or problems are exposed in time.

If a team feels like a team and enjoys working together, the likelihood is higher that they can handle conflicts, problems with ICT and a confusing environment, as well as there is an immense probability that motivation will increase, feelings of isolation will decrease and collaboration will improve. Teambuilding activities can be beneficial depending on the situation and participants; formal activities and exercises, but even more importantly, opportunities for people to socialize. A starting point for getting to know each other can be for example presentations, both personal ones to get to know each other and professional ones to learn about each other’s background, competence, and knowledge. An efficient way of getting to know each other in a more familiar situation, at the same time as providing a joint experience and building a team feeling and team identity, is to have a face-to-face meeting. Teambuilding can also be obtained by the actual teamwork, by having discussions about goals and rules, acquiring a team name, having a team space (virtual and/or physical), etc.

To gain trust it is essential to learn about people’s knowledge, find things in common, learn about their personality, how they do things, and why, etc. This is important since it increases predictability and expectations can be adjusted to reality. Being open towards each other can happen both faster and slower in a distributed setting, but real trust will be harder to reach. The level of trust and openness also depends on how open the atmosphere is in the environment in general, the clarity of information and communication structures, the leadership, etc. It is crucial to create an environment that supports open communication and where people feel they can trust each other and the organization.

If a distributed project will be successful or not depends on if people are willing and capable to learn how to communicate and collaborate with the available ICT, learn how to deal with the new set of problems that might arise, and on if somebody (outside or within the team) is giving the participants enough guidance and support to keep them on track, keep them motivated, help them avoid preventable conflicts and misunderstandings, and clearing out the problems that couldn’t be avoided. Receiving information, attaining support and having teambuilding activities won’t diminish all problems, but some problems might disappear and others might be detected earlier and will hence be easier to handle. To make distributed projects work well it is essential to consider psychosocial aspects as well as ICT. To be able to do that proficiently, it is necessary to understand the changes in communication and collaboration, the new issues people encounter when moving to a distributed work environment, the effects distributed environments have on individuals and the interrelations between different areas and variables.
6. Towards a Theoretical Model of ICT and Distributed Project Work

There are plenty of variables that affect distributed communication and collaboration and how people perceive a work environment. The theoretical model presented in this chapter illustrates distributed project work from the point of view presented in this dissertation, and summarizes and illuminates research findings and reflections derived from case studies and experiences. The variables found in the case studies have been structured and divided in various ways; based on Bradley’s (1989; 1993; 2001) models of psychosocial work environments (see figure 1 and 3 in Chapter 2), and the communication circle (see figure 2 in Chapter 2). These models and illustrations emphasize that work environment factors exist at different levels that interact with one another (see Chapter 2.1.1). The theoretical model presented here has been developed with base in these representations, as an abstraction of my results according to the models and not through statistical analysis of the data.

The aim of the model is to analyze and illuminate what variables affect distributed collaboration comprehensively as well as investigate how they are interrelated, hence making the problem at hand clearer. It is an attempt to clarify the situation for distributed teams and make it easier to understand, but with the awareness that there is no absolute truth and we should never forget that “Parts of the reality can be separated out and described in great detail – effects can be shown – but the force of these effects in the interplay with other parts and ‘fragments’ is often uncertain.” (Bradley 1993, p.31).

The focus of the model is on the interrelations between the use of ICT and diverse factors, with limited attention on the physical environment and more concentration on psychosocial factors for distributed collaboration and communication. ICT affects the design of team roles as well as the patterns for how these human roles will be integrated. These “soft sides” have to be taken into consideration in order to create a pleasant and efficient work environment. “While we concern ourselves with the impact of computerization on ‘man-machine’ or ‘human-machine’ communication, we must also direct our attention towards the qualitative aspects of communication ‘human to human’.” (Bradley et al. 1993, p.158). As Bradley (1993) reminds us, we shouldn’t disregard that the computerization of the work environment places new and greater demands upon the social and emotional components of communication, which is particularly important to remember when trying to improve the distributed work environment.

6.1 Background

How teams develop is an iterative process, and the starting point is dissimilar for all teams. There is more or less creativity, motivation, competence, trust and willingness to work in a distributed team when a project starts, depending on the
nature of the project, the setting, the organization, the personalities of the people involved, how experienced they are with working in distributed environments, etc. Most teams start with some basic level of trust and motivation, since people have to assume that others wouldn’t be part of the team if they didn’t feel motivated at all to be there, and normally don’t assume that other team members want to harm them (even if that occasionally happens). This kind of apprehensive initial level of trust, motivation and state of mind in a team either develops and grows stronger, or fades away, or disappears altogether and revolves into distrust or aversions because of developments in the project.

Team members begin with a basic awareness of each other. This awareness has to be cultivated and developed for the team to work well, since awareness is a vital element to help people maintain engaged and motivated. If a team feels a sense of presence, because of physical meetings, ICT, personality, etc., that is a good growing ground to enhance motivation and collaboration. A team has to start coordinating the work in the beginning phase; to figure out when to meet, what to do, and how to get a hold of each other. The more open team members are when commencing, the more likely the collaboration will work well. Trying to conceal information or avoid discussing problems or conflicts, because of leadership issues, status, personality, etc., won’t lead to satisfactory collaboration and communication.

If the level of trust and openness is high, and don’t get diminished by circumstances, an environment where people dare to say what they think, reveal more about themselves, be less inhibited, come with ideas and be creative is formed. In combination with a feeling of presence, it might lead to a team identity, a feeling that the team is a unit, are there for each other, and belong together. Being present (in a virtual or a physical sense) in combination with sufficient team coordination also provides a good ground for predictability; the team knows where and when to find each other and the work material when needed. This is a good base for collaboration, communication and informal interactions between team members and leads in turn to better working conditions, more awareness, a higher level of trust, motivation, creativity, and a team feeling, which leads to better collaboration, etc. If the collaboration and communication is pleasing and rewarding, there might even be a community formed, a community that goes beyond the teamwork and is a starting point for long term sustainable relationships.

The model outlined in this chapter is aiming to enlighten and clarify central variables that are important characteristics of the distributed project work environment, to illuminate interactions between variables as well as illustrate what factors affect certain variables, and how different parts of the distributed project work environment are connected to each other. By revealing what variables influence distributed work environments and how they affect each other, it hopefully becomes clearer what areas are essential to consider, what to strive for and what variables are imperative to consider to create a pleasant and efficient work environment. An essential aspect of the model is to draw attention to the human factors of the distributed work environment and the complexity of the situation distributed teams are in.
6.2 Variables from a Hierarchical Perspective

A way to organize variables describing influences on the distributed work environment is to analyze distributed project work from the perspective of different levels in society. Bradley (1979; 1989) suggests the possibility to look at the work environment from this hierarchical perspective. She divides the different influences into the levels of society, company, organization, group, and individual. In the case of the distributed projects investigated in the case studies this could be translated into the levels of society, organization, department, team, and individual.

There is an interplay between factors on different levels as presented in the convergence model (Bradley 1989; 2001) in figure 3 in Chapter 2, which illuminates the fact that teams and individuals are not entities unconnected with the surrounding, but are on the contrary strongly affected by factors in the environment, and moreover affect the environment themselves. To attain an improved understanding of problems in distributed work environments, and what variables that affect team members, it is essential to look concurrently at all levels (compare Bradley 1989; 2001), to see the actual problems and acquire a better representation of what factors influence the work environment, to avoid trying to solve problems at the wrong level.

The society influence how people behave and want to behave in essential ways. At the society level issues like e.g. the degree of industrialization, what government a country has, if the society is hierarchical or not, the importance of status, the political and economical structure, ideologies, culture, religion, etc., influence the environment and thoughts and feelings of individuals. The society influences the general openness, language knowledge and educational level. The reigning culture affects how people think, e.g. if it is an individual or collectivist culture, what the main religion is, what the educational system looks like, etc. If there is a tendency to travel a lot or if there are many cultural differences within a society also affects the openness, awareness of cultural differences and language knowledge.

The university or company, here referred to as the organization, a team is operating within influences e.g. available resources and what the underlying organizational structure is. This in turn affects the openness, leadership styles, leadership training, rules and norms, the hierarchy and importance of status, as well as the physical environment, and the information and communication’s structure.

There are naturally cultural differences and diversity within organizations as well, which affects the environment. At a department level the team is affected by e.g. available ICT and resources, the departmental organization, hierarchy and status, power structure, and leadership or teaching style. This in turn affects if the environment is open and allowing, if there are clear rules and norms, and if the environment is predictable and creative. The department at least partly decides the grading or reward system and how teams are formed (how, why, and who does it?). If there is an understanding of the situation for distributed projects affects the amount and quality of support and coaching a team receives, as well as if there will be e.g. any teambuilding activities.

In a team the organizational design of the project and the project management
is particularly important. Distance, physical meetings, diversity and degree of fragmentation are aspects of distribution that shape a team, as well as issues like what kind of project, team composition, team size, time frame, and actual project work. The social and emotional side of an environment influences a team as much or even more than the physical environment and available ICT. Expressions of influences could be openness, creativity, a feeling of presence, etc.

A team is naturally also affected by the team members themselves, the *individuals*; what experience they have with the task, project work, ICT, what personality they have, their gender, age, and background.

These are only examples of what can be found on the different levels. More important than this list of examples is to be aware of the distinction between levels, and what is essential is to make sure problems are handled on the right level, e.g. when discussing action strategies.

### 6.3 Variables from an Organizational and Psychosocial Perspective

Work environments can be divided into two distinct parts; the objective and the subjective work environment, i.e. the more “objective reality” and how people perceive it. They affect each other, but are also affected by people’s background and psychological state of mind. The term “objective” should as mentioned not be confused with something unrelated to people, but *the objective work environment* refers to areas of work that are common to large groups of people. This naturally includes the physical environment, but also things like the organizational structure; methods used to allocate work, the basis for decision making, and organizational aids. Bradley (1977; 1989) identified the following objective variables for work environments in her model: the organizational structure; the decision-making system; organization, design and content of work tasks; promotion patterns; communication between individuals and groups; special treatment of certain employee groups; power structure; intermediate positions; working hours; salaries; training/ frequency, design and function; and physio-ergonomic conditions.

*The subjective work environment* consists of perceptions and attitudes related to corresponding sets of factors in the objective work environment and are closely linked to the concept of work satisfaction. *The background variables* are individual characteristics connected to a person’s background and personality. *The psychological variables* cover a number of intermediate, psychologically relevant variables connected to a person’s state of mind. More detailed descriptions and examples are presented in *Chapter 6.3.1.*
Figure 7: Relationships in the Distributed Psychosocial Project Work Environment (development of Bradley's model 1989-2001, adjusted to the distributed work environment and variables and relations found in the case studies)
The combination of variables leads to influences (either positive or negative) on individuals which in turn affects how successful the communication and collaboration will be and how satisfied people will be with their work environment. This way of conceptualizing the work environment and the definitions following are from Bradley (1979; 1989; 1993) and Bradley et al. (1993). The term psychosocial work environment is used to signify the course of events or the process that occurs when objective factors in the environment are reflected in an individual’s perception of the conditions of work. The essence is the interaction between the environment and the individual.

The model in figure 7 is an illustration of relationships in the distributed psychosocial project work environment and visualizes variables and relationships that were found to be central for success and satisfaction regarding communication and collaboration in globally distributed teams.

6.3.1 The Variables
The variables in the model are all aspects that were found important for success and satisfaction in the distributed teams in the case studies and are hence derived from my empirical studies. Even if not all of the variables have been covered in the summary of results found in Chapter 5.1, the ones that are not presented there can be found as background variables or as part of the specific research context in the case studies in Chapter 4. Some examples from the case studies are incorporated here, but for further examples; please see the chapters stated above.

6.3.1.1 Objective Work Environment
The organizational structure of a company or university affects distributed projects and how they are conducted. If a project is part of a course; what kind of educational system there is and what department the course is at influence the work environment. The hierarchical structure in an organization affects the openness in the environment, what kind of leadership that is encouraged, the rules and norms, the awareness of leadership issues, and if there is any support for and training of people in managing positions. If a project is supported by the organization influences the opportunities and available support. A significant factor is if there is knowledge and awareness of distributed project work in the organization, and if people with power and in positions that can actually influence the work environment have the right knowledge.

The leadership affects the organization of a project; how reliable and predictable circumstances are, the coordination of tasks, if the work will be stressful, if there is support for conflict management, if the environment is allowing, open and questions are encouraged, and if support is provided continuously. If a leader has knowledge about distributed project work influences if suitable activities and discussions are encouraged, if characteristics of different media are considered so appropriate ICT is used for specific tasks, and if exercises are used at the right time, in the right way. Teambuilding activities and the creation of a socially pleasant environment are not necessarily controlled by a leader, but it is definitely affected by and should be encouraged by the leader, who should promote communication and social activities and try to actively create an environment that supports and encourages awareness and informal meetings. In
the case studies it was noticed that participants normally didn’t take time from the actual project work to have deliberate teambuilding activities if not encouraged by a leader, and informal teambuilding and social interaction occurred more frequently when people actually had gotten to know each other.

Another important factor is information and communication structures; e.g. if it is clear whom to ask, where to get information, what to expect, etc., as well as the grading and reward system. These factors differ between various organizational cultures, and it is essential that rewards encourage what is considered central for the project and promotes an environment that is motivating and comfortable to work in. It should encourage collaboration, reward team effort, but not disregard individuals as well as reward what needs to be encouraged in specific situations. The reward system affects the equity of participation, and in this way, affects the collaboration in fundamental ways. Rewards and encouragement to teams and individuals can be e.g. grades, salary, feedback, praise, support and site visits. In ME310 there was a social hour with free food and beer once a week. The money used to buy food came from last years students that had won rewards for excellent designs in a design competition. By having this gathering the students got a chance to socialize, they were motivated to come by receiving free food and drinks and in this way they also interacted with members from other teams. It furthermore encouraged them and made them feel motivated to produce good results to win rewards for the class to be able to continue the tradition. Connected to rewards is also the importance of a project and the weight it has in the organization, which affects how meaningful a project will be considered by its participants. If nobody cares or if everybody finds the results and outcomes interesting and important, does not only affect the support a team receives, but also team members’ attitudes towards their project.

The team stage affects what problems are likely to occur and what management issues that are important to handle at a specific time. It turned out to be useful to know what to expect in different phases of the team process and how to deal with stage specific issues. Detailed information about team stages and challenges distributed teams meet in different stages can be found in Chapter 7.1.

The organization and leadership in turn affect the team composition. How are teams formed, why are they formed the way they are, by whom? Is the size of the team suitable and what is the degree of fragmentation, i.e. on how many places are team members located and how many are located at each site? What diversity is there in the team; regarding personality, competence, culture, disciplinary background, etc.? What are the competencies and skills? All these factors affect how easy the task alignment, communication and coordination in the team will be, as well as how fruitful the collaboration will be.

The organizational design of a project has one of the most direct influences on communication and collaboration. What is the time frame for the project? What is the budget? How is the project organized? What types of meetings are there and are the meetings formal? Are there any possibilities for random and informal encounters? Are there any physical meetings? How are tasks, power and competencies divided between the sites? Closely connected to the organizational design is the content of work tasks. The type of work a team is supposed to do affects the collaboration and what problems a team might encounter. What type of
project is it and what is the actual project work? What activities are there; do the participants need to brainstorm, draw; make decisions, etc.? Are the tasks programming, constructing, research, investigations, writing, building, etc.?

The way a project is set up affects the communication patterns and the requirements on the environment in a distributed project. The combinations of communication; individual to individual, individual to group, group to group, how often team members communicate, through what ICT, if the interactions are planned and how they are conducted, as well as the mixture and amount of social and project related interactions; all affect the teamwork.

Team management is essential for how well a team manages to coordinate the work and really collaborate at a distance. The likelihood for success depends heavily on whether a distributed team manages to handle logistics and sets up rules and norms of conduct. The power structure and more informal hierarchy within a team, organization, or society can be even more influential than the official hierarchies and thus affect how status and appearance within the team is considered and has a definite effect on the equity of participation. An important part of team management is time management; i.e., how much time a person can contribute with to the teamwork, depending both on the division of labor and work tasks within the project, but also on the situation outside of the project with involvement in other projects, hobbies, personal life, classes, or work activities. This is to some extent a leadership issue; that a leader makes sure that the time provided for tasks is sufficient and the planning realistic. But individual time management is as, if not even more, important to create a good work environment. People tend to be time optimists and a problem frequently noticed in the case studies was the lack of understanding among students that administration, writing reports and having meetings take time. When planning their projects they tended to calculate how many hours they had, and e.g., use it all for programming or designing. And even when they didn’t underestimate the time it would take to do a task in the planning stage, they tended to devote too much time to areas they found interesting, and not enough in others.

Distance is a factor that does not only affect the other variables, but is a reality in itself. How noticeable the distance will be depends on the degree of fragmentation of a team, the actual distance, time zone differences, if a team has any physical meetings, as well as on how the teambuilding has succeeded. It is not only that a team is distributed; how far away from each other people are affects the collaboration as well. Are they located in different time zones? Are they located in different countries? Are the team members from different countries or cultures, and how are the nationalities distributed (are all from one country on one site, or are they spread across the different sites)?

This is true also for the setting; the physical environment. Does the team have its own space? What does the environment look like? What is the availability of meeting areas and rooms? Is the environment creative? What is the accessibility of equipment, people, knowledge, information, etc. like?

6.3.1.2 ICT – Information and Communication Technology

The term ICT refers to the fact that media, computer- and telecommunication technologies have converged, and is preferred because it draws attention to that
technology is used also for communication, and not only to distribute information. ICT can be considered part of the physical environment, but it is furthermore a dynamic variable that changes along with the progress of the technological development in society and people’s comfort level when getting used to new media and new ways of communicating. ICT affects the way we communicate, collaborate and experience our surroundings, as well as people affect what ICT is used and in what ways. ICT influences the objective side of the work environment by changing the physical environment, but also by e.g. affecting sufficient leadership strategies and the organizational design of projects. If a team is well organized and the ICT works well, it can e.g. lead to that people are perceived as more predictable and reliable, which in turn affects the subjective work environment as well as the effects on individuals.

The case studies was conducted at a specific time in a specific situation, and what ICT people used was affected by e.g. what was accessible at that time, in those places, as well as the costs of different media. In the few years that have passed mobility regarding ICT has increased, the size of gismos has decreased, transmission speed has increased, and the possibility for awareness and representations has improved, etc. Regardless of this most questions regarding technology per se are still generic and applicable. What ICT does a team have access to and what is the availability of the ICT? Is the ICT experimental? How stable and reliable is the ICT? How well adjusted to the needs of the team? How well adjusted to the participants in the team? What are the costs? What are the limitations of the communication channels? Is there suitable support for different activities, like discussions, decision making, brainstorming, etc.?

6.3.1.3 Background Variables

When people enter a project, they arrive with a background and a personality that is rather set, even if some parts are not impossible to affect or develop. These variables are the so called background variables, i.e. everything a person brings to a work place that hasn’t really anything to do with that particular work environment, but with who they are and how they think. People’s backgrounds affect the collaboration, communication and how satisfied they are with their work and shouldn’t be neglected, simply because it is harder to influence. If people e.g. are not conscious of personality differences or don’t appreciate people with different background, it can be the source of conflicts, and should therefore be acknowledged. An appropriate combination of team members can also be the reason for success, in spite of e.g. an uninspiring and discouraging work environment, which was noticed in some case studies. Important variables are e.g. how open a person is in general and in a distributed work environment in particular, the need for status for a person, and how predictable and reliable he or she is. The goal-orientedness among individuals, the competitiveness, how polite they are, and with what respect they treat others can also be essential for the outcome of a project.

Examples of more general areas of background variables for distributed collaborative work are gender, age, personality, social background, cultural background, life perspective and religion, nationality, mother tongue, language knowledge, skills and educational background. People have a certain personality,
preferences and ways of communicating, being and working. Depending on status, age and gender, people enter a project with certain expectations. People have different background that affects the way they think, behave and do things, as well as different language knowledge, level and field of education, have studied different topics, at different universities, in different countries, and with different goals.

A strong influence on how distributed work is perceived and handled, connected to a person’s background, is knowledge about and experience with distributed project work, and experience using and communicating through ICT. This can to a certain extent be considered a background variable, since it can be part of a person’s education, and be affected by e.g. age, personality, and social background. The difference is that it is more easily affected and changed by the factors in the objective work environment. It takes time, if it is even possible, to change a person’s life perspective and the way of thinking that comes with one’s background. With the right support, a good work environment, and a little effort, somebody’s knowledge about distributed project work or feelings towards communicating through ICT, can change and develop relatively quickly. That is why it is placed next to and in connection to the background variables, but with a special connection to the objective environment in the model. This is an extremely important variable; since it can be influenced and can be a determining factor of the successfulness of a distributed project, the power structure within a team, and the work satisfaction; and it is therefore particularly important to take into consideration and try to influence.

6.3.1.4 Psychological Variables

The psychological variables that affect collaboration and communication in distributed project work cover as mentioned a number of intermediate, psychologically relevant variables such as the level of aspiration, expectations, the weight or importance individuals place on different variables, and the general level of motivation. A very important factor for how a person will experience a situation is what he or she expects, and how the environment and the people correspond to the expectations. This should be considered when organizing and informing people about a project or a course.

6.3.1.5 Subjective Work Environment

The subjective work environment is as mentioned the experienced environment, i.e. how individuals perceive the objective environment, their attitudes towards the environment they are in. This is affected not only by the objective environment, but depends also on people’s background and state of mind at the moment. The attitudes can be both negative and positive, and can affect the communication and collaboration in both a negative and a positive way. If somebody consider getting a good grade as indispensable, status within the team might not be as important for them; if somebody is very concerned about their status, the power structure and hierarchy will affect their attitudes more. Some people are self-motivated while others require more support and leadership; some people like flexibility while others prefer a more organized environment.

Significant influences on a distributed work environment are participants’
attitudes towards collaboration in general, towards working in a distributed setting, and towards different cultures and personalities. If team members have a general resistance towards working in a distributed and diverse project, or towards collaborating in general, it affects their attitudes towards everything else negatively. The perceived importance of status affects especially the openness and competitiveness within a team, and can influence the level of collaboration tremendously. Influences of the above attitudes were observed in the case studies, as well as the immense impact it had on the distributed collaboration.

How a work situation is perceived depends heavily on what influence a team and its participants have regarding decision making and the organization of the project, and how they experience that power. That is true also for the design of the reward system; how fair, predictable and well thought through it is perceived to be. The perception of meaningfulness of a project in general and the distribution in particular also affect the motivation and satisfaction with the work situation, as well as the attitudes towards the leadership. The work situation is furthermore affected by how predictable and reliable the environment, the organization and other people involved are perceived. In some teams in the case studies it was observed that motivation decreased immensely when team members felt powerless or didn’t see the meaning of the collaboration or the project in general. The attitudes towards and comfort with using and communicating through ICT are also vital for how individuals perceive their work situation. If a person does not feel comfortable using different media, it will most likely affect the state of mind and general attitudes negatively.

6.3.1.6 Effects on Individuals
The work environment has deeper effects on individuals that are vital for if the communication and collaboration works well, and if the work environment becomes pleasant, efficient, supportive and comfortable to be in. The most imperative effects, which in turn affect the communication and collaboration the most, are trust, a team feeling, a feeling of presence and awareness, openness, motivation and a desire to interact socially.

Positive attitudes and a proficient objective work environment can lead to positive influences regarding the above effects as well as to a team identity, a feeling of belonging and that people enjoy spending time together. When people get to know each other better and start trusting each other, this in turn affects the openness, respect and honesty; the feeling of presence becomes stronger and team members become more aware of each to other and more motivated to communicate and collaborate. If the environment is perceived as pleasant, it leads to that people feel more comfortable, have more social and random interactions, and hence acquire common experiences.

Negative attitudes, problems regarding issues in the objective work environment, and lack of communication and collaboration unfortunately also have an effect on people and the distributed work environment. If a project e.g. is not considered meaningful or people have a feeling that they can’t affect their work situation, it can lead to de-motivation, distrust, stress, hopelessness, loneliness, slacking, free-riders, feelings of isolation and various expressions of alienation, etc.
6.4 Clusters of Variables

To exemplify and illustrate what areas affect communication and collaboration in distributed teams, and more effortlessly see variables connected to the areas and what needs to be considered, variables derived from my empirical research have been congregated into clusters according to the model in figure 7, into the main concepts represented in figure 8. The clusters are areas that are vital to remember and consider when attempting to improve a distributed work environment. The variables presented in figure 8 should be viewed as examples, and can be expanded on and the ones presented can sometimes also be placed in several clusters. Problems in one area can be devastating for the entire work environment, as well as positive effects can be transferred and affect other areas positively. The purpose of this is not to predict or give a complete picture of distributed work, but to illuminate areas that are imperative for successful distributed collaboration and communication.

With the starting point in the communications circle (see Chapter 2.1.1), the clusters have been gathered into a graph (figure 9) to illustrate important influences on collaboration and communication in distributed projects. The variables could be structured differently and more coherently with the model in figure 7, but clustered like this, areas that have proven to be difficult are in focus and the circle can be used as an aid for recollecting frequent problem areas. The clusters provide a foundation for discussion and recommendations, to improve the work environment for distributed teams, and give a representation of what factors affect distributed teamwork. (More concrete recommendations will be presented in Chapter 7).
Figure 8: The Clusters
The variables are derived from all areas in the model in figure 7. The 7 clusters to the right can be viewed as the more objective variables and the ones to the left are connected to individuals; their background, attitudes, perception and comfort with the situation they are in. To make the model more comprehensible, the clusters of objective variables are darker in the distributed communication’s circle illustrated in figure 9.

As mentioned, people’s attitudes and psychological state of mind often determine the outcome and success of a team. They are regularly not easily changed, at least not by trying to change them directly. As Manstead (1997) declared, it is always hard to change people’s attitudes and there is no easy way of doing it. But they are in turn affected by the objective environment, which is more easily influenced and adjusted, and often the cause of perceptions, problems and attitudes found on the subjective side. When aiming to improve a work environment, it is therefore the objective side, i.e. factors that are more easily influenced from a managerial point of view, that ought to be in focus.

The subjective side of the work environment and people’s background are naturally vital and not always directly dependant of the objective variables, and should not be dismissed. Sometimes e.g. an active focus on trust or teambuilding is advisable, but in general it is in the objective work environment causes to problems detected in the psychological variables, attitudes or effects on individuals can be found. The effects on individuals (as seen in the model in figure 7) have been divided into two main areas; trust and team feeling. The reason for
this is that presence, awareness, motivation, a desire to interact socially, a feeling of identity, openness, etc. all can be effects of and lead to trust and team feeling, and can, even if very important in themselves, be considered sub-variables.

6.5 Effects of and Interactions between Variables

The variables presented in this chapter have significant effects on communication and collaboration in distributed teams. They affect e.g. the general work satisfaction, the creativity in a team, if people reflect on what they are doing, or if there is conformity and a strict focus on what task to perform. This is not a one way causality. The variables affect each other both within areas and between different areas (illustrated by the double-directed arrows in the model) and the effects can be both positive and negative, depending on the variable, the person and the situation.

Bradley (1989) explains why the distinction between the objective and subjective work environment is essential. If only attitudes, satisfaction, and the perceived side of problems are discussed, it is easy to fail to notice the actual underlying causes. The opposite is also true, and focusing only on the objective environment or the ICT in use can lead to incorrect conclusions and measures. When it has been clarified what areas influence a work environment, there is a higher likelihood that the right measures will be taken and the roots of problems can be found.

The importance of specific variables varies between situations and individuals. What feelings people have towards their work environment can, as mentioned, to a large extent be explained by what happens in the objective work environment. “But there is a complex interdependency here. Our disparate backgrounds, aspirations and basic values and, in addition, any changes in these factors, all affect the way we perceive our environment.” (Bradley 1989, p.34). An example of this is the effects on individuals that were demonstrated imperative in the case studies. Even if clearly affected by the objective work environment, teams sometimes succeeded because they for some reason, in spite of problems regarding several issues in the objective environment, managed to create a team feeling, kept each other motivated, created a feeling of presence and awareness by communicating and socializing, etc. Even if this is true, it is still essential to avoid unnecessary tribulations and provide a distributed work environment where collaboration and communication is supported, since the objective side is more easily influenced and outcomes are more easily predicted.

The interdependence between variables is as mentioned unfortunately also true when it comes to negative effects, and negative influences in one area can spread to other areas. Reactions to problems and a, in one way or the other, bad work environment can take different forms. Common reactions are problems with motivation, feelings of hopelessness, loneliness, isolation, powerlessness, slacking, free-riders and stress. Possible benefits from good work environments are motivation, creativity, communication, collaboration, personal and professional gratification, a feeling of meaningfulness, etc.

How details precisely are connected and to predict what exactly will happen in a distributed project work situation is according to me principally impossible to
say. Like any complex situation where humans are involved, we never have access to all information about a situation, people and how they think and will react. The amount of variables are vast and the connections tangled and complex. People react in dissimilar ways to the same situation, because of differences regarding background, personality, state of mind and preferences. This doesn’t mean it is impossible or unimportant to try to clarify the important factors that influence the work situation and how they are connected, which is exactly what my research is aiming to do. It only means that the action strategies have to be different depending on the specific project and psychosocial work environment in question.

6.6 Final Remarks

The variables presented in the theoretical model presented in this chapter can, as mentioned, have positive or negative influences on distributed project work, as well as affect each other. Because of the amount of variables that affect the work environment, the tight interconnection between the variables, the complexity of the situation, effects on individuals and the communication and collaboration in the specific situation has to be looked upon and handled. As Petty (1997) pointed out, a complicating factor in understanding human behavior is that it turns out that it is rarely the case that any one explanation for any one outcome is universally correct. This does not mean they can’t be analyzed, but when trying to improve a work environment, it has to be adjusted to the specific situation.

The aim with the model is to provide a better understanding for the distributed work environment and improve the understanding of factors crucial to consider when planning a project, so it can be an aid in analyzing the situation when actually conducting a distributed project, and a basis for action strategies. The sub-divisions could also serve as a basis for future research using quantitative data for further multivariate and causal analysis, as well as work as an aid to support distributed teams become aware of or recollect crucial areas.

A different research strategy is required to validate the findings and accomplish verifying the conclusions and relations drawn up in the model, moving over to quantitative data and large groups of subjects, with statistically correct samples from well defined populations. Thorough analysis is required, using statistical methods of analysis. My contribution regarding the model is to create a basis for future research undertaking a more explorative strategy from where one can draw conclusions valid for a big population. Without investigating and clarifying relationships and variables, the confusion will remain and the possibility to support distributed workers and students won’t increase. It is not necessary to know exactly what is going to happen to be able to improve work environments, but it is essential to analyze main correlations in the work environment.

The most essential aspect of the model is to draw attention to the fundamental psychosocial factors of the distributed work environment and the complexity of the situation that distributed teams are in. To make distributed projects work well it is necessary to look beyond technological issues and take humans into consideration. To do that, it is necessary to understand the new issues people encounter and the interrelations between different areas when people are moved to a distributed work environment.
7. Recommendations

In this chapter hands on advice based on conclusions from the research is presented. Some of the issues presented in Chapter 5 and 6 will here be presented in a form more directly usable for distributed teams. In Chapter 7.1 the team stages and team challenges that distributed teams meet and go through are summarized. This information can be helpful to see what the problems actually are or to create awareness of problems before reaching the stages, as well as a reminder when they occur, and are not as concrete as the guidelines. They are likely to be useful especially for project leaders, managers or teachers to revisit regularly, to remind themselves, and inform and remind teams when needed.

Chapter 7.2 contains examples of areas for teambuilding activities and exercises, and suggestions for simple presentation exercises. These are examples of what was used in the teams, and should be considered inspiration to develop further exercises that works in distributed settings. Chapter 7.3 contains guidelines for distributed work as well as general advice for the choice and use of ICT, suitable for the starting phase of distributed projects. The guidelines are supposed to work as succinct information to help a team get started and as reminders that are easy to review and revisit. The distributed project team suggestions were briefly tested in case study 6 and 7. These are no final guidelines, but topics that were important at the time for the research and in those projects, but seemed to be general problems reoccurring in distributed teams. The material should be viewed as inspiration, a starting point and base for developing guidelines suitable for the situation a specific team is in.

7.1 Team Stages and Team Challenges

I don’t believe team processes are completely predictable, but theories about team stages are useful to achieve awareness of stages teams go through and common problems, to help avoid problems and predict guidance teams will need at different times of the project. Often it helps sharing this knowledge with team members, to help them help themselves. In this chapter problems found in the distributed teams in IE264, ME310 and 2G1319 are listed, and placed under the stage where the problem mostly occurred and needed to be dealt with. This is far from an absolute truth, other problems can occur and the problems can occur at other times as well. Some problems will reoccur and be present in all stages; others will be distinct for some specific stages.

The likelihood for problems differs between the stages of the collaboration, and it is useful to know what to expect when and how to deal with it. If teambuilding activities are used it is also vital that the right activity is used at a certain stage, to not just waste a team’s time, and make them loose faith in the organization and management.

The stages a team goes through can be divided in different ways, depending on what factors to focus on, see Chapter 3.1.3.1. To get a clearer picture to handle

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and try to foresee conflicts and problems, a simple division into four general stages is sufficient; team formation, getting started, working, and ending stage. Except for the stage specific problems, there are general problems common to all stages in a team as well.

### 7.1.1 Common Problems Areas in Different Team Stages

#### 7.1.1.1 General Problems in All Stages

**Awareness**
Lack of awareness is a recurring problem in distributed teams. It is difficult for distributed teams to achieve a team feeling, if they don’t see each other and have never met. People that aren’t visible are easily not prioritized, and it is likely that collaboration will never become as close as it could be if people are not aware of each other, each other’s competence and skills. It is difficult to know what the distributed side of a team is doing, and team members often fail to see the process. The goal is to achieve distributed presence and awareness and figure out ways to make work and people more visible.

**Distance Communication**
A common problem for distributed teams is lack of communication and more frequent miscommunications. It is more challenging to explain things when not having access to all communication modalities present in face-to-face. People working at a distance have to develop partly new explanation and presentation skills.

Since people do not have access to the same amount of cues when communicating at a distance, it is more likely that misunderstandings will occur. If an email is sent and no answer is received, it is easily interpreted as not caring. People don’t see the process, don’t know what the other members of the team are doing, or if they are doing anything at all. Misunderstandings can occur because of differences in communication styles, different expectations, differences in how much experience people have with using ICT for communication, cultural differences, etc. Another reason is that a distributed team gets less synchronous and informal time together, which means they have to work actively to achieve what local teams take for granted. Time zone problems can naturally also make this problem worse.

**Distance Collaboration**
To be able to overcome the increased obstacles, more work is demanded from participants to make the communication and collaboration work. It takes more time, they have to deal with time zones, logistics and language differences and have to think things through and plan everything more thoroughly than on-site teams. Some of the added planning would be beneficial also for on-site teams, but it is not only a question of having to plan things in advance. People have to learn new ways of working and communicating, figuring out how to do every day things when not seeing each other.
A lot of people have problems applying theory and information received to the actual team project activities. They also tend to see process issues as product issues, which naturally makes problems even harder to solve and attempts to solve problems are done in the wrong place. It is necessary to rethink how to work in a distributed team and problems do get harder to solve at a distance, and it takes time to learn how to make it work well.

**Keeping the Energy and Motivation up**
The energy in a project goes up and down. It has been proven hard to keep the energy and motivation in distributed teams. People get energy from seeing and interacting with each other, and the motivation is partly driven by mutual accomplishment and having goals and rewards to look forward to. It is imperative to not disregard the importance of this and make things explicit and tangible also in distributed teams.

### 7.1.1.2 Problems in Team Formation Stage

**Team Identity**
In the beginning of the team process it is important for team members to learn what they have in common, get to know each other and start building a team identity. It is easy for team members to feel disoriented, not really feel that they belong to the team or know who the others are. It is hard to obtain a common team identity at a distance, since team members might not have any common experiences and don’t really know each other. If the local parts manage to create a team feeling, the question is how to extend that feeling to the whole team. In the beginning it is therefore vital to negotiate and clarify team goals, since it is easier to get the feeling of being one team if the goals and the direction are clear.

**Getting to Know Each Other**
To get to know each other people have to socialize or at least interact. If people don’t know each other there is less motivation to be social, which is one issue that prevents socializing from happening at a distance. The socialization process has to be started in some way. It is not being social that is the most difficult impediment; it is the motivation to be social. Social interaction is significant, not only for teams to have a pleasant time while working together, but also to get the important informal interaction started, and to ensure an open discussion.

It is vital to know each other well enough to communicate openly, and to really utilize the knowledge and skills of everybody in the team. If people don’t know each other and there is a lack of trust, they don’t dare to speak freely, are more cautious, put up facades, and might not say what they are thinking and feeling out of fear for getting into trouble or hurting somebody else. If that is the case, it is also harder to find out what people really think and want, especially when not seeing or knowing them.

**Motivation to Collaborate**
It is not necessarily obvious to people why they should collaborate at all, and sometime they need help with the motivation. People might not see the added value and don’t understand why they are supposed to collaborate with particularly their distributed team members, especially if it demands a lot of extra work, and
they have no idea about what knowledge and competence their team members have. Some people are also overly competitive, especially since competition and trying to be better than others is normally encouraged, and might not be familiar with looking for other people’s skills and don’t necessarily understand why they are worth spending time on.

ICT
The first issue to consider when choosing ICT is the needs of the team. When ICT is chosen, the team has to decide how to use it, and when to use what. A problem for distributed teams is that these decisions normally have to be done through some ICT. Especially in the beginning it is hard to communicate via technology. Distributed communication can be a problem for the teams; to achieve consensus, making decisions, and negotiating norms and rules; and can therefore be an obstacle for starting the teamwork. People have to learn how to use the communication tools and on top of that, a new way of communicating with distance and technology as a filter in-between them and the people they are talking to. Things become harder to explain, and it takes time before participants know how to use all the tools.

7.1.1.3 Problems in Getting Started Stage
Team Management
After a team has been formed and hopefully has gotten to know each other a little, it is time to start working. It can be difficult to get started, even if team members feel they know each other pretty well, which they normally don’t. The team has to make sure to set a common goal, as well as jointly make decisions about other things. Successful decision making demands good communication, choosing the right media, an open atmosphere where everybody feels they can speak freely, and that people know when agreeing on something and that it is clear what they have agreed on. People have different decision making norms, so that has to be negotiated and discussed in the beginning, to avoid misunderstandings, or at least to be able to clear them up faster when they occur.

As mentioned earlier, people have to learn and develop new ways of communicating when working at a distance and a common mistake in distributed projects is the lack of support from managers, teachers or facilitators on how to get passed the worst obstacles. Policies for the documentation in the team ought to be decided, since people have very different habits concerning documentation (or not documenting). It becomes crucial in a distributed environment to be able to share work, trace problems and mistakes, and for everybody to get an idea of the process of the work.

When a team is in reality starting to work together, they normally discover that people in the team have different personalities, or at least notice that they don’t understand some of the others’ behavior. Learning to understand how and why other people behave in certain ways is not anything people can learn in an afternoon, but simple guidance of e.g. personality types can improve the understanding of differences in a group. Except from personalities, the team also has to figure out people’s knowledge, skills, and what they can contribute with, to actually start working as a team. People will have different preferences for how to
do things, which is a common source of problems. The differences can be based in
culture, personality, communication, or diversity because of discipline, skills, or
knowledge. Understanding what the diversities are, what they derive from, and
what the team can benefit from, is important to create a successful team.

Distance Communication
Problems occur because of lack of understanding of each other, but can also be
caused by lack of clear communication. People often fail to make assumptions
explicit and noticed, and hidden assumptions might never even be discovered as
the source of problems, which make them hard to handle and the problems hard to
solve. It is easy to assume that everybody thinks the same, and wants the same
things, without ever questioning if that is the case. People don’t want to spend
time discussing things that seem obvious to them.

Achieving clear communication demands some kind of openness. Having an
open communication requires some kind of trust in the group. If there is mistrust,
people tend to build up facades to protect themselves, and even if it has not gone
as far as to mistrust, a low level of trust often implies more formal
communication. If the communication is predictable it is easier to handle not
seeing each other and it is at least clarified when the next scheduled meeting is.
The frequency of communication should therefore be discussed and decided.
Having set times for meetings, rules for how fast people should respond to emails,
etc., really help making people feel more comfortable. It is nice to have something
set and secure in an ever-changing environment, and know a little more about
what to expect.

Task Alignment and Equality
When people are working at a distance, new problems arise that managers and
teachers have not had to think about before. If there is more than one university or
company involved, there are bound to be organizational, leadership, or scheduling
differences. Even if the work is synchronized; holidays, and the calendar year
might be different. If the projects or courses on the different sites are different,
then team members might have different demands and deadlines that should be
negotiated before the project starts. If there are multiple teachers or managers
involved, it is vital that there are not multiple messages to the team members about
what the “right” way to do things is, and what should actually be done.

It is easy that inequality arises between the different sites, especially if the
conditions are different. If one site depends much more on the other, have very
different access to a sponsor, information, money, teachers, etc., it is hard to
obtain an equal collaboration. If the size of the sub-teams is different it also
becomes harder for team members to work on equal terms. It is likely that the
smaller part of the team, or the part with less privileges or power, will be used
more as consultants or less important members of the team.

Site Visits
When people are not seeing the ones they are working with it is easy to forget
them, and concentrate on more immediate issues or local projects. While
discussing awareness and visibility the question about site visits naturally comes

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up. Is it necessary? Is it possible? When is the best time to go? How many on-site visits are possible? If a team has a choice of if and when to see each other, they should be encouraged and guided so they can make the decision early, so they plan their work in accordance to the decision.

ICT
When working at a distance through ICT, people often feel more limited than in face-to-face interactions. Even when the ICT works people have to deal with time delays, different cues, etc. To avoid spending too much time with the ICT, it is important to choose the right combination of ICT as fast as possible. Teams that want to try and constantly add all different kinds of technologies often end up doing nothing but testing different ICT, instead of using them. Especially if it is new ICT that they have to learn how to use every time they change their mind.

It is vital to not get stuck with ICT that doesn’t work, but always have a back-up plan, so a team e.g. does not end up spending a whole meeting trying to set up non-working equipment. How to handle the ICT and what should be used for what kind of activity is essential to decide in the beginning of the project, to avoid too much hazel later, at the same time as a team has to keep an open mind if the ICT doesn’t work well enough, so they can change it to something that works better, instead of getting hindered in their work because of ICT.

7.1.1.4 Problems in Working Stage
Motivation and Awareness
Even if a team has met at some stage, it can be hard to keep the motivation and energy up when actually working, especially if the team hasn’t set up milestones and tangible goals. The motivation definitely doesn’t increase if the process of the work is not visible. It is desirable for distributed teams to really try to give each other an idea of the work progress, so it is possible to see if other people care, and how much they work. It is easy that the motivation to communicate decreases if there is no social interaction in a team. Projects always leave space for “slackers”, and project courses are in a way “opportunity learning”, which means that it is up to the participants how much effort they put in and how much they really learn, which makes it even more necessary and important with encouragement and help with motivation.

Conflict Management
The prevalent predicament that arrives with lack of cues is that it makes common problems most teams encounter much worse. Teams have to handle conflicts at some level sooner or later in the collaboration. Conflicts are hard to deal with in a constructive way even on-site, and it becomes even harder without the cues normally available. It is more difficult to recognize the factual reasons for conflicts and the lack of cues also makes it harder to detect them in time. Management of distributed teams and the team communication also becomes more difficult, and as mentioned, people have to learn new ways of doing things. Confusion about who is supposed to talk, who said what, who is responsible for what, etc., is common.
Team Management
People, and especially students, often have a hard time dealing with leadership issues, since they are not used to having to take responsibility or be in command. It is normally the teacher who is the leader, and a lot of the students have a hard time putting themselves “above” or “below” their peers. If there is no appointed leader, facilitator of discussions, or person responsible for certain a topic, there will most likely be discussions, conflicts or confusion because of leadership issues. Even if there is an appointed leader, it is difficult to deal with slackers, people missing deadlines, not showing up to meetings, not answering emails, etc. It is hard to argue with somebody that can’t be reached, and even if it is possible to reach them, it is complicated to discuss issues when not having seen the process behind them, and if the team perhaps has not gotten to know the person enough to get a good picture of him or her.

Some people don’t answer emails, some send too many. Information overload is often a bigger problem than slackers in distributed teams. Should everybody get all team emails to keep updated? How can you make people send less email? To at least avoid the worst problems it is important to structure how to document everything, decide what kind of communication that is supposed to go through different ICT, have assigned places to post files on, and give guidelines of what media to use in different situations.

ICT
If ICT doesn’t work the way anticipated, and there is not really any back-up, it will affect the teamwork negatively, and it will take valuable time and effort to change ICT in the middle of the project. Not changing insufficient ICT is worse than keep using ICT that doesn’t work, though, so if this hasn’t been prevented in previous stages, the team simply has to deal with the situation and discuss feasible solutions for their situation.

7.1.1.5 Problems in Ending Stage
For a team to work well and keep motivated, it is important to see a clear end, or graspable milestones and a comprehensible continuation. Even when the situation is unambiguous, teams have to make sure to finish in time, keep deadlines, decide how to present their material, agree what is a good enough end product, how to deliver it, etc. It can be harder than anticipated to synchronize different parts into one final deliverable when being at a distance. Even relatively simple things can cause a lot of discussions and agony. People normally have problems with structuring their work. They realize the problems with lack of documentation too late, and it becomes hard for them to explain what they have done.

Hopefully most predicaments are sorted out before teams part. But even if everything works out fine, it is often difficult for people to separate after spending a lot of time together. Having a dinner is normally a pleasant way to achieve closure of the work. At a distance this is difficult, but teams can be encouraged to come up with creative solutions of what they can do together (e.g. dinner over video conference, or perhaps watching a movie together or in parallel). It is important that people don’t feel the end is an anticlimax after working hard to reach their goals.
7.2 Distributed Team Exercises

7.2.1 Areas for Exercises

After analyzing what problems teams might encounter in different stages of the team process (see Chapter 7.1), the next step is to consider what areas that can be supported e.g. by guidelines, teambuilding exercises or activities. It is important to remember that some issues might be best handled by a simple discussion, and not everything ought to be illuminated, practiced, experienced or analyzed by an exercise. Below follows a list of possible topics for exercises; as an aid to make problems more noticeable or to give guidance how to deal with them. Naturally, one exercise can cover different topics, and it is not necessary to have one exercise for each topic. There could be several for one topic or one exercise that covers parts of a lot of the topics. What areas that is crucial to cover in exercises or discussions depends on the team, the project, and the situation (see Chapter 6 for an overview of important aspects and variables).

1. **Distance Communication**
   - Techniques for communication
   - Different communication’s media
   - Communication through ICT
   - Clarity of communication
   - Openness
   - Asking questions
   - Listening to input

2. **Distance Collaboration**
   - Specifics regarding distributed work
   - Giving guidance to others
   - Depending on others’ contributions
   - Sharing
   - Establishing norms, rules and demeanor
   - Documentation and logistics
   - Enabling sharing of ideas

3. **Team Management**
   - Knowledge construction and sharing
   - Project organization
   - Task alignment
   - Shared discourse
   - Building critical thinking skills
   - Identifying and examining assumptions
   - Communicating meaning across cultures
   - Conflict management
   - Motivation
   - Use of norms to clarify uncertainties

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4. Team Composition
   • Value of diversity
   • Personality types
   • Common interests
   • Skills and knowledge
   • Discussion of roles

5. Design of Project
   • Similarities and diversities regarding team structure
   • Alignment of team deadlines and goals
   • Staying synchronized
   • Shared access to corporate sponsors

6. Distance
   • Impacts of distance
   • Culture and cultural differences
   • Language barriers
   • Time zone differences
   • Creating awareness and a sense of presence

7. Teambuilding
   • Creation of team feeling
   • Establishing team identity
   • Social interactions
   • Shared suffering
   • Shared team space
   • Shared experiences
   • Taking risks
   • Visibility of others’ efforts

8. Trust Building
   • Overcoming uncertainty
   • Judgment of people
   • Competence on task
   • Reliability
   • Expectability
   • Respect for others
   • Knowledge of others
   • Awareness of personality types, skills and knowledge

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7.2.2 Planning Exercises
When planning or creating teambuilding activities, it is beneficial to think about that:
- By getting to know each other people learn about each others’ behavior, knowledge and skills. This helps increase their understanding of each other and develop viable expectations, instead of loosing trust in each other, if anything goes wrong.
- By learning about mistakes distributed teams are likely to make and see problems that usually occur, before starting to really work together, team members might see problems and solve them faster if actually encountering them.
- Placing team members in situations where they experience problems that might occur at some stage in their work can make them more willing to believe other things that they only learned about by hearing or reading.
- A virtual environment lacks a lot of cues, like a fast handshake or steady eyes, and it is therefore harder for people to trust their intuition and trust people, which make it even more important to not ignore the significance of team and trust building.
- It is easier to feel like a team if there is an opposite team or somebody to compete against.

7.2.3 Examples of Simple Exercises
One fairly easy and common way to get to know each other a little more is to make a presentation; of yourself or of somebody else in the group. Beneath follows examples and brief descriptions of presentations that was used in the distributed teams.

7.2.3.1 Written Presentation on the Web
Some teams had access to a web presentation form with brief questions that all team members were supposed to answer; questions about themselves, their work and about what they were hoping to achieve in the project. The presentations were posted on the course web site. All presentations had a picture attached so there was no doubt of whom the presentation was about. The presentations were used as a way to remember people’s name, especially in the beginning before team members knew each other, and as a way to find out more about people’s personal life. In some cases the presentations had resumes attached to them, to provide knowledge about people’s strengths, knowledge and skills.

The presentations were useful, even if how open people were and how much they cared about the presentations depended a lot on how somebody set the standard in the beginning and how much it was encouraged to actually post a presentation. It is valuable to have a presentation to go back to if forgetting somebody’s name, and the participants thought it was fun to read about people after they had gotten to know each other more. Written presentations normally only take people a short step on the way, and it demands that participants take initiative on their own to both open up, take time to write something, and take time
to read others’ presentations.

7.2.2.2 Presentation over Video Conference
One common way of presenting team members was to make a short introduction the first time meeting over e.g. telephone or videoconference. That is normally not the best way, since a lot of people only feel uncomfortable and don’t know what to say about themselves, so presentations tend to be short and there will be a lot of names and presentations made at the same time.

If this is the way a distributed team is planning on presenting themselves to one another, it is to recommend to help participants by listing a couple of things that could be in the presentation, like e.g. name, hobbies, age, where they are from, where they live, etc., and perhaps add something like “and tell us something about yourself that nobody here knows”. It is sensible to choose a fairly open and outspoken person to start the presentations, since he or she will set the standard, just like in the written presentations.

7.2.2.3 Presentation of another Person
An alternative to people presenting themselves is to let people present each other. There are different ways to realize this. If people already know each other in the local teams, they can be assigned to say a couple of things about somebody else that they know. Another, probably better way is to let participants talk to each other in pairs; talk about their background, what they are doing now (work, personal life, hobbies), and what their plans are for the future. They should be instructed to bring things up that they don’t think the other person knows about them. After the discussions, everybody presents their partner; either summarizes what was said or brings up some of the most surprising issues that they didn’t know about the other person (depending on how well the participants know each other before the presentation).6

The advantage of presenting each other is that it is often difficult to say favorable or personal things about yourself in front of a big group, but it is easier to tell one person, and the pairs also get deeper knowledge about each other, learn more about someone in the team by talking one on one. Time has to be allowed for these presentations, and people should be encouraged to pair up with somebody they know as little as possible. By making the presentations this way, people also get a picture of how other people see them, what they put emphasis on, and what they found surprising in what was said.

7.2.2.4 Asynchronous Video Presentation
If a team has the possibility to put more time into the presentation, an option could be to make a short video presentation in the local teams and send it to the distributed parts. This was tried out in the ME310 class spring 2001 (see Chapter 4.7 and Appendix II). The distributed team made a video presentation that was supposed to include impressions and images of team members, their hobbies or other personal information, the team space, the campus and the environment. The

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6 I have encountered this way of presenting in courses and this specific format is from discussion with Ylva Navér at the consulting company Provins Fem.
aim was to get to know each other more and get a view of what it was like at the different sites.

One of the problems was to provide an instruction that gave inspiration, without saying exactly what to do (since the purpose is that team members are supposed to show their personalities in the video). The immense problem was that it takes time and equipment to do a video. Nobody expects a professional video, but it is hard to present a tape that people are not happy with, and there was definitely a wish to edit the material. If management, in the case studies the faculty, gets too involved or the instructions for the filming and presentation are too detailed, it is hard for the teams to make the video their own, and focus is easily placed on more formal matters instead of personal issues. If the instructions are too loose, there is a high likelihood that the “video project” becomes too big and takes too much time.

The diverse video formats was also a problem, but with a little more planning the videos could have been put on a CD or DVD or some other joint format. If you are working, as the case was here, with people from another continent, with different video standard on different sites, work and money has to be put into transferring the video onto the right format. Another option is to put the video on the web, but the quality still suffers from that.

The video presentation was a good way for the local team to do something fun together and get to know each other better as well. A difference from normal presentations was that the team had a possibility to visually show what their hobbies were, what it looked like at the local site, and they got a clearer image of what their distributed team members looked and sounded like (with good resolution). The students enjoyed making the presentation, even if it demanded a lot of time.

7.3 Guidelines

7.3.1 Distributed Team Suggestions
These are some suggestions to consider before starting the collaboration in a distributed project team. The suggestions have been developed from discussions, observations and questionnaires with distributed teams. The problems listed are common, but none of them are impossible to avoid and they are easier to overcome if thought about and discussed early in the project. An interesting aspect is that these problems seem to reoccur and were noticeable in all the teams observed, and it is therefore likely that the suggestions can be of use for distributed teams in general. The suggestions were also used (see case study 6) with a successful outcome.

Synchronize the Team as Much as Possible
Your teammates probably have different schedules, requirements and deadlines that will affect the teamwork. When you are working, make sure the other parts of the team know what you are planning on doing, when your holidays are, your local deadlines, etc., so fewer misunderstandings will occur. It is important to try to synchronize your work as much as possible, but when you can’t do that, you
will at least know why.

Choose ICT that Works
Use the most stable ICT possible for the communication with your distributed teammates. If the technology is experimental, always have a backup plan. This is especially important if you are in a synchronous situation, like videoconferencing. Make sure to have the phone number of a contact person during the time of the conference or establish who will be reachable over email or IM (and at what address) during the meeting. Be on time (so it is clear whether you don’t communicate because of failing technology or because you are late) and set a time (e.g. 10 minutes after the conference start time) to give up or start using some other technology.

Choose the Right Technology for the Right Activity
Think about and set norms for when to use what kind of media. For example, email may not be the best medium for decision-making, since it is slow and asynchronous. Email may be useful for file-sharing, updates, (lightweight) discussion, personal information, questions, planning, and briefings. Video or telephone conferences may be useful for decision making, clarifications, confirming email discussions, updates, allocations of work, and planning. These examples may or may not hold true for your team. As a team you should discuss when you will use IM, file sharing systems, web forums, telephone, videoconferencing, email, etc.

Discuss Norms and Rules for Behavior and Communication
You can expect that there will be conflicts, sooner or later, in your collaboration. By discussing how to deal with problems before they actually occur, you can avoid a lot of conflicts, and establish ways to address those that do arise. You might state norms, or informally discuss expectations for behavior. You might also consider rotating roles for group meetings, such as facilitator, agenda planner, recorder, etc. Try to avoid slang and talking too fast, especially if you have non-native speaking members in your team. Ask questions when things are unclear or hard to understand. Most of the time it is not only you that are unsure and everybody benefits from a clarification.

Discuss any Face-to-Face Visits
Discuss possibilities for site-visits. If you have the opportunity to meet, before seeing each other face-to-face, you should discuss what the purposes are for meeting, when the best time is to meet, and what you should have done by the time of the meeting, to get the most out of it.

Have Teambuilding and Social Activities
For the collaboration to be as smooth as possible, it will help if you get to know each other. This will help you know what to expect from the other members of the team and learn about special skills of different team members. It is advisable to have some form of personal presentation in the beginning of the collaboration. This can be done for example by making a short video about yourself, your team
and your campus; by making a web page where you introduce yourself; or by presenting each other during a video conference. Remember – a picture can say more than 1000 words, so try to include pictures in your presentations.

Think Proactive!
When you come to, especially the first, telephone or video conference, make sure you know what you want to get out of it. Make a list of what topics you want to cover, things that are uncertain and need to be clarified. Ask your distributed teammates what they want to discuss and tell them what you want to get out from the meeting, so you can come to a mutual agreement. If possible, an agenda about this should be shared before the meeting. Also remember, when you first start meeting, you can set the tone, and even if you have to remember that cultural and personality differences also play a big role in deciding how people will prefer communicating, being relaxed and positive yourself will help creating a good atmosphere.

7.3.2 Distributed Team Suggestions with focus on ICT
These suggestions are focused on the choice and use of ICT, suitable as a base for discussions in a distributed team in the beginning phase of a distributed project. They somewhat overlap the more general suggestions, but since the choice of ICT has such an important impact on the distributed work environment, a particular discussion is to recommend.

Choosing ICT
• Choose ICT that fits the activity you want to accomplish the best.
• Choose ICT that you feel comfortable with, but think about the choice so the team does not end up using a sub-optimum technology just because you are not willing to try new things.
• When choosing ICT, also consider how transparent the media is to the users. A media like the telephone is e.g. more transparent than videoconferencing, because people are more used to it, and therefore works better in some situations.
• Consider the different needs for synchronous and asynchronous communication, when to use what, and how to share information and files (i.e. not communication, but work in progress).
• Avoid having too many places to check for information and be clear about where you are supposed to put what.

Communication and Collaboration through ICT
• Remember that writing in a virtual environment is something different than a lot of on-site writing. It is communication more than information.
• Set rules for communication. What topics should be discussed over email; how should you use cc; how quickly should you respond; etc.??
• ICT with fewer cues makes the communication and social interaction harder, but it can also help you keep the focus on the task in a discussion, instead of focusing on the presentation of the content.
• Remember that language problems are harder to see at a distance, and even if there are no language problems, pictures, tables, and illustrations make it easier for everybody involved to understand what you are talking about.
• To get a discussion started on e.g. a web board there has to be a topic of discussion present that inspires people to contribute. If there are too few contributions, people won’t even take the time to go there. If the discussion gets started, it can be useful for the collaboration.

Specifications Regarding Different ICT
• Email is useful for general communication, updates, short questions and confirmations. Discussions over email tend to take a long time and it is hard to come to conclusions.
• Telephone and videoconferencing are useful for discussions, making decisions allocating work, planning, and brainstorming. Remember to have a presentation in the beginning of each session, so everybody knows who is there, and to inform everybody if somebody is leaving (or coming in late). There should be a facilitator or at least decided beforehand how to take turns, to avoid confusion in the communication.
• Don’t think that videoconferencing will automatically be the best way to replace face-to-face meetings, but use it as a media as any other, and be aware of its advantages and disadvantages. If the quality is good, video has its advantages, but using video can also make people feel awkward, and if it is suitable or not depends on the situation, the participants, and the topic discussed.
• Sharing files is vital for all collaborative work, and the team has to decide if it should use email, FTP, or some web based database to handle file sharing and what format to use. It is also important to decide how to name the documents so there is no confusion about which is the latest version and figure out ways to avoid that two persons are working on the same document at the same time, as well as how to structure the file storage and sharing.
• IM is mainly useful for lightweight discussions, social interaction, brainstorming, quick questions, etc., and it is a very cheap, easy way to have informal synchronous communication. It is less useful for big group discussions, since it is easy that the discussion gets confusing with too many persons involved, if not used in a “lecture-like” manner, where one person is the main speaker, and the rest listen and ask questions.
• Unfortunately there is no default best ICT to use in a distributed team. What works best depends on the participants, their preferences, budget, and the technology available.

Team members reported that the telephone was used mostly to make critical decisions. Its synchronicity and reliability were key factors, as well as the ability to have discussions with multiple people using speakerphones. The cost was a major drawback and prevented teams from using it a lot or from home. IM was used most effectively for smaller meetings which were more informal, with goals such as brainstorming rather than decision-making, and to simply keep in touch. A major drawback was the different access to IM depending on location.
Email was used extensively for communication among team members, as well as in communication with people outside of the team. Teams found it useful and convenient because they were used to it, it was easily accessible and the asynchrony was sometimes opportune; especially because of the time difference. Email also allowed people to edit their texts more carefully than with e.g. IM. People that had to use their second language, as well as those who were more thoughtful and didn’t like to just throw out ideas without thinking, liked this characteristic. Email is familiar and reliable, the drawback was that it was sometimes overused, resulting in excessive amounts of email.

Files were sent as email attachments or through other tools, like web discussion boards and distributed databases. Several teams found distributed databases very useful for data collection. Important features for them were that they were reliable, secure, easy to use, easy to access, flexible, fast enough and with adequate functionality for structuring or sorting files. The need for sharing files, and the need for a suitable tool for doing that, was essential for distributed teams.

The web discussion board was mainly used to share information with people outside the project team. The participants did not find it to be secure or flexible enough for frequent use. For more details of what team members thought about specific tools and their usefulness, and what the advantages and disadvantages are of different media, go to Appendix III.
8. Closing Comment

One of the main contributions of my research is the perspective from which I have approached distributed project work, and that attention has been drawn to the fact that to make distributed projects work well it is necessary to consider psychosocial factors as well as ICT. The purpose is to provide an overview of essential areas that affect distributed collaborative work. The research covers both results from the particular case studies and an attempt on a theoretical model built on both results and a theoretical framework empirically tested in early phases of the history of computerization. Practical and concrete recommendations are concluded from the research aiming to support distributed collaborative work.

I have analyzed real life distributed work environments and the results build on extensive data gathered in field studies in globally distributed teams. By accumulating literature and research data from different research areas, various data about what factors influence distributed teams have been made more available and directly accessible for researchers, managers and people working in distributed environments. It is the use of ICT, organizational and managerial aspects, and the psychosocial work environment that has been the focus in my studies, and with that perspective I have explicated fundamental characteristics vital to consider.

I have analyzed disadvantages with distribution, problems teams have, as well as advantages and opportunities provided by the new ICT facilitated work environment. The notion that problems also can be viewed as opportunities for development, learning and creativity is a basic perspective in my research. My starting point is analyzing general factors in the distributed project work environment, attempting to untangle the complex relationships and multitude of variables affecting distributed teams; to be able to improve the work environment for distributed teams, comprehend its effects on individuals, as well as understand the interplay between ICT, organization, physical environment, individuals, and groups.

There will always be problems when working in distributed projects (or in projects in general), and people have to adjust the choice and use of ICT and activities to their specific situation. According to my results some problems seem to reoccur in distributed project teams. By identifying common problem areas teams have in different stages in their project work, it will be easier to recognize and handle them. By providing concrete advice and guidelines, my work can assist project workers, teachers, students, project leaders, and other people working and learning in distributed environments make the work environment more enjoyable and productive. I have hopefully clarified what areas that are important to support for distributed teams and in this way assisted in laying the ground for improving the distributed work environment. By helping people avoid the most common pitfalls, make them aware of the differences between face-to-face and distance communication, and help them be prepared for problems they might encounter, teams will hopefully more easily be able to turn problems into advantages or
learning opportunities, or at least handle them without jeopardizing the project.

It is not probable that virtual interactions will ever be satisfying enough to replace face-to-face interactions completely, and it is hard to say if distributed collaboration will reach the same level as on-site collaboration when it is working really well. Some research, including my own, at least points in the direction that used in an appropriate way, ICT can be very useful and a worthy substitute to face-to-face interactions in distributed project work and distributed projects furthermore obtain advantages because of the distance. The difficult part is learning how to use the ICT, handle the situation and adjust in appropriate ways to different scenarios, ICT and environments.

Visions and views about development and use of computer technology were presented in Sweden already in the 1970’s (Bradley 1977) in research supported by the Swedish Work Environment Foundation and was first published by the “Delegation for long term motivated research”. Research programs were outlined for the development and use of computer technology, followed by multiple large research programs in Sweden in the field. Views presented already then are to a certain extent still valid, even if the technology has evolved. Theoretical models and the communication circle (presented in Chapter 2) were first presented 1977. This vital perspective on ICT is often forgotten in discussions, but has gained an increasing attention internationally. Organizational and psychosocial aspects of using ICT are in addition vital to integrate into software and hardware research. Hence when conducting research regarding ICT, it is imperative to remember the effects it has on work environments, individuals and communication, including interactions between different variables and areas. My aim has been to add to this long and prestigious research tradition.

There is plenty of interesting research to be done in this area, for example to look deeper into how to help teams handle the new environment better. How can ICT be used to get to know each other, to form a team feeling and to help people get passed the more limited cues provided when communicating through ICT? Further research should be conducted with more structured investigations and formalized evaluation, to more easily quantify the results, and thereby integrating statistical analysis of the data. The next step could therefore be more formalized investigations with the base in my findings and studies to test what happens to project work when there is guidance, a clear purpose for the distribution, well organized teamwork and teambuilding activities, to see how that works without face-to-face meetings. Testing the generalizability of the results, comparing the results with distributed projects in corporate environments as well as with teams consisting of experienced project team members, would also be beneficial. Another area that would benefit from further investigations is developing and testing different teambuilding activities for distributed environments to figure out what works, how it can be used, and formulate guidelines for how to improve the distributed work environment, as well as investigating social activities suitable for a distributed work environment. The guidelines and recommendations presented here should also be tested, improved and developed.

Last, but not least, the theoretical model of ICT and distributed project work presented in Chapter 6 is an attempt to clarify what areas and variables are important and affect distributed communication and collaboration the most, as
well as to disentangle connections and interplay between variables in the distributed work environment. By conducting my research I hope I have provided a solid ground and inspired future research in the area.
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Appendices

Appendix I- List of Previous Publications


Appendix II- Instructions for Video Introduction

Your team is going to make a fun, informal video introduction of yourselves so your distance teammates can get to know you better and get a feeling for the environment you are in. If you can make it with humor, it is a plus, but it is definitely not compulsory.

The suggestions below are very flexible, but please try to keep the tape to 1/2 hour or less. Each person should get about 3 minutes or so. Don’t try to be comprehensive, rather demonstrate or portray 1-3 brief things about each person, as well as one or more aspects of your team workspace and your campus or local area.

In the presentation you might include things like:
- Your name, where you are from
- What you have studied before this course
- Hobbies, pets, special skills
- What it looks like where you live (or where one from the team lives, if it is typical student housing)
- The team workspace at Stanford/ KTH
- Some local sight/ sights that you think is worth showing somebody from another place/ country (it can be both from your university and/ or the area you are in).
- Etc.

Make sure to use the media, and not only have talking heads in the video, but try to actually show what your dog looks like when he eats peanut butter, if it would be a good idea to have the Ipmen man describe your team room, how people swim in holes in the ice, or what you look like in your skiing outfit.

Before you start filming, get together with your local team (at Stanford and at KTH) to brainstorm what is going to be in the presentation and in what order. You might want to make a list of in what order you will film things, so you make sure you don’t have too much or too little material, and so you don’t have to edit the material too much (or at all).

Eva Jansson of the Stanford Learning Lab and Martin Grimheden of the Swedish Learning Lab will provide you with video equipment and tapes to use. They will also arrange a copy for both the KTH and Stanford sides of your team, and ship your local tape out to your distant colleagues. We suggest you have a movie night locally to watch the tape and eat popcorn together.

Tentative Schedule
Nov. 6 – start brainstorming and planning film, set filming times (up to 1/2 day may be needed; do as a team or in groups), get camera and tapes from Martin and Eva.
Nov. 14 – Finish film; give tape to Eva and Martin
Nov. 16 – tapes mailed out
Nov. 27- Dec 3 – plan and have popcorn and video night to “meet” your teammates
Appendix III- Usefulness of Different ICT

This is a collection of what students in IE264 (1999) thought of the usefulness of different ICT, what they used the ICT for, and advantages and disadvantages of different media. The collection is from 1999, so some of the data is outdated, but a lot of it is general results and thoughts and is useful also today.

Email

Purpose and Usefulness of Tool

The teams used email for all kinds of communication, with team members, faculty and sponsors. The messages were often short, but there was a tendency to be a lot of them. They used email very successfully for example for updates, reminders and confirmations about important dates, briefings, agendas, minutes, and questions. It was also used for more general communication and sharing of files. Some teams found email adequate and did not see the need for more specialized applications like for example eCircle or flashbase to share files (if they did not have limited email inboxes). Email was also used for (lightweight) discussions, personal communication, and planning. Sometimes the students ended up arguing over email as well as discussing.

Email was seen as an extremely useful tool. It is convenient to use an asynchronous tool for a lot of the communication (partly because of the time difference), and most people had easy access to it, and didn’t even have to leave home to check their email. The fact that it is an asynchronous media and that users have more time to think of what to say, also help people that do not have English as their mother tongue and shy people to be part of discussions. Most people are used to email and it is reliable. Sometime it can be too easy to send away an email though, which can lead to an enormous amount of emails or that thoughts and ideas not well thought trough get sent before they should.

Advantages and Disadvantages

Email has got a lot of advantages as a technology. It is cheap, it is easy to use, convenient, has very low failure rate, is reliable and fairly secure. The accessibility and convenience is important for how used a tool will be, or as a student put it, that communication “mainly has been held through email, much since this is the principal thing that everyone check while having access to a computer” (IE264 Lessons Learned paper) and that everyone has experience using it and finds it comfortably easy. One advantage with email is that it is easy to have multiple recipients to a message, and you can easily choose to contact only the people who need the information, or everybody in the group by using a group mailing list, or cc people that are not necessarily directly affected by the email, but might want to have a look at it.

Since email is so easy to send, it “is an excellent way to communicate and exchange information, but it is very important to keep messages short and concise,
to avoid information overload.” (IE264 Lessons Learned paper). One way to avoid overflow of mailboxes is to create an email list. Email lists make it easier to keep everybody up to date, record all emails in one place and create a useful document trail. If the email list is arranged as a group email archive it makes it convenient to access information even when people are not by their own computer, and it is also very practical to have all messages collected in one place, not deleted by mistake or getting lost by being saved in different folders in an inbox. Email in general, and lists in particular, make it easy to track the chain of events since the email shows the time, day, and sender of a message.

Email is an effective asynchronous tool, suitable for distributing tasks and give updates of information. It being asynchronous also gives a writer time to think things through, and being more organized. Email also supports the possibility to respond to and quote messages, to make it clear what is answered and what is not. One team chose email for their information sharing and considered it the most effective communication medium, because of its low presence level, not despite of it. “We evaluated an audio or videoconference as not ideal because it would introduce too many distractions for such a straightforward task. The medium of email also had the added strength of allowing the team to create one list where all of our communications could be sent and thus allowing each member, despite their location, to keep abreast of and follow the team’s communication.” (IE264 Lessons Learned paper).

Asynchronous tools in general are suitable to use when you work over different time zones, or as a student put it, a good asynchronous tool doesn’t wake anybody up. Emailing allows a team to work 24 hours a day and get fast answers to questions. In a way, email and messaging in general, can increase the level of intimacy between people. “One can talk about things that one should never write or talk about face to face. I do not expect someone who is about to get married calling me love, hun, gorgeous etc but over email that is completely accepted and have a very different meaning from a regular letter or a phone call. […] illustrates that message and medium is highly interrelated. Understanding the medium and how the message will be interpreted by the receiver is therefore critical in global communications.” (IE264 Lessons Learned paper).

Some of the downsides of email have already been discussed. The fact that it is asynchronous can be seen as both something positive and something negative. When you are communicating via email you cannot hear or see the person you are talking to. It can become impersonal, and in worst cases, the base for very bad conduit. It can also lead to difficulty using humor.

If you get too much email, they easily become disorganized. Even if that does not happen, if there is an overflow in information, it is easy to miss what is important. It is also hard to use the right titles to make emails clearer, and if titling is not decided upon in the beginning, it makes the emails even more disorganized. “We found that too many emails caused us to pay less attention to them. If there were few emails, the importance could be sensed and every word read, but with so many going across 11 of us, it became difficult to read every email thoroughly. This sometimes caused us to miss information, simply because we didn’t read the emails carefully enough! This was more so with group emails, and personal emails also got quicker responses.” (IE264 Lessons Learned paper).
The cc-function is convenient to keep everybody in the loop, and to help the recipient judge the importance and urgency of the message, but it can also be dangerous if used carelessly and by default cc everybody instead of thinking about who should get the email. To communicate “e-mail is of course the most common way. We have agreed to ‘cc’ all team members on all mails that are not obviously only of value to the receiver. This is a good way to let everybody get a feeling of what is happening with all the tasks. However this make you almost drown in mails. E-mail is good but it is not the most effective way to have discussions with all team members.” (IE264 Lessons Learned paper).

A lot of students had problems with receiving larger files, and large attachments can flood the participants’ mailboxes. If a team is not using an email list, there is also no central history of information in one place, and the team has to depend on that the members are organized and will keep track of everything. Some teams even went as far as to forbidding anything but urgent emails, they said that the “email system is now resolved for urgent mails” (IE264 Lessons Learned paper). Students using UNIX machines also had difficulties downloading attachments in general and when traveling team members had to make sure they had access to their accounts even from the remote site.

Decision making is difficult in any asynchronous media. The latency before receiving information hinders the decision making process since everything has to go back and forth before deciding, and what can take a couple of minutes on-site, can take days over email. “We also discovered that it was not as easy as we thought to set a time for the meeting. Everybody sent mails to everybody saying that they could not make it at the suggested time and would prefer another time instead. We then decided to set a fixed time for the meeting with the sponsor every Thursday” (IE264 Lessons Learned paper). This latency connected to asynchronous media leads to that email discussions can proceed very slowly. That is, if the system even works, since “a few times, important emails gets lost or gets send out late due to network errors. The lesson I learned from this is that: do not rely only on one medium, when dealing with important information.” (IE264 Lessons Learned paper).

“Email is wonderful. It allows information to travel around the world instantaneously. But what about me going back home after a tough and busy day, turning on my computer and realizing that in my short half-day absence, more than twenty emails about the global project have been exchanged, even though the night before, during the phone conference with Singapore, we had all agreed that we should refrain from sending too many mails? Sometimes, instantaneous information often transform into the (understandable) desire of instantaneous answer and information gathering.” (IE264 Lessons Learned paper).

Fax

Purpose and Usefulness of Tool

The teams only used fax machines when soft copies were not available or when a signature was needed. They thought that the fax works, but it is inefficient due to the time it takes loading papers and that you actually have to use paper, and it was very seldom needed.
Advantages and Disadvantages
Fax is efficient when you have a few papers that can’t be sent electronically, sharing documents that aren’t available in a soft copy, like a letter or report sharing, and a lot of company information is still in hard copies. When something has to be signed, it is also a good alternative to regular mail, since it is faster and cheaper. In general it is cheap and easy to use. If a softcopy is available (which there is most of the time) email was preferred, and “it is more cost and time effective to send a huge pile of documents via airmail than either scanning or faxing. Moreover, the fonts may be too small and will become undecipherable after faxing or scanning.” (IE264 Lessons Learned paper).

Telephone
Purpose and Usefulness of Tool
Telephone was used by the teams for both regular calls and for teleconferences. Most teams had telephone conferences weekly, for updates, to make decisions, come to conclusions, and to clarify what’s going on everywhere, since the synchronous mode the telephone provides supports more interactive decision making. Regular phone calls were used to clear things out, and it was often used for time critical problems, like where to call for the phone conference or when answers were needed directly, and there was no time to wait for an answer via email.

Advantages and Disadvantages
A lot of teams thought that teleconferencing is one of the absolutely best ways to communicate, and they found it to be the best working technology for group meetings, because it allows all team members to participate, it is a stable technology, and is efficient. “POTS is simply irreplaceable when the going gets tough.” (IE264 Lessons Learned paper). It is fast, it’s reliable, everybody knows how to use it and almost everybody has access to a phone. The fact that you have access to a technology at home is especially important when working in different time zones, because it is so much more convenient with late night or early morning meetings if you don’t have to travel somewhere and don’t need any support personnel.

Almost all participants actually said they preferred using a phone from having videoconferences. The video doesn’t add that much and the telephone is much easier to use. “I find phone-conferences to be just as effective [as videoconferences] because they can be held at any time, at any place without any difficult technology involved.” (IE264 Lessons Learned paper). The telephone can also be put anywhere, which makes it easy to change location for the meeting, to be flexible, and you don’t have to schedule the meetings as far in advance as when you need access to a videoconferencing room.

Students also tried to use chat rooms to get a synchronous discussion, but they preferred telephone to that as well. “To communicate synchronously, we

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experimented early on with chat, but found that it is hard to beat a telephone call/ conference call for quick reliable communication.” (IE264 Lessons Learned paper). The reason for this was that they found teleconferencing more comfortable and reliable than chatting. They also didn’t have to worry about members being logged out suddenly. “We also feel closer to heart when we hear one another, being able to sense any changes in tone or mood. Speaking is definitely faster, more convenient and less tedious than typing.” (IE264 Lessons Learned paper).

Telephone conferences were definitely preferred to IM when there were a lot of participants in a meeting. If there are more than three, four persons, online discussions tend to be confusing. Because telephone is a synchronous, real time tool, it is great for clarifying issues and it also adds an extra dimension, for example that you hear the voices, and via the voices and the way people talk, some of the personalities of the other team members. The immediacy of the responses in a telephone conference makes it much easier to make decisions, and it is also valuable that you can hear more of if everybody agrees, on for example their tone of voice. “Thus we evaluated audio conferencing as the ideal technology because of its strength of enabling the spontaneous, back and forth exchanges normally associated with regular conversations.” (IE264 Lessons Learned paper).

The possibility to get cues from the tone of voice was mentioned as a huge advantage by many students. “By using telephones there’s the chance to use the voice to more than just formulating words.” (IE264 Lessons Learned paper). The chance to feel the thoughts and feelings behind the words, and not only receive words on a screen. Getting emotions and feelings into the communication also makes the atmosphere more social, and makes it easier to build a team. “One of the key advantages of teleconferencing is that it effectively communicates human emotions. Through text mediums such as Internet chatting, human emotions are often difficult to convey and inaccurately interpreted. Simply hearing the voices of my teammates across the globe seems to eliminate the tremendous distance that is between us.” (IE264 Lessons Learned paper).

Except for in conferences, the students didn’t seem to use phones that much, since it is expensive to call long distance from home. The possibility to and the fact that they knew that they could get a hold of each other was definitely seen as something positive, though. “I now realized the advantage of using cellular phones. My US-teammates can reach me at any time, which has been extremely helpful for our project.” (IE264 Lessons Learned paper).

In spite of all the positive sides with telephone conferencing, there are still some problems with using the media. Especially with a restricted budget, it is quite costly to call long distance. If you want to have a good telephone conference you also have to have access to a real conference phone, with speakers and the possibility to have three way calling (or more). Another problem with using the phone is that you cannot see the counterparts. This leads to that it is harder to interpret what people say, and how they really feel, and it can also cause confusion. “One weakness that we have found using the phone, however, is that the multiplicity of cues offered is limited. For example, often we do not know who is speaking over the conference call and often need to clarify. Also although we can tell from the intonation and tone of somebody’s voice if they are amused or irritated, we are unable to see any body language, like whether everyone is giving
their full attention with eye contact.” (IE264 Lessons Learned paper).

The fact that the telephone doesn’t provide any visual cues makes it more suitable to use when the members of a team already know each other. The lack of visual cues also makes it hard to know who is in a meeting (especially since people tend to forget to introduce everybody in the beginning), and it can even be hard to know when people have disappeared, because of technical difficulties or simply because they left.23

People have to learn more about how to use only words to communicate with each other, which some participants saw as a problem, that “without seeing the facial expressions and body language of each other, we might misinterpret a remark made by a teammate. This problem is likely to worsen if we do not understand the culture and personality of the person who made that remark.” (IE264 Lessons Learned paper). The fact that it is a verbal medium also means that somebody has to take notes, and it won’t be automatically recorded like a chat session. This is no different from a face-to-face meeting, except that it is harder to keep track of who is talking for the note taker in a phone conference.

Since it is a synchronous tool, everybody needs to be available for the meeting at the same time. In Sweden three way calling is available everywhere, but for most people in the US that is not the case, but it is something that has to be ordered specially (and it is not always possible). This leads to that the team members have to be located together for the conference “the fact that there are at least six or seven people gathered around one phone at the same time, sometimes tends to make the conversation slightly messy.” (IE264 Lessons Learned paper). It can, as mentioned, also be hard to organize the discussion if nobody is in charge, and if there are no rules for how to take turns, etc. The fact that everybody has to be in one place at the same time means that the team has to plan ahead. For the meeting to be as efficient as possible also other things, like documents and an agenda, has to be distributed beforehand.24 This is something positive for the work in the long run, but it can be tiresome to have to do it, and that it is much harder to improvise when necessary.

Once you get to know how people work and what their personalities are, it is much easier to work together. The problem is that you have to get to know them, and it can be hard to break the ice over the phone. “It is easier to understand people over a teleconference once you are familiar with their communication styles.” (IE264 Lessons Learned paper). If people don’t feel completely comfortable they won’t discuss as freely as they could and it is easy that a phone conference with people that don’t know each other becomes formal and strict. “Sometimes the teleconference tend to be quite formal and might actually damp some of the useful ideas or thoughts that need to come through.” (IE264 Lessons Learned paper).

Sms

SMS (Short Message Service) are short text messages sent mainly to and from cellular phones, but they can also be sent from a computer to a cellular phone. Some students used SMS to get attention and fast responses from other team members, since the phone beeps when a message arrives. They did this e.g. when they wanted their teammate to go and do something immediately (e.g. check their
email, go to a phone, start a chat session, etc.) fast. SMS was used very rarely. One of the reasons is probably that SMS was not big at all in the US at the time, and was not as popular and commonly used in Sweden 1999 as it is now.

Web based Databases
The students used web based applications for different purposes. Most of them used Flashbase to store files, so they had one place to keep all files, where everybody had access, and could view and edit the documents. Some teams chose different web communities, for example eCircles, Excite, Yahoo, to store links, documents and pictures. In these web communities they could also create a group feeling and deal with practical things, like having a team calendar.

Purpose and Usefulness of Flashbase
Flashbase is a distributed database, a tool for collecting, managing and sharing information, and was used for data collection within the team. With a distributed database, the team could have access to their files from where ever they could access a computer network.

Advantages and Disadvantages
Flashbase was seen as really useful with its capacity for distributed access. It was also easy to use and fairly reliable. Teams using Flashbase stated that without this virtual space for multiple user file sharing and data collection, it would have been much harder to collaborate, or keep track of different versions of a report, or avoiding flooding mailboxes. The tool was used mainly for file sharing and some students thought it was much better than using attachments, other said that they only needed email. The biggest problem seem to have been that it was not reliable, but a lot of times unavailable and slow. Some also had problems logging in. It seems like they thought it would be a very useful tool when it had matured more and had become more stable.

Purpose and Usefulness of eCircle
eCircle was the most commonly used web community, so this discussion will basically be about eCircle, even if a lot of the comments would be similar for all web communities.

   eCircle is a tool especially designed for groups working at a distance. It contains a discussion board, a chat room, places for shared files and pictures, presentations and contact information, lists, a group calendar and group email. eCircle was used by the students for sharing files, information and pictures and it provides the capability to describe the files. It made it easier for the students to distribute information for the project and build a community.

   The opinions differed when it came to eCircle. When it comes to file sharing, it lacked the possibility of structuring the files, which was seen as a big disadvantage, and was one of the reasons why teams felt a need to use Flashbase instead. A lot of the teams saw it as fun to have a common space, and very convenient to have group email lists, calendars, a place to store files and links where they could also easily delete them. The wish was to have one well
integrated, unified location to store all material, where you can access files anytime, in any place, get communication updates, etc. It should also be, as eCircle is, confidential and identify the owner, so people don’t have to be worried about putting sensitive information there.

Advantages and Disadvantages

eCircle is an easily accessible information exchange center, a centralized space for different services, and the students really saw the advantage of that. To have everything in one place. “E-circles has also proven to be a strong technology tool for us to use because it allows everyone to go to a central place and allows us to do a variety of things to update our teammates including, posting lists of companies that we have contacted, sharing files, discussing agendas, and even posting pictures.” (IE264 Lessons Learned paper). Some students created a sense of community and built a stronger team foundation by exchanging virtual gifts. It also brings people closer together to be able to share files and pictures, for work or just to have fun. It is in a small way the start of an online community.

The eCircle is free and its interface is easy to understand, which makes it a good tool for students who have never used online communities. The problem is that a tool like this, that is for free, normally comes with problems. Of the web communities the students tried some didn’t support all platforms, others lacked file sharing, or the file sharing was not sufficient, but forced the students to change and adjust the file formats, and e.g. eCircle had file size limitations. Using a free tool also makes it harder so provide security and a lot of the tools lacked privacy. It is never good to have to depend on a third party to store your information, especially since this resulted in that the servers were frequently down.

The basic idea, to have a common information board were the whole team can find any information needed for the project and also find what was going on in other parts of their global team, is great. It also helps avoiding flooding mailboxes. “E-circles and similar databases are great. Use them for bigger amounts of data. Since mailboxes are limited” (IE264 Lessons Learned paper). Some students also liked eCircle better than regular email for discussions. When you have an email list (like eCircle provides), the whole discussion is gathered in one place, which makes it easier to summarize and follow what is said. “E-circles is not only as strong as e-mail as an asynchronous technology, thus allowing people in different time zones to communicate when convenient to them, but it is also a stronger decision making forum. This is because it allows those people, like the Stanford students, who feel a need to respond to every idea a chance to do so in one location, while allowing other members of our group, like our Swedish teammates, to see all the arguments and then comment once with their decision.” (IE264 Lessons Learned paper).

Using eCircle can reduce the amount of emails, but at the same time it is another place to check for information. There is a possibility to keep a team calendar, but it is also hard to keep the calendar updated. It allows file storing, but the capacity is limited. Especially when it comes to file sharing, the students had a lot of complaints, and most teams used Flahbase for that instead.

In eCircle you cannot save changes to uploaded files, which makes it harder for true group sharing (since only the creator of a document can make changes, it
is hard to work on the same document). The system also didn’t provide any way to structure files that are already there. One student suggested to “use several of them! One for background reading, one for interview results etc. It’s easier to find what you need and less ‘messy’.” (IE264 Lessons Learned paper). Even if it is good to organize the work into sections, it is not really optimal if you have to arrange everything beforehand, because you can’t organize the files at all once there. There were also formatting problems between Mac and PC.

Another problem is that having all files on the web also makes downloading time a big issue. One big problem was the slow access from Singapore and some access problems in general, which made it impossible to use web communities at all for some teams.

Having slow access is bad; not getting access to your files at all when you need it is worse, and unfortunately not unlikely. One student said his team used an “Internet community (Excite) where we could put all our important files, meeting protocols and reports. The idea was excellent, but we soon realized that the community often suffered from server trouble. We thought it would be a way to reduce our email correspondence, but instead we missed out on some important information, because we could not access the community when we needed to.” (IE264 Lessons Learned paper).

Web board

Purpose and Usefulness of Tool

The class web discussion board was used when members of a team purposely wanted somebody else to see the progress in the team or wanted them to provide input. It was also used to keep track of each other. “By posting as much as possible on the ie264 web discussion site and the ecircles.com, we could right from the start detect if any of us had deviated from the course objective.” (IE264 Lessons Learned paper). The web board was also used for discussions and for sharing information. “The minutes from the meeting are then posted on the web so that everybody can check that we are all thinking the same thing. I have learned in this project that this is something that is important to do. It sometimes sounds like we all think the same thing when we are actually not.” (IE264 Lessons Learned paper). The students also used it to share views, post announcements, post findings from literature and interview reports, and make updates.

The web forum offered by the class was not used much, though. The teams did not think it was flexible enough, it was slow, not secure (since there was no password protection), and often down. The students also felt that they already had enough places to check for new information, and the forum didn’t add enough value for them to use it.

Advantages and Disadvantages

The web board was a good joint tool, for the teams to share ideas with the rest of the class and the faculty. It was helpful for both team members and faculty to see the progress in the work of the teams, find records of meetings and it sometimes helped the participants to maintain their self discipline. It was compared to the commercial sites reliable, was easy to use and had a good structure.
A joint web board is also a place where you can have cross team learning and interaction, since it allows members from other teams to contribute to discussions, but the down side with this is that it leads to that there is no confidentiality or security. It was therefore only used when the students purposely wanted others to see the progress and if possible provide input.

The biggest problem with the web board was that it normally was not frequently checked. It was just another place to check for the students, and if the discussion is not active, there won’t be anything new to read, which in turn make people use it even less. Another problem with the particular web board used in this class is that it didn’t allow the students to remove or edit messages once posted. This decreases the flexibility of the use of it (even if this has as a consequence that the comments often were more well written and thought through). All files were also forced to be posted as discussion messages and it was not possible to attach files, tables or pictures, which limited the usability.

IM

Purpose and Usefulness of Tool
The teams used different chat forums for more informal meetings and group discussions between members from the different universities, especially when only parts of the team was meeting. IM was also used for brainstorming, discussions with less information, fast “on the fly” decisions, messaging, and sending files. Some teams used it for midweek updates and these meetings were not as information and decision intensive as the phone conferences.

There were very different opinions about the usability of IM. Some found it very useful, while others didn’t see the need for it at all. When using a chat it is easy to interrupt each other and the discussions can be hard to follow. Another problem was that not all the students had the right to install for example ICQ on the school computers, which made it hard to use chats as a team tool for some of the teams. The IM program the students liked the most was without competition ICQ. Most if the advantages and disadvantages covered here will therefore be about ICQ, if nothing else is stated. ICQ provides chat, awareness and instant messaging. Remember that this is data collected 1999, and some of the more technical problems probably have been corrected now.

Advantages and Disadvantages
Using IM is more cost effective than using a phone for long distance calling, so some teams just used it as a cheaper form of conferencing. Another advantage is that chats can be saved, so you know what you talked about and you can extract information easily after the chat is over. The teams used IM mainly for brainstorming and lightweight discussions. They thought it was very useful especially for brainstorming, since the media is so casual. “I have found Internet chatting to be an arena where all team members tend to contribute evenly regardless of their personality types. As a result, a wider variety of ideas are exchanged and all team members feel involved in the project. Another advantage of a chat conference is that it can easily be saved as a text document to be read later by any member of the team that was not present.” (IE264 Lessons
learned paper).

For some people it is also easier to write than to talk. Chatting is not as
"serious" as other written messages; people write fast and don’t care that much
about spelling, even if they are native English speaking. For someone “not being a
native English speaker it is easier to express oneself not having to be embarrassed
about my silly accent.” (IE264 Lessons Learned paper). If you have to type fast, or
feel insecure about how to spell things (and care a lot about it), typing can be
much harder than talking though, and other students didn’t like it at all. “Chatting
requires the participants to handle both the used language and the keyboard with,
as it seems to me, almost inhuman quickness.” (IE264 Lessons Learned paper).
Some people will feel uneasy talking, others don’t like writing, and it is more a
matter of personality than if the technology is good or not.

Chatting provides synchronous communication in real time. It is faster than
e-mail, and helps preventing clogged mailboxes. Since there is a feature in ICQ
telling users if somebody else is logged on or not, it is a good media to create
awareness. It can also be set to signal to other people if you want to talk, are busy
or away temporarily from your computer. This means that the participants in a
team can get fast answers and see whom to ask to get an immediate response.
Clarifications and miscommunications can therefore be ironed out faster and more
easily. When using IM for conferencing, you can use different fonts and colors to
distinguish between users to help sort out some of the confusion if there are a lot
of participants.

ICQ is very suitable for social interaction. “For example, our group may
spend the initial sessions on ICQ (or teleconferencing) exchanging greetings, jokes
or even gossip. I find this particularly essential for a budding team, as it enhances
rapport and chemistry.” (IE264 Lessons Learned paper). It is easy to talk over
ICQ, since it is very informal and it allows people to take a short brake from their
work and chat with somebody when they want to. Besides from sitting right next
to someone, there is hard to find something more convenient. Since nobody can
hear you talk, it can be even easier to have short chats and social conversations
over ICQ.

One of the opinions about ICQ was that it is only good for chatting, and not
suitable for meetings or more serious discussions. It is hard to coordinate a
discussion and “the synchronous form of online discussion was confusing to
follow when we have up to 10 persons talking at the same time. It was an informal
session and we have no agenda or moderator whatsoever. My thought from that
session was that if we were to ever conduct any synchronous discussion online in
the future, it ought to be in a more systematic manner.” (IE264 Lessons Learned
paper). Disorganization can be solved with some planning, by appointing a
facilitator and by setting up some rules. But it is hard to follow a chat if there are a
lot of participants, and that is something that is hard to overcome. It is difficult to
get a total view of the flow of information and it is hard to remember who said
what.\[v

IM can also be slow when you want to express long statements, where for
example a telephone would be much more efficient. A student said that ICQ and
other chat tools are good for one to one talks, but that they are somewhat
inefficient in bigger meetings due to the typing needed. Something important to
think about to make discussions easier to follow is therefore to avoid having too many people in a meeting or to have a facilitator.\textsuperscript{CV}

An advantage with IM is that it is easy to talk about everything and anything, the problem might be that it is difficult to express deeper feelings and moods, and it is easy to say too much, or get misunderstood, or that people get offended or misinterpret what was said. A big problem with chats is not only that it is a new way of communicating, and it was also a pretty new media (1999), with some technical problems. The sessions could sometimes be unstable (when there were too many dialogue windows), and communication sometimes failed when somebody logged out. Messages also have a limited length, which can make it harder to have a discussion. Learning how to use a new chat forum can also take time. Especially if the program has extra features, it is easy that the focus is on the technology instead of on the content of the meeting. “Determined to find a better alternative for real time discussions, we tried Microsoft chat room […] I must say that the chat was fun while it lasted. However, we put more energy into making our characters smile just the right way than actually digesting each other’s suggestions and concerns.” (IE264 Lessons Learned paper).

Video conference

Purpose and Usefulness of Tool

A video conference system was used for the lectures in the course, and the same system could also be used by the students for meetings within the team or for presentations or meetings with the sponsors. When it was used within the team, it was used basically in the same way as the phone conferences. The students used videoconferencing to elaborate on different issues, for general communication (often with the sponsor), discussions, allocation of work, planning, presentations, updates, brainstorming and coordination.

Most teams saw videoconference as something useful for the class lectures, but not for the team meetings. It was not reliable enough, the delay was too long, and the quality of the audio and video was not good enough to put in the extra effort to use it (it took too long time to set it up and the students could never be sure that it was going to work). Before trying it out, most students thought that the digital video link technology would improve the project teams’ abilities to make complex decisions, because it is synchronous, carries voice and images, and allows all opinions to be voiced in a synchronous environment. However, when the students attempted to use the link for meetings, they found it too difficult to use. In addition, they felt that after already having become familiar to one another in the face-to-face meeting in Singapore, the voice only communication was quite adequate for conducting group meetings.

Advantages and Disadvantages

Videoconferencing allows for synchronous communication, and the immediacy of the feedback can make conversations smoother and more efficient. Compared to phone conversations, video interaction provides more cues, enables the possibility to use slides, video, to draw, show things with your body and gestures, and you can more easily recognize who is talking. This makes it more similar to face-to-
face interactions since it is possible to see the facial expressions and reactions of the other team members, and you can see who is talking at the moment and who is present. “Video conferencing facilitates our communication the best as we can see and hear each other. From the tones and expression on our teammates, we can read something that is not told and we can know immediately if there is any link broken. In this way, it is better than teleconferencing and the other tools.” (IE264 Lessons Learned paper).

Video is good for conferences with a lot of participants or participants in a lot of places, where it is necessary to keep track of everybody. This is especially true if the participants don’t know each other and don’t recognize each others voices. When videoconferencing technology becomes more stable, cheaper and easier to set up, it will probably be used more. But it is always important to use what is needed, and the used technology have to fit the situation. “With larger bandwidth and better reliability there’s no question that videoconferencing is a, both nice and important, method of communication for the future.” (IE264 Lessons Learned paper).

One advantage of video that can be a reason to use it more, is that it can provide a higher sense of presence and that it allows the use of many senses. “Video conference is useful especially in contact with the sponsors that at least I have never met. It is much easier to work for someone who is not just a name and a title but also a face.” (IE264 Lessons Learned paper). The communication becomes more personal when you “know” who you are talking to. The same reasons make video useful when you get to know somebody and it makes communication more fun when you already know them.

The added cues that come with video is a desired feature to improve the communication, but if the video and audio doesn’t work well, it might disturb more than it helps. “Video can provide useful body language communication, but is expensive and fraught with technical difficulties (as evidenced by in-class delays). At times, voice quality may drop to the point where it is completely incomprehensible. On the other hand, text is a cheaper and more reliable means of communication, but it is slower and does not allow the full range of expression.” (IE264 Lessons Learned paper).

Videoconferencing is still very costly, especially in relation to how little value the students thought was added compared to telephone conference. It is also highly location dependant and with the technology used in the class, there was need of a technician to be present. Even if the technology will become easier to use, the team members have to know how to use video to present themselves and learn how to take advantage of it, to make it really useful. One student said that “you need a skilled camera technician to follow the speaker, zooming in and out as necessary. Another problem is connected with the small field of view and the size and quality of resulting images. Audio is of course also very important. The small time delay we are experiencing on our conferences is enough to off set the benefits the use of back channels provide. The effectiveness of videoconferences I think decreases if the participants lack prior social bond. The video lectures have been more satisfying after our trip to Singapore.” (IE264 Lessons Learned paper).

Other people thought it was the most useful to use video in the beginning, before they really knew each other. Once a team has established trust and is
standing on a common ground, it is not as important any more. “Videoconferences are more helpful when you do not know the people you are communicating with.” (IE264 Lessons Learned paper). Unfortunately the video technology used in the class was not stable. There were too many technical difficulties, like loss of sound, time delays, bad picture and sometimes it was not working at all, and it “can not provide a satisfying quality on picture, why face-expressions and other non-verbal-communication gets lost, and for me the whole point of seeing each-other.” (IE264 Lessons Learned paper).

The opinion of if video was good to use, even with the bad quality, differed a lot. Some people liked the feeling of seeing something of the person they are talking to. “The pictures on the monitors were blurry, and all movements seemed jerky. But the technology worked and with some imagination one could even read the body language of a speaker overseas.” (IE264 Lessons Learned paper). Other people don’t see the need for a picture even if it is good, and some people said that they felt closer over phone than with video, for a lot of different reasons, and using video can also be difficult for camera shy people. Even if not everybody is camera shy, most people don’t feel at home when communicating via video and it is a media most of us are not used to communicate with.

Video Lectures
The Setting
The effectiveness of lectures broadcasted synchronously over the digital link varied depending on the learners’ remoteness, setting, time zone, culture, etc. As described earlier, in this course a lecturer located at one of the three sites was heard and seen synchronously by students at the other two sites. At NUS and Stanford, the students sat in a lecture style classroom, facing a large wall screen. On that screen was a computer monitor display, which sometimes held a single full-size image, sometimes held two or three open computer “windows” showing students at the other two sites, or the lecturer. In the Stanford classroom there were also ceiling-mounted monitors which displayed the image currently being broadcast to the other two nodes. This was sometimes an image of the Stanford students, the Stanford based lecturer, a computerized (PowerPoint) slide, or an object from the lecturer’s desktop.

At KTH, the students sat in a small seminar style classroom, facing multiple small monitors on an oblong table. These monitors held the same sorts of images seen on the larger screens in Stanford and NUS, only much smaller. The room was fairly small and was crowded with students at the lectures, some at the table and some sitting behind them around the edges. The air was stale and the environment was often hot. The lectures were held at 11 p.m. at Stanford, 2 p.m. in Singapore, and 8 a.m. in Stockholm.

Student Participation and Engagement
The video worked better in the lectures than in the team conferences, but there were still some problems. Although videoconferencing allows the students to listen to and see the speaker, the technology was still very unstable and the image quality was less than ideal. Insensitive speakers didn’t realize when they lost their audience, since they didn’t get any feedback. The students still thought the video
conferencing was very useful for the lectures in the class. “With the videoconference, you can have a lecture by a professor from another continent (the more I think about it, the more I think it is amazing).” (IE264 Lessons Learned paper). The technology makes it possible to learn from well know teachers from different universities, and that was something the students really valued.

During lectures, students on the site remote from the speaker did not participate fully, and became disengaged. This disconnection between the speaker and the students when the speaker was in a remote location was observed by the students. The following field notes excerpt is a short description of one class session held at Stanford, demonstrating that students became restless when the speaker was in a remote location. Not being able to see even an image of the speaker caused additional frustration.

“What are the trends? Computers are getting smaller and smaller. Go back into the history to the earliest telephone system. Operator plugging two wires together,” a disembodied voice from Sweden explains. There is a diagram and images of the classrooms in Singapore and Stanford in each corner of a split video screen. There are no camera shots of the speaker, so the audience can only hear this disembodied voice. It feels strange not to see the speaker. It is quiet except for the voice without a body. There is no interaction within the classroom. There is only the sound of the lecturing voice. “Mobile communication is not about radio,” the voice continues. The sound is good. It is easy to understand the speaker. It is just strange that we cannot see the speaker. Everyone is looking at his or her own sheets of paper in Stanford. A few students shift around in their chairs. The Stanford students are whispering to each other now and again. A few students are taking notes.

This feeling of distance between the lecturer and the students (when the lecturer is off-site) is a challenge that is difficult to overcome. The technology itself causes distancing, because it filters some of the communication cues. For example, visuals are blurred or small, so that you can not clearly see the person speaking. The sound may be unclear or words may disappear. The technical person coordinating the broadcast may focus on a display object or a PowerPoint slide rather than the speaker, so people do not get a visual of the speaker. Even when the technology works perfectly, it does not fully provide such things as eye contact and small gestures, which carry communication information in a co-located setting.

There are unique requirements for visuals and adapting the lecturing style due to these distancing effects. The research staff concluded that a “best practices” document needs to be developed to lay out some of these practical suggestions, which could then be applied to a videoconference style lecture setting, to help and guide the speakers in their distance presentations.

In addition, students reported a disconnection between the theoretical or technical lectures and the practical work they were doing in their teams. In an interview, one teaching assistant reported that during lecture “The things that get technical, it is something that they already know. It was not relevant to the course. Once the project starts they are really focused on the particulars for the client. They are just concerned about how to get it done. How does it apply to my case?” (IE264 Lessons Learned paper).
Appendix IV- Quotes

i “that mornings’ lecture [given from Sweden] was the first one worth listening to... it is a big difference with the lecturer present. And the link room is also not suited for lectures at all. With 21 people the air is gone after a couple of minutes.” (IE264 Lessons Learned paper)

ii “The fact that the link doesn’t always work affects the lectures a lot. It is much easier to listen and ask questions when you are on-site. If the image gets bad and you are tired, you get tired of trying to listen and focus much faster. As soon as the technology doesn’t work, you lose your focus. It is hard to keep awake and ask questions.” (IE264 Lessons Learned paper)

iii “With the videoconference, you can have a lecture by a professor from another continent (the more I think about it, the more I think it is amazing).” (IE264 Lessons Learned paper).

iv “Since we are not working on a face-to-face basis, we sometimes have difficulty in getting our point across. [...] other times when we try to make jokes, the humor does not always get across.” (IE264 Lessons Learned paper).

v “The language becomes a problem since we are communicating in English and all of us are not equally good at expressing ourselves using this language. I consider it true to say that, if two or more opinions are presented, the one making the stronger case will be the one whose suggestion will be implemented in most cases. This shows that communication is vital when discussing. Hence the one who has the best language skills will be able to make a stronger argument even though the actual suggestion is not necessarily better.” (IE264 Lessons Learned paper).

vi “I have also learned that the time difference is our biggest problem. E-mails are a good way of handling this problem though.” (IE264 Lessons Learned paper).

vii “The time we all spent together in Singapore working and having fun has allowed us to develop personal relationships in the group based on mutual trust, understanding, respect and genuine friendship. These relationships are essential for the development of a genuine team spirit where everyone feels valued. We all strive to do what is best for the team.” (IE264 Lessons Learned paper).

viii “Meeting and interacting in person improves team effectiveness. We get to know each other much better through meetings, dinners, outings and even jokes.”.

ix “The lack of face-to-face contact has made things harder of course, but the weekly video- and telephone conferences overcome it in some sense.” (IE264 Lessons Learned paper).

x “However, when each of us gets approximately 30 emails per day about the project alone, information overload occurs. Most members of the team were confused about the importance of these emails, and it took us a while just to figure out which attachments
was the most current version of the questionnaire for the financial analysts. Since we also document our weekly discussion, meetings with professors, as well as summaries and interviews, the amount of emails quickly multiplies. We decided to separate discussion of ideas from file transferring.” (IE264 Lessons Learned paper).

xii “When important information must be conveyed, synchronous communication like video or teleconferences are necessary to ensure that everyone is up-to-date and ‘on the same page’.”

xiii “By recording the meetings with the sponsor in digital format we were aiming at quickly uploading the data to the web for everyone to access quickly and easily. But the technology became more trouble than it was worth. If there was a tech person to manage this it would be useful, but learning how to convert all the files and find enough disk space was too time consuming and eventually did not happen at all.” (IE264 Lessons Learned paper)

xiv “I do not think we could have ever coordinated our activities without meeting first in-person together in Singapore to define our project. This synchronous communication was key to us all starting from the same point” (IE264 Lessons Learned paper).

xv “one of the most important lessons I learned when working in a cross-cultural group was learning to deal with conflict. The main lesson I learned is to try to diffuse any problem as soon as it starts.” (IE264 Lessons Learned paper).

xvi “The time we all spent together in Singapore working and having fun has allowed us to develop personal relationships in the group based on mutual trust, understanding, respect and genuine friendship. These relationships are essential for the development of a genuine team spirit where everyone feels valued. We all strive to do what is best for the team.” (IE264 Lessons Learned paper).

xvii “PurpleS8: Small group meetings, those are included. One of the big things that PurpleS1 actually implemented which I think is one of the biggest reasons to why 210 won more awards, was PurpleS1 changed the paper format on how you write your document. It’s purely a document award. All you do is get the document. He changed how the document format was done and gave everybody a template and that’s what they went off of. And I think when he did that, that’s when he started winning more awards.

CY: So there’s a lot of different factors of things that happened in the course, that influenced the awards that […]” (SLL alumni focus group, 04-02-2000)

xviii “PurpleS8: I think it really depended, there were a lot of issues involved in having global partners, as PurpleS1 I think termed it. And one of the things was is that one of the experiences we found out they really needed to have the same motivation. That was something. If they don’t, meaning they get like a grade in the class, there was one, I have one particular case where that person wasn’t getting a grade, they were just supposed to be involved. Well they didn’t really contact the people very much, they kind of said hey
you know, whatever.” (SLL Alumni Focus Group, 04-02-2000)

xx “OrangeS2: [About how often they communicate with the Swedish team] In general still once a week on the internet. Here and there kind of this week they were all gone for Easter and so we didn’t even know about it, occasionally that happens. And really about at some points it’s just an update of what we’ve done and a few times like this week we tried, we were getting some information on actual specs that have to do with something that we’re spec’ing, you know.” (Orange Focus Group II, 20-04-2000)

xx “OrangeS4: There was I think an important development between when we wrote our document and when we went to visit them was that RedK5 at KTH [tape fades] was here at Stanford and these guys were on [tape fades]. He communicated to us that the company wasn’t really happy with the direction that we had taken. We sort of for lack of any guidance selected our own project direction [...] and started working on it, but then once we started going down that path, we got feedback from RedK5 that that wasn’t what they wanted. And so kind of over the break and then the first week or two of the quarter, we changed our focus on [tape fades]. Orange company may not have been completely aware of that redirection on our part. And so that may have been why they were, their expectation were a little different.” (Orange Focus Group, 28-01-2000)

xxi “PurpleS9: -Yeah, I think that was kind of a time when they started realizing that it was weird when we actually got to talk face-to-face, we could see that their opinions on their requirements were a lot less strict than what it seemed from e-mail, so I think the face-to-face visit was really important, ‘cause it kind of changed the whole focus. It was more like you created them to sign away to make this device happen? Rather than have it have to absolutely stick to these parameters. You know, so that was good. Kind of changed it a little bit. But it’s unfortunate though we didn’t get that initially from the e-mails ‘cause I think we could have obtained that information just remotely or over the phone or something.” (SLL Alumni Focus Group, 04-02-2000)

xxii “PurpleS7: He (pause) PurpleS1 never told you or never forced us to use the Myers-Briggs or any of the different measures of diversity, but you were rewarded for forming a diverse team. When you bid on your projects, you had more points to bid if your team was more diverse so you were more guaranteed to get the project you wanted.

CY: And what were the, you mentioned that to me. What were the categories of diversity that were used for that?

PurpleS7: Personality profile, you had to have at least 3 of the 4 different quadrants to be considered diverse in that dimension. Gender had at least 2 types of genders on your team, ethnic background, had to have at least one member who was not the same as everyone else in ethnic background. School that you went to, which was really easy, as long as more than 2 people were from a different school.

CY: School within Stanford you mean?

PurpleS7: Undergrad. Since it was a graduate school course. Where you’d gone to undergrad. I believe it was whether or not you’d worked, industry experience and the 6th one was location. If you have at least one team that was not on campus, whether they were SITN, and local or global. So if you qualify for each one of those, then you had an extra 60 points to bid on your project. So you were really guaranteed you were going to get the project you wanted.” (SLL alumni focus group, 04-02-2000)

xxiii “EJ: You got assigned to the paper bike?
BlueS1: Yeah.
BlueS2: Right.
El: And that was random or was it Myers-Briggs?
BlueS1: Myers-Briggs.
BlueS2: Yeah, or probably a little bit of both.
BlueS1: Yeah.
BlueS2: I mean people obviously have the same Myers-Briggs profile in the class, so it was sort of kind of random.
BlueS1: Yeah I mean I guess the teaching team didn’t really run a computer program to maximize the Myers-Briggs, you know, profile of every group, but they just kind of did it by hands, so there was some randomness to it I guess.” (Blue focus group, 23-02-2000)

xiii “CY: So when you were forming your second team, the Delphi one, did you think about the profile at all?
PurpleS9: Yeah, we would look into it and they could see how the chart was and see how different people could contribute to the whole […] Yeah, I remember, we did do that.
CY: Was that kind of after you’d decided who might work together or before?
PurpleS9: Maybe, well he was kind of juggling people around a little bit towards the end so I think we probably looked into it a little bit afterwards, but basically we just kind of knew how other people worked just from seeing them and working together on the paper bike race. I don’t know if they went hand in hand, but I think it was after we already formed our teams.
CY: And did you think about that, the personality profiles while you were doing the project all quarter?
PurpleS9: I think so. A little bit, yeah ’cause we I think during one of the SGM’s we had to assess how close our personality profiles matched how people really were and we wrote about that in our final reports. […] [tape fades]. So I think it was helpful to look into. And then also some of the teams had people that they knew were going to be leaving like I was pretty sure I was going into ME282 so we wanted to form teams based on knowing that if one person left, the chart would still be pretty stable. That was a big reason why we kept […] So we wouldn’t be leaving the team with like a missing quality or something.” (SLL alumni focus group, 04-02-2000)

xiv “GreenS2: Paper bike was random selection and by Myers-Briggs, so that was completely assigned. The project based ones, the corporate project ones, not so much. [GreenS5 gets off cell phone] You have the choice of finding your own team members, but there was like a big fat mess towards this quarter for some reason and towards the end it was pretty much RedS1 assigning and reassigning and reassigning over and over again. So he probably used Myers-Briggs a lot.
GreenS4: But the basic point is I guess GreenS2 expressed interest to Green Company project. And a friend and me also is expressed interest to this program, so based on the Myers-Briggs, so maybe RedS1 […].” (Green focus group, 09-04-2000)

xv “GreenS2: It actually it did say that they want to choose teams before they chose a product for each team, but the reality was it didn’t quite work that way. People started going well what product do you prefer and then they had, when the arranged teams I think they basically went with who’s interested in what project. It’s a strange coincidence I guess.” (Green focus group, 09-04-2000)
“EJ: So then, what do you think, how important is the loft? What role does the loft play?
BlueS2: Oh it’s a key
BlueS1: It’s great.
BlueS3: Yeah.
EJ: In what way?
BlueS1: I don’t know what we’d do without that place
BlueS2: -No. I don’t think -
BlueS3: -Yeah.
BlueS2: There’s no way we can do this project without the loft. No way. There’s no way.
BlueS3: Yeah you spend all your time like going from the machine shop, and -
BlueS2: -When you have no place to like work and just-
BlueS3: You use it like the [dremmel]-
BlueS2: -Yeah, I mean it would take, seriously it would take 3 times as long to do what we’ve done without if it wasn’t the loft. At least.
BlueS1: Absolutely being necessary.” (Blue focus group, 23-02-2000)

“RedS5: And I think the physical space, it can’t be underestimated, the importance of that can’t be underestimated. The fact that there’s a central meeting place, everyone knows that’s obviously where you’re going to meet, there’s no question you can dump all your stuff there, it’s just, it’s so much, it’s so much closer to the work world than, you can’t sit and cut up wood in your room, you know it’s just –
RedS3: -Right.
RedS5: -Or——
RedS2: --Right.
RedS5: -- here at this shop there’s a teeny little locker and it’s just, it’s just more of a community.
RedS2: Hmm, right. For a team based thing where if you had in somebody’s dorm room you did all your work, well then everyone has to come to that one person’s dorm room whereas here it’s sort of a shared dorm room.
RedS5: I mean I was an undergrad and I took ME 113 here, which is a one quarter undergraduate version of this class, and I mean I’d say the biggest difference aside from the fact that people have less experience and it’s just one quarter, but I mean the teaching methodology was very similar and stuff but the biggest difference was that we didn’t have the central meeting location and that is it really made it harder to I think, to sort of expand your ideas and it seems kind of weird, but if you don’t have this physical space, it’s just harder to really become a part of the project. It’s more just like a discrete homework assignment type of a thing rather than a live-in [...] RedS2: Yeah, you come and do the project vs. –
RedS5: -Right, yeah –
RedS2: -You just sort of… That’s where the project lives.
RedS3: Yeah there is a fair amount of synergy with like expensive equipment and parts and materials. We just sort of had stuff from maybe 10 years ago just strewn all over the loft and I think it helps people prototype things faster and get ideas just by looking at what other people have done and used, which is nice. I know we used that.
RedS2: And the catalogs, even though a lot of stuff is on the Web, the catalogs still definitely come into play.” (TA focus group, 10-03-2000)
the loft. But also what you just said sparked me to think, you know in someone like RedS1 or RedS3 or myself, we all can walk by and see what’s kind of going on and suggest changes. It’s publicly open so other people in the loft can see what’s going on. So it’s sort of, it’s just a little more shared I guess, a shared environment.” (TA focus group, 10-03-2000)

“PurpleS8: -It was mainly social. Because we never actually got into other people’s projects. And that was something that I think PurpleS1 was even kind of disappointed with, he was hoping people would share their knowledge, but I think everybody reinvented the wheel at least twice.

[...] CY: So you’re thinking it’s more about, if you want to learn about someone else’s project, it’s because it’s an interesting project. You’re not thinking about okay they’re working on this kind of piece of equipment and we’re also using this kind of piece of equipment, maybe I want to talk to them.

PurpleS8: Right, that never happens. But okay it might happen, but it rarely happens. I mean and that’s a shame, that’s why I’m saying they reinvent the wheel because you know so and so went and got this piece of equipment and then painstakingly got through it and then someone else wants to do it, they never go and ask this group. Plus a lot of times you keep things, for whatever reason, it’s kept kind of secret.” (SLL Alumni Focus Group, 04-02-2000)

“BlueS1: Yeah, could be. It’s just a good place to work on other classes.
BlueS2: Yeah.
BlueS2: I think that actually helps a lot because we just happen to like, if we’re working on other stuff, and other classes, we just have to be there and maybe okay we’ll work on something for an hour or something like that. It’s kind of just like constant interaction. Maybe that’s why our team gets along so well to tell you the truth.
BlueS1: Why is that?
BlueS2: Just ‘cause I think we constantly see each other, so it’s not like we have defined times where we say okay we sit here and we have to do this.” (Blue Focus Group, 23-02-2000)

“PurpleS8: A loft community? It’s kind of-
PurpleS3: -21 people-
PurpleS8: -Right. And you kind of feel like you’re going through the same thing-
PurpleS3: -2 or 3 times [...] have them all cycle to do things at the same time.
RS: And these are all the local kind of all the teams-
PurpleS8: -Right.-
RS: -That’s the common ground for all the-
PurpleS7: -You are on a physical work space and you’re never in there alone. There’s-
PurpleS8: -Never,-
PurpleS7: -at least half of the people are there at any one given time.
RS: So one big-
PurpleS7: -unless it’s like 3 in the morning-
RS: -question is how can you recreate [...] [talkover – inaudible]
CY: So what makes it feel like a community?
PurpleS7: Suffering.
PurpleS8: Right, you’re suffering, that’s one. [...] Suffering together, eating together.
PurpleS7: Drinking together.
CY: Okay. Drinking meaning alcohol or just in general?
PurpleS8: Living together.
PurpleS7: Alcohol.
EJ: Snapple?
PurpleS8: Snapple.
PurpleS7: Yeah that’ll get you so far.
PurpleS8: Yeah.
CY: Anything else?
PurpleS8: That gets you typecast all together. There’s also, people are even sleeping there too.
CY: Oh really?
PurpleS8: Yeah ’cause there’s-
CY: -There’s a bed out there now.-
PurpleS3: -There has always been.
[talkover – inaudible]
PurpleS8: There’s futons that were there and so people would spend the night there. If I know one guy who lived there for about a month.” (SLL alumni focus group, 04-02-2000)

xxxiii “PurpleS8: -Another thing I think is interesting would be to set up more of the, well at least I always think it’s kind of cool is just a plain chat place like ICQ or something so sometime if you do just want to talk to someone.
RS: It’s the awareness thing and instant messaging.
PurpleS8: Right.
CY: Well also like a shared, having a shared space.
PurpleS8: Also they can just talk to people, I mean so that you don’t always have to like talk on the phone. But it’s not a bad way to do it as well. It’s a pretty good communication tool.” (SLL Alumni Focus Group, 04-02-2000)

xxxiv “RedS3: That’s a nice thing about the Orange group. If you sit in on their video conferences, they try, they totally extend their boy’s club to Sweden. Like if you’ve ever listened to them, it’s amazing like they just hang out and they, they’re always telling each other jokes and they’re just having the greatest time and they’re talking about the engineering problems but it’s just like a bunch of friends when they talk about the, you know, what they did when they went over there and stuff, and the other team was also highly motivated. They’re all mechatronics students in Sweden and they’re all working you know way overtime and really enjoying it, and so I think the, the bar is, is being raised on both ends with, it is that they’re having fun.” (TA focus group, 10-03-2000)

xxxv “OrangeS1: You can’t really discuss something over e-mail well. You can get answers for a specific question, but the link is very effective for that, and especially since we went to Sweden, we know who we’re talking with and just the communication is very easy going and people are very clear and (pause) there’s no, there’s no hiding information not that they’re, not intentionally but just I mean everyone’s very comfortable to discuss very frankly what’s going on. So, [...] LT: Do you think you need it every week or is that like something you [...] necessity or do you think maybe like two weeks, every two weeks?
OrangeS2: I’d say the best, I mean occasionally they, I would say one out of every three conferences is probably not that important.
OrangeS1: Yeah the content’s probably not that important.
OrangeS3: But it does help us try to keep the intensity up though.” (Orange Focus Group II, 20-04-2000)

“OrangeS3: Well the concept is very sound. But when they practice, it just doesn’t ever seem to work that well.
OrangeS1: Yeah because it needs to be working optimally in both ends. And usually it’s like our end is having some problem, or their end is having some problem. And now they’ve got something new, the IP [phone] up there, hooked up at KTH. So they’re hoping that that will make the sound a lot better.
CY: As part of the same system you mean?
OrangeS1: Yeah, ’cause the sound’s been the problem. I mean that’s obviously the most important part of the communication.
OrangeS2: What’s difficult is that even when it’s worked its best, you can’t talk at the same time or else it’ll cancel each other out and there’s a time delay to it too. So trying to coordinate that, real challenge to get something meaningful across. So, just when you’re talking and someone is saying something, you’re kind of like, yeah, yeah to verify that you’re getting it, and if you say that it ruins what they’re saying. And-
CY: -Oh.
OrangeS2: And it kind of messes things
OrangeS1: Yeah, there’s definitely a different, different way you have to talk on the long distance.
CY: Like ship to shore kind of.
OrangeS1: Yes.
OrangeS2: A lot of the best information is really traded by written word at this point.”
(Orange Focus Group, 28-01-2000)

“RedS2: He might have. We haven’t been pushing PENS, we never did for a long time now.
RedS5: And I think the technology is just behind the convenience. It’s, I mean you can say it’s easy to do but the fact is you still have to wait several minutes for it to upload on the computer and you still have this big, heavy bulky thing and it’s like 10 more years maybe, but right now you’re just forcing the technology on the, I mean it’s not ...
[…]
RedS2: There’s no way we’re going to be downloading and scanning and dropping. It’s just, it’s one step beyond what’s already not being done, so it’s almost like you just need a little, need a little digital voice recorder. You just set that sucker there and then and just describe your pictures and then have that go text to, speech to text and drop it on […] Web or something, maybe that’s what we need to do.
CY: Yeah.
RedS2: Something that gets even easier.” (TA Focus Group, 10-03-2000)

“OrangeS1: Well I guess I’ve, I grew up living in Europe so I have 10 years that I was living in Europe and so it’s something that I’ve kind of accumulated over the years in terms of recognizing how communication can be most clear like OrangeS4 was saying, that a lot of times there are a lot of assumptions that you take into account when you communicate with people who are from a similar background. And that a lot of times if you communicate in the same way with other people, engineers, they have to communicate with people in all other disciplines, different scientists, different people in business, etc. And a lot of times, without even realizing your conversations are based on
a set of assumptions that are not shared by the person you’re talking with. And so working on an international project helps you to recognize that how to make the communication lines clear, as clear as possible and keep the big picture like OrangeS4 was saying.” (Orange Focus Group II, 20-04-2000)

xxxix “OrangeS2: --I think a lot of that was because they didn’t-- really like, we ask them for a lot of information, they didn’t have any paper documentation of a lot of things they did. So they kind of avoided us in a way and I think a lot of that, we were there, so in many ways they had their engineers come in and describe to us exactly how they built things, but they couldn’t really do that by sending us papers and stuff” (Orange Focus Group, 28-01-2000)

xli “CY: And you tried to get the company to help you focus it or?
OrangeS1: We tried. Oh yeah.
OrangeS2: Yeah we tried but not much was I just think I don’t think they were really ready yet in another way to-
OrangeS1: -Yeah.
OrangeS2: -cause KTH was on a different time schedule. And they really don’t get rolling 'til now.
OrangeS1: So they were kind of not really ready to be pressed by our tighter schedule we were trying to get them to react to.” (Orange Focus Group, 28-01-2000)

xlii “GreenS2: Almost that. I wasn’t consciously paying attention to the content so much either though, because it was like Japanese comes in and then I just spit it out in English and then the English comes in and just spit it out in Japanese, so like I wasn’t able to take notes at the same time and I get the feeling that I don’t remember some of the meeting […].” (Green focus group, 09-04-2000)

xliii “GreenS5: The meeting was in Japanese
GreenS4: So GreenS2 will just be our translators.
GreenS3: They tried to start out with English, but they realized they couldn’t really do it.
GreenS5: And they give up.
GreenS2: They didn’t really even try though. At the start of the meeting was like well can we try doing this in English, they asked whether they wanted to do it in English or Japanese and I asked them to do it in English as much as possible.
GreenS3: And they just sat back.
GreenS2: They said they would, but then they started making small talk in Japanese just to start off and they never went back to English.” (Green focus group, 09-04-2000)

xliii “GreenS2: [About meeting with their sponsor in Japan] Well we got really explicit set up what we don’t need to do. Like originally we have, we were pretty much up in the air about how much they expected from us and we were like well we need to do the hardware, we need to do the software, we need to do safety training, we need to do focus group testing and we need to do this and this and this and this and well maybe we need to do that. And turns out that’s what it was like, well safety, you don’t really need to think about that, testing, well you just need to do like anything that you think is necessary but not anything beyond that. You don’t really need to do comparison testing, you don’t really need to build the software, just have a basic model you can interact with. So they simplified a lot of the things that we thought we might need to do. So then we have a more clear focus on what exactly we need to pinpoint then work with instead of like this
really broad range of things that we would, right?” (Green Focus Group, 09-04-2000)

“OrangeS4: There was I think an important development between when we wrote our document and when we went to visit them was that RedK5 at KTH [tape fades] was here at Stanford and these guys were on [tape fades]. He communicated to us that the company wasn’t really happy with the direction that we had taken. We sort of for lack of any guidance selected our own project direction […] and started working on it, but then once we started going down that path, we got feedback from RedK5 that that wasn’t what they wanted. And so kind of over the break and then the first week or two of the quarter, we changed our focus on [tape fades]. Orange company may not have been completely aware of that redirection on our part. And so that may have been why they were, their expectation were a little different.” (Orange Focus Group II, 28-01-2000)

“OrangeS2: [About how often they communicate with the Swedish team] In general still once a week on the internet. Here and there kind of this week they were all gone for Easter and so we didn’t even know about it, occasionally that happens. And really about at some points it’s just an update of what we’ve done and a few times like this week we tried, we were getting some information on actual specs that have to do with something that we’re spec’ing, you know.” (Orange Focus Group II, 20-04-2000)

“OrangeS1: I would say that, well to bring this on my own personal educational philosophy, I would say that it's a definite failing of the American educational system that most American students don’t really have the kind of exposure to, to working with other cultures that most other cultures do. I mean people in, many people in Europe end up working with American companies and many people in Asia end up working with American companies and a lot of other countries have to be, their engineers have, are much more focused, externally than Americans tend to be and so it’s definitely, it’s definitely an opportunity that, there should be, there should be more opportunities in the United States to get people involved with working with, working outside of just America, just outside of just the American educational system. So it’s very valuable for us, I mean and it would be valuable for everyone in the class.” (Orange Focus Group II, 20-04-2000).

“HS: In what way would you say that the design of the assignment has been influenced by the cooperation with the Swedish students?
OrangeS2: Well, (pause) there’s a technical aspect of how we communicate with their project electronically with their microprocessors. And we, a while, maybe two months ago, or quite early in our project, we agreed on this one technology, which has proven kind of difficult for us to get a real handle on, but in many ways, that’s maybe it’s something that we wouldn’t have even considered once we got into it. But once we’ve agreed on that and they expect that on their, on their design, we kind of had the goal to stick to that and make sure that we also implement that in our design. So it was possibly something that wouldn’t have even come up. So it’s definitely, it set some extra requirements on our design and what it had to do.” (Orange Focus Group II, 20-04-2000).

“OrangeS2: Yeah, well you know if you hear yelling or like [going off] it’s probably us. But I think you end up getting more accomplished in the end. If you challenge someone to prove their point and then they prove it really well, you’re like woah, all right. OrangeS4 is particularly good at that.
OrangeS2: We’ll make a big noise and bla bla bla and he’ll say well shouldn’t it be like this? Oh my God. But you know, I think in a way it challenges you to push your ideas to a new level." (Orange focus group, 28-01-2000)

**BlueS1:** I don’t even know what I’m supposed to be anymore. (pause) We just kind of settled into our roles and it seems like whenever there’s a deficiency someone will step up and do it.

BlueS2: Yeah.

BlueS1: I mean and we recognize, we recognize deficiencies pretty well, but […]

BlueS2: I think so too. Nothing really falls through the cracks too bad. I mean there’s little things" (Blue focus group, 23-02-2000)

1 “EJ: What is your major way of communicating? And what [kind of media] do you use to communicate?

BlueS2: Face-to-face every day.

BlueS1: Face-to-face daily.

BlueS1: Yeah. And except for that, it’s e-mail. We don’t use the phone that much. (pause) Except to wake me up on Sundays.” (Blue focus group, 23-02-2000)

II “EJ: How do you think your relationship with your sponsor would have been if they hadn’t been local? What is the difference?

BlueS3: I don’t think we would have gotten to know them as well.

BlueS2: Yeah I think the project, probably would have been pretty much the same though. Fairly close to the same. I mean there was some key feedback from the project sponsor in terms of refinement and goals. I think again the danger is if you don’t have a lot of contact with your project sponsor, you’re going to be (pause) assuming you’re going to the same goals, I think the danger is, is that at the end, the product may be perceived to meet or not meet goals depending on where you stand, right? Because they could develop that you’re going to interpret the goals in some respect, in some way, and you’re going to make the project meet that and if the project sponsor never sees it or never interacts with it, they’re going to have a different understanding of what the goals are. Even though some of them are written in hard stone on a paper, a lot of them are not necessarily –

BlueS1: -concrete.

BlueS2: So, yeah they’re not necessarily in concrete. So I think the relationship that we gained was we’ve come to the same expectations in terms of what the project, or what the product should be. I think if we didn’t have that, we’d end up with maybe the same product at the end, but maybe not the same expectations.” (Blue focus group, 23-02-2000)

III “Orange S3: [about the option of not going on a site visit] We might have been able to pull it off, but not as effectively as now. We have the same scheduled meetings as before the trip, but they are longer now and more productive, and the technology works. We send a lot more e-mails to Orange company. They never responded before. There are more e-mails to KTH, but the big difference is that they are more productive!” (EJ, discussion with Orange team, 22-02-2000)

III “GreenS2: Not really, it was more of an informal meeting with the, our corporate liaison and one guy from human engineering and one actual engineer so it was 3 on their side and then everyone else on our side. So it was basically first we just went over the e-
mail in like our own words just to make it more explicit and clear and describe what we wanted to do, in our quarter [...] And then they also gave their feelings of what they thought individually each of the 3 people, felt we should be doing on this project and then we went over questions and tried to iron out what the requirements.” (Green Focus Group, 09-04-2000)

“OrangeS2: We had a number of portfolio books of ideas that we had come up with. [tape fades] you know everyone conducts [tape fades] that came in and they kind of, they had read our final document from last fall and they had kind of taken the sentiment that we were following this one line of thought and it was kind of contrary to that, we weren’t really.
CY: Oh, you just had to do that for the assignment.-
OrangeS2: -Yeah and we didn’t we had no direction, no scope direction at all so we just kind of let’s try this you know. It seemed like a logical way to go at it. It was more thought out than that obviously but-
OrangeS3: -Yeah that was part of our biggest thing last term was to figure out was to narrow the scope of the project because it was fairly undefined.
OrangeS2: Yeah.
[talkover]
CY: And you tried to get the company to help you focus it or?
OrangeS1: We tried. Oh yeah.” (Orange Focus Group, 28-01-2000)

“OrangeS2: And so we wrote back saying let’s, maybe we can optimize our time better while we’re there because you don’t need to convince us that our way is wrong. And they kind of came back and just left the program the same. Which ended up working out fine in the end but it was just another example of how they weren’t really taking us that seriously ‘til we showed up.” (Orange Focus Group, 28-01-2000)

“GreenS2: How did it change, we don’t know yet. We’ve only been back for a week and a half, two weeks. At some point we need to contact Green Company again because our promise upon leaving the meeting was that we would confer with TMIT again and then by this week or next week have a more defined idea and tell them what we’re going to do from those several ideas that we had. Pick one and then present it to them. And we haven’t done that yet because of the whole TMIT thing is going, I don’t know. But I would suspect that the communication will be a lot better with Green Company now. Last quarter we had the introductory e-mail where he was introducing himself and then the warning e-mail telling us that there was a navigator on the way and then that was about it. Any questions we asked they weren’t answered. And then when it came time for us to go to Japan this quarter, then they started responding with well here’s the schedule that is possible and here are possible days you can show up.” (Green Focus Group, 09-04-2000)

“HS: From the start, I think that that was a problem to get the information from the company? 
OrangeS2: It was. It really, it was a 180 degree turnaround from when we went over there. I—
HS: —Why, why do you think it was a turnaround?
OrangeS2: Well from, I really don’t know exactly why, I just think that their confidence in us was really turned around. I don’t, we were so far away, they just didn’t really feel like they had to invest their time in us. And once we showed up on their doorstep, and
realized that we were putting some real thought and effort into this, they, maybe it, something clicked in their brains that they had a good opportunity here, you know.” (Orange Focus Group II, 20-04-2000)

“OrangeS4: -I think there was a level of trust that was-
OrangeS1: -Yeah absolutely.-
OrangeS4: -different when we showed up and-
OrangeS4: -demonstrated that we had some solid ideas.
CY: So do you mean they trusted you more after
OrangeS2: Yeah.
OrangeS1: Yes.
OrangeS4: After they met up and after we discussed the project and they could sort of appreciate that we had some serious insight.
OrangeS1: And since then they’ve been, when we’ve had several communications with them for technical information and they’ve been getting back like within several hours, they’ve been responding-
OrangeS2: -Yeah.-
OrangeS1: -within 8 hours.” (Orange Focus Group, 28-01-2000)

“OrangeS2: [about what happened after site visit] I think it will, our relationship with them is what improved the most drastically.
OrangeS1: Yeah.
OrangeS3: It’s been remarkable. Prior to going over there, we, it was difficult to even get a response to our e-mails is that right?
OrangeS1: Oh yeah.
OrangeS2: Yeah.
OrangeS3: And they wanted to do everything through KTH and not really speak to us at all, which is, I mean it’s hard enough for us to speak to KTH or them, but for us to speak to them through KTH is --just virtually impossible.--” (Orange Focus Group, 28-01-2000)

“PurpleS9: -Yeah, I think that was kind of a time when they started realizing that it was weird when we actually got to talk face-to-face, we could see that their opinions on their requirements were a lot less strict than what it seemed from e-mail, so I think the face-to-face visit was really important, ’cause it kind of changed the whole focus. It was more like you created them to sign away to make this device happen? Rather than have it have to absolutely stick to these parameters. You know, so that was good. Kind of changed it a little bit. But it’s unfortunate though we didn’t get that initially from the e-mails ’cause I think we could have obtained that information just remotely or over the phone or something.” (SLL Alumni Focus Group, 04-02-2000)

“OrangeS2: We had a number of portfolio books of ideas that we had come up with. [tape fades] you know everyone conducts [tape fades] that came in and they kind of, they had read our final document from last fall and they had kind of taken the sentiment that we were following this one line of thought and it was kind of contrary to that, we weren’t really.
CY: Oh, you just had to do that for the assignment.-
OrangeS2: -Yeah and we didn’t we had no direction, no scope direction at all so we just kind of let’s try this you know. It seemed like a logical way to go at it. It was more thought out than that obviously but-
OrangeS3: -Yeah that was part of our biggest thing last term was to figure out was to narrow the scope of the project because it was fairly undefined.
OrangeS2: Yeah.
[talkover]
CY: And you tried to get the company to help you focus it or?
OrangeS1: We tried. Oh yeah.” (Orange Focus Group, 28-01-2000)

GreenS2: Not really, it was more of an informal meeting with the, our corporate liaison and one guy from human engineering and one actual engineer so it was 3 on their side and then everyone else on our side. So it was basically first we just went over the e-mail in like our own words just to make it more explicit and clear and describe what we wanted to do, in our quarter […]. And then they also gave their feelings of what they thought individually each of the 3 people, felt we should be doing on this project and then we went over questions and tried to iron out what the requirements.” (Green Focus Group, 09-04-2000)

RedS2: Well like you get a little worried when the Green team goes ’cause they weren’t really coagulated and like driven about any particular direction, they were kind of just flailing.
RedS3: Right.
RedS2: And it’s like a site visit, when you’re flailing, you’re just telling your sponsor you’re flailing, it’s not, not really constructive. When at least when Orange Team went we had them get their ideas on paper, bind them up so that they could hand them out and look a little professional and sort of make a presentation and get some feedback on which, on where they believe they should be going. I don’t think Green team ever reached that. And they came back very fuzzy, which it is, it’s working out now, but at the time it was like what happened? It went from bad to worse.
RedS3: Yeah, it went from bad to worse.” (TA Focus Group 10-03-2000)

OrangeS1: That, well that was what they were doing but the key thing that we found out on our trip was that wasn’t the only problem, and that in fact at Orange company they had several other key problems that they would be very happy to have people working on in a project. But those were not things that were laid out from the start. I mean I don’t know how much of that learning that was due to our probing. I mean we were, in a sense by making the trip later, there was almost a sense of urgency about being extraordinarily productive and getting a lot out of this meeting, so we were very aggressive about asking all the questions that we knew there were holes, and about really probing for what are the problems and how could we, would this solve them? These things that we’d been thinking about. And so we found well yeah, there are these other problems and it’s not just the pneumatic driver that they need to improve for their final system but this and this and this, which we’re going to address with our project.
OrangeS2: As one aside to that, there was only of the few things as an advantage to going later. When we went, we were I think we surprised them with the knowledge base we had of their industry and the way that their system worked. We still had to ask questions, ”Is this component hydraulic?” or something like that, but we knew the components, we knew a lot of the common problems in the cow milking industry, you know that, that would be the one bonus is that if we went in the fall-
OrangeS1: -Yeah we wouldn’t have-
OrangeS2: -we wouldn’t have such an educated stance-
OrangeS1: -Yep.-
OrangeS3: "I think we did a lot of documents putting them up on the Web and then they would respond by putting stuff on the Web. So our Web page has been really, really useful. Because-

OrangeS1: Yes, international in-box.

OrangeS3: "It’s really useful.” (Orange Focus Group, 28-01-2000)

OrangeS1 [about web page]: So it’s a good way for them to keep in contact too. Because they just say, oh yes, we’ve been checking on you guys. You guys did a lot of work this week, and it looks like things are going, nice job on the documentation. And I mean, that’s cool that they’re, you know, that they’re using that.” (Orange Focus Group, 28-01-2000)

OrangeS3: Occasionally, usually there’s someone leading the meeting, but there’ll be about five people in the room and we’ll have exchanges with those different people throughout the course of the meeting. You know the usual suspects are OrangeK6 and OrangeK8, and OrangeK10 is usually in the background, he’s usually running something in the back but he’ll always say hi and he’ll answer technical questions. OrangeK8 is usually there and now OrangeK15 is running the meetings. OrangeS1: It’s usually been like their one contact person which has been OrangeK6 up 'til like last week, and then plus the current project leader and then yeah, a few other people that I mentioned.” (Orange Focus Group II, 20-04-2000)

PurpleS8: Pro E actually, when I actually got to work it, it works extremely well and once we got a tutorial, I was able to teach myself in about a week and a half. Unfortunately for that class, a week and a half is considered too long. I mean they wanted it now.” (SLL alumni focus group, 04-02-2000).

PurpleS7: [...] We had a couple of teams that just imploded and most teams survived that, but you asked earlier about problems that teams had and I was thinking of two problems that our long project had. And one was trying to incorporate a member who wasn’t there, our SITN member and we failed at that. We just basically turned him into a consultant and said, okay we need you to get lithium battery data and then he’d come back and we, okay and we need you to research door latches, and he’d come back with this report. And we’d like okay we need you to write this section of the report and he’d come back and basically did not involve him in the team.” (SLL Alumni Focus Group, 04-02-2000)

CY: Anything else for, any other idea, sharing community with distant people? (pause) Or how to get them involved in the team.
PurpleS3: Play more games together!
PurpleS8: That’s kind of worked for me.
PurpleS7: Drink together.
PurpleS3: Depends on what you can use as a motivational tool.
PurpleS8: Right.
EL: So sitting on each side of the VIP camera and drinking.
PurpleS8: Even the broken squares may be a good.
RS: Well I think that’s going in that-
PurpleS3: -That’s in the right direction. I really think you need to give them a problem to tackle. The one really addicting thing about this Everquest game is it’s all about finding quests or killing, defeating things and you need group, other people to do it. That’s the addicting part about it, is when one night you’ll be playing with someone and then 2 weeks later you’ll see the same person so you ask him so what have you been up to and they’ll talk about something and you’ll talk about something and at some point the paths will cross. ’Cause you, oh yeah I was in that dungeon that night but I didn’t see you’ or whatever.” (SLL Alumni Focus Group, 04-02-2000)

“CY: But the idea of […]. Also the idea, getting back to the idea of suffering that really meshes with what I know from anthropology about when a really tight group forms, they go through ordeals together.
RS: Yeah, I think it’s the notion of shared experience.
CY: But is actually something very difficult, painful, or that sort of thing.
PurpleS3: And they’re proud that they accomplished.
CY: Right because then you get through it and then-
PurpleS8: -That’s like boot camp.
PurpleS7: Yeah.
CY: It’s exactly like boot camp. There’s tons of things like that. (SLL Alumni Focus Group, 04-02-2000)

“PurpleS8: [About VIP camera] Well I think it’s kind of funny because when you get up and you see they’re there at 3 in the morning, then you feel for them. Because when you were there the night before at 3 in the morning so in those kind of things you would see like commitment[…]. And because I think that’s even funny even in the game. In the game that we play, you see somebody and they’ve been trying to kill a character for like the last 8 hours, and they say, I’ve been on here 8 hours and you just kind of laugh because you’ve been there. Or in those kind of things
CY: -So shared experience.
PurpleS8: It’s like shared-
CY: -Being able to actually see or hear the people are going through the same thing you’re going through.
PurpleS8: Right.” (SLL Alumni Focus Group, 04-02-2000)

“OrangeS4: Well one of the strengths of this program here and I’m not sure how much it is stressed at KTH, is the project definition. Fortunately […], which was a big deal for our group. I got the impression when we were there that it was fairly different from what KTH students go through, and so, even if that didn’t necessarily impact the details of the hardware that they were building, I think it was interesting to see the difference in the way that they were working. They saw our portfolio ideas that we brought over and said, “Oh we never do anything like that.”” (Orange Focus Group II, 20-04-2000).
“The fact that people on each side of the telephone line are gesticulating and speaking with their body without the others being able to see it leads to wrong perceptions of opinions and feelings. The inability to perceive body language with most global communication technologies must be compensated in some way. Making sure to be explicit when speaking, to avoid joking during serious discussions and forming action items (which was a recommendation made by one of the groups during the video lecture) are some ways of making sure that decisions are unanimous.” (IE264 Lessons Learned paper).

“Noteworthy, no single mode of communication reigns over the others. They serve to complement one another. Yet, I must also stress that we do not propose too many means of communications. First, if information resides in too many different places, it is rather inconvenient and confusing. We may even lose track of the latest information. Second, sometimes a member may inappropriately place a piece of information and adopt a wrong mode of communications. Consequently, two parallel tracks on a similar topic may appear at two different places, causing confusion.” (IE264 Lessons Learned paper).

“Well that’s it, it’s kind of interesting because you can. You can just go different places and meet up with different people and you know you get tired of that, you can go somewhere else. And you can make friends that way and then you want to group with these people at a particular time or you don’t. So it’s just like any other […] LT: Talking about the game or in the loft? PurpleS8: The game. The loft too.” (SLL Alumni Focus Group, 04-02-2000)

“BlueS1: Well I don’t know, it seems like when you’re Meyer Briggs you have things like mock up maker and strategist and-
(pause)
BlueS3: -Visionary-
BlueS1: -Visionary and what not and it seems to me like those things aren’t nearly as important as the group chemistry. I mean our paper bike was, our paper bike team was supposedly pretty well balanced, but, and our virtual glove team wasn’t as well balanced. But I think we’re definitely a better team.
BlueS2: Yeah I think so.” (Blue focus group, 23-02-2000)

“But I think that I’m only a little skeptical on the actual work that he’s done. I think it’s interesting. But I think he’s, he has this, or he’s done too much, he has his theory and he’ll run through it all, he’ll find out it didn’t quite give him what he wanted, and he’ll go back and rationalize and do it again. And make it, tailor it a little bit so it’s a little bit better.
RS: Change his theory?
PurpleS8: Right and so then all of a sudden it makes sense. And now it moves up to more awards. So I’m not sure I quite buy into it, especially because when PurpleS1 was into this, he was also promoting complete diversity, he wasn’t just promoting Doug’s stuff, but he was doing an overall diversity thing. And I think that was important. And the work that I had done actually shows that the diversity part acted in and of itself. I think high diversity is very good in team, but I think low diversity is good in a team and middle diversity part is horrible for a team. And from the work that I’ve done it kind displays that. And I think that Doug hasn’t addressed that.
CY: And Doug’s stuff, can you separate out the online mathematical thing that the
students learn about and Doug coming to the class and presenting and helping form teams? How those 2 things are different or how they affect the class.
PurpleS8: I think that a lot of the times it’s dependent on the person, and how they’re going to take in Doug’s information. Because one of the things I’ve found was funny was that what Doug will tell you is, what his work is trying to do is say 51 out of 100 instances, you’re going to prefer to work in this area. Well people will say is, so you’re saying I only work in this area?
CY: But they don’t hear it?
PurpleS8: Right.” (SLL alumni focus group, 04-02-2000)

lxxx “OrangeS4: Yeah and I think it was maybe useful to notice that our test pilot area was blank. [tape fades]. Actually there were 3 of them that were blank but we felt that we had been sure represented but […] really covered […]. So the way this one […] so we can sort of think well, you know when we make our prototypes we need to kind of […] how much we’ve made out of them. So I would say it’s useful. [tape fades].” (Orange focus group, 28-01-2000)

lxxxi “PurpleS8: Small group meetings, those are included. One of the big things that PurpleS1 actually implemented which I think is one of the biggest reasons to why 210 won more awards, was PurpleS1 changed the paper format on how you write your document. It’s purely a document award. All you do is get the document. He changed how the document format was done and gave everybody a template and that’s what they went off of. And I think when he did that, that’s when he started winning more awards.
CY: So there’s a lot of different factors of things that happened in the course, that influenced the awards that […]” (SLL alumni focus group, 04-02-2000)

lxxxii “spending time with the team, has not only made us good team members but also personal friends. This leads to a greater understanding of everyone’s needs and capabilities.” (IE264 Lessons Learned paper).

lxxxiii “Many technological tools are limiting the expression of feelings.” (IE264 Lessons Learned paper).

lxxxiii “perhaps as a medium gets richer (face-to-face), there are more possibilities for personal differences to show and take effect.” (IE264 Lessons Learned paper)

lxxxiv “Probably all teams find their own way of communicate and the main thing that I have discovered so far is the value of trying to stick to theses channels as much as possible. Anyway as long as they work well and are as efficient as any other. In this way it becomes much easier to overview the work and additionally increases the ability to follow the progress of the project. It also causes the information flow to be much more efficient, due to the fact that all team-members know where to check for and where to send information.” (IE264 Lessons Learned paper).

lxxxv “RedS2: He might have. We haven’t been pushing PENS, we never did for a long time now.
RedS5: And I think the technology is just behind the convenience. It’s, I mean you can say it’s easy to do but the fact is you still have to wait several minutes for it to upload on the computer and you still have this big, heavy bulky thing and it’s like 10 more years maybe, but right now you’re just forcing the technology on the, I mean it’s not ...
RedS2: There’s no way we’re going to be downloading and scanning and dropping. It’s just, it’s one step beyond what’s already not being done, so it’s almost like you just need a little, need a little digital voice recorder. You just set that sucker there and then and just describe your pictures and then have that go text to, speech to text and drop it on [...] Web or something, maybe that’s what we need to do.

CY: Yeah.

RedS2: Something that gets even easier.” (TA Focus Group, 10-03-2000)

“PurpleS8: Pro E actually, when I actually got to work it, it works extremely well and once we got a tutorial, I was able to teach myself in about a week and a half. Unfortunately for that class, a week and a half is considered too long. I mean they wanted it now.” (SLL alumni focus group, 04-02-2000).

“CY: So how does that fit in like with for you guys with your academics for your career goals?

OrangeS2: Very well.

OrangeS3: Extraordinarily well.

OrangeS2: Kinda like what I want to do. It, personally the way I view this class is it’s getting to do exactly what I want to do before I would have ever been allowed to do it a long time before I would ever have been allowed to do it.” (Orange focus group 28-01-2000)

“RedS3: Also to talk about maybe some of the negative side effects also which is like usually my position for some reason, in the teaching team. I’m filling in for RedS4 ‘cause he’s softening up, but (pause) the, the Orange team would be a good example of a highly motivated team who didn’t come in with much design experience. Like their project is largely electronics driven, it’s about to be more mechanical design driven and none of them really have any experience with that at all and the first few things they did kind of were, they kind of showed that. You know, they weren’t, they weren’t great, they were a little naïve, and they didn’t work. That’s okay because —

CY: --training the cows is the one I remember.

RedS3: Yeah.

CY: But it was nice that they brainstormed to that extent I guess.

RedS3: Yeah.

RedS5: This fall quarter stuff you’re talking about, or?

RedS3: Yeah uh huh. Like their early prototypes and stuff, yeah, were, but in the teaching team you know we’re like you know hey we love your motivation you know, we just want to see some different ideas and so now they’ve started, they interact with the teaching team more and they try and justify the design ideas in a concrete way before they push ahead and do something. And I think they’re coming out with something that’s, that ultimately will be a good project in the end. I think they’re doing very well. So I’m trying to think, the opposite team, let’s pick on them from last quarter would be the IBM team. IBM blue eyes team. It had one 310 alumni on it who would not be continuing into BMCs and two SITN students who were working 50 hours a week at their regular job. And who were not motivated at all and then one SITN student who stayed on who was somewhat motivated but really needs team synergy to get going. And that team was just, well they didn’t put in any time, they weren’t really interested in creating ideas and I mean the end result was a pathetic prototype and bad documentation. I mean you really can’t get any worse.
RedS2: For A or B?
RedS3: For A quarter. Right I’m in A quarter. So and the only difference in my opinion between those two teams was, is merely attitude. You know if they’d gone in and were like all right we’re going to do something cool, and we’re going to invest some good time and design ideas and then we’re going to make it happen, I think they could have had an awesome project. I think that the members were relatively skilled, had industry experience. They just didn’t care and weren’t, they weren’t going to be continuing on. So, ...” (TA focus group, 10-03-2000)

PurpleS7: I don’t think there was an awareness even at the time of what I’ve learned, throughout the whole project. I mean 210 is a course that I didn’t understand until probably 2 years after I took it. And I still don’t understand a lot of the things I learned, but when I was in it, it was kind of like just frenetic. We’re just trying to get something done and we’re going to do whatever it takes to get it-RS: -So there was no time for reflection kind of?
PurpleS7: No. There was no, there may have been time for reflection, but when you’re writing these reports you end up pulling 2 or 3 all-nighters in a row and everyone’s writing at the same time and you’re not really thinking, you’re just putting words on paper.” (SLL alumni focus group, 04-02-2000)

OrangeS2: Yeah, well you know if you hear yelling or like [going off] it’s probably us. But I think you end up getting more accomplished in the end. If you challenge someone to prove their point and then they prove it really well, you’re like woah, all right. OrangeS4 is particularly good at that.
OrangeS2: We’ll make a big noise and bla bla bla and he’ll say well shouldn’t it be like this? Oh my God. But you know, I think in a way it challenges you to push your ideas to a new level.” (Orange focus group, 28-01-2000)

"with technology, I changed my behavior. From now on, my computer is turned on the whole day and I checked my emails very often. [...] But I realized also the drawbacks of spending the whole day in front of a screen. You don’t talk to people really. You become lazy. You live an artificial life. You are always harassed by new emails etc. It is very important to find a good balance in your behavior. Technology can really control you if you don’t control technology.” (IE264 Lessons Learned paper).

BlueS1: Maybe we were just lucky, I don’t know.
BlueS2: I think it’s more than luck though. I mean I think we’re lucky that we work together, like really lucky ‘cause I look around the class and I see some other groups that as people I don’t think it would be as fun to work with. But I don’t know, I think we just, it’s like I never have any concerns about not finishing what we need to do.
BlueS1: Neither do I
BlueS2: I mean there’s time where we’re like okay we need to get going, we need to go, but once we get going it’s like no worries that we can’t do it.” (Blue focus group, 23-02-2000)

"RS: We’re talking a lot about trust building and the assumption is if you trust, if you have a high level of trust, then you really support learning and a lot of other cooperative activities. So trust to me actually also means that you not only respect the other person for his or her skills, but also it goes beyond that into the personality.
PurpleS7: I don’t know if I agree with that.
EJ: No, me neither.
PurpleS7: I think that I can trust somebody because I know that they’re going to be consistent in the way that they don’t like me or like me or whatever. As long as they’re consistent I’m happy.
EJ: And trust their ability to do things.
PurpleS7: Yeah.
RS: And to me there is a social component which, well okay.
PurpleS8: I would disagree with you as well. I don’t think there is necessarily unless the social component can be negative, unless you mean that way as well. I mean unless you’re taking social as always being a positive sense.
RS: No I mean either way, yeah.
PurpleS8: Well then you’re right, but I think that’s what he’s saying, is it’s consistent that I know how you’re going to act towards me, then you can build trust at least in that.
PurpleS7: I think that’s the biggest thing of forming a team, is finding out what each people are consistent or finding out the patterns and finding out, know what you can count on all the time. I’m not going to hang out with so and so, but I know when lunch time comes around, they’re going to be in it.” (SLL alumni focus group, 04-02-2000)

“PurpleS3: It would take a special set of individuals who worked like that, who were able to step back and be professional as it were and focus on the problem at hand as opposed to, unless they’re just having way too much fun being together. And that’s the bound when you push let’s build friends, let’s build trust, let’s build all that, the problem is, is human nature is to want to continue to do that as opposed to wanting to work. So there has to be a balance between the shared experience and the shared trusting and the actually getting work done.
CY: So that a lot of the teams you guys have seen, actually there’s like clashes and problems.
PurpleS8: I think those are actually the ones that end up being the most successful.
RS: And is that part of your diversity work?
PurpleS8: Yes. And the thing I’ve found, with everything that he said, is there’s one group that comes to mind, they were really good friends, they didn’t get anything done. They got very little done. And you could tell they weren’t very happy ‘cause they didn’t, but they all liked each other and so that was really a good experience for them, but they didn’t do well in the class. And for most of the high performance teams, a couple of them would like each other and somebody else, they wouldn’t like this other guy but he would be driving them and so on. Or for some whatever reason they would do well, but as a group they weren’t very cohesive.
PurpleS3: The adversity that they shared though was the getting the class done.
PurpleS8: Right.
PurpleS3: Getting through it. That was the adversity that they shared that brought them to bond together, that made the whole thing work.
PurpleS7: And everybody bought into that.” (SLL alumni focus group, 04-02-2000)

“When it comes to managing the time difference, e-mailing allows the team to work 24 hours a day and get fast answers to questions.” (IE264 Lessons Learned paper).

“Large attachments had flooded my mailbox several times and at one time, all my emails have disappeared and I have to seek the help of the system administrator to retrieve all my emails back.” (IE264 Lessons Learned paper).
“my team decided to use telephone-conferences instead of video-conferencing, and realized that it actually works even better.” (IE264 Lessons Learned paper).

“Despite the fact that business and technological discussions sometimes could be quite boring, and due to this, could have a great benefit of being presented in some more way than just the audible, we have found that it overall has worked out quite well. Of course the lack of seeing the person you are talking to causes some difficulties, but as long as you personally know them, I actually don’t think that it matters so much. In advantage of this technique the sound is much better than while talking over the video, there is no delay and the sound is much clearer” (IE264 Lessons Learned paper).

“In the beginning we had some difficulties in finding a speaker phone on the Swedish side but now we have got one.” (IE264 Lessons Learned paper).

“It is a good substitute for video conferencing once the team members are familiar with each other.” (IE264 Lessons Learned paper).

“But sometimes we may not be aware that we lose one of our counterparts as the system doesn’t give us the signal at all.” (IE264 Lessons Learned paper).

“For a teleconference to be effective, it is also important to send all relevant documents beforehand, so that other teammates can read or refer to the materials during the meeting.” (IE264 Lessons Learned paper).

“because of the differences of speed of our connections between Stanford and NUS, we cannot use eCircles easily.” (IE264 Lessons Learned paper).

“It was quite difficult to read what everyone was typing simultaneously, and some ended up talking about other issues when others had not finished with the current one. Our chat could turn out to be rather disorganised at times and resulted in some miscommunications, I personally find that the chat was not very helpful and not time-effective. When we switched to the phone conference, it was much more effective. We took turns to talk on each side and there was more focus in our discussions and we tend to make our decisions more quickly.” (IE264 Lessons Learned paper).

“After 4 sessions with icq, we finally decided that it was not the best medium for communications for a large number of people- there are 7 members in our team.” (IE264 Lessons Learned paper).

“video conference is great when the group is trying to establish rapport with each other (this was especially useful for me as I did not meet the Swedish team members face to face), or when the meeting is a brainstorming session when live visual drawings are to be created on whiteboards. In other instances, such as when progress reports are delivered, it is unnecessary and tedious due to poor picture, and voice quality. In these instances, teleconferences are best and can be supplemented by electronically mailed slides or spreadsheets in advance.” (IE264 Lessons Learned paper)

“The three-way Video Conferencing has played a significant role in making the project meaningful.” (IE264 Lessons Learned paper).
“Video-conferencing does not seem to lend any more ‘presence’ to our conversations, and in fact has the opposite effect of reducing it. Our teammates feel much closer on the telephone than they do over the video-conferencing link.” (IE264 Lessons Learned paper)