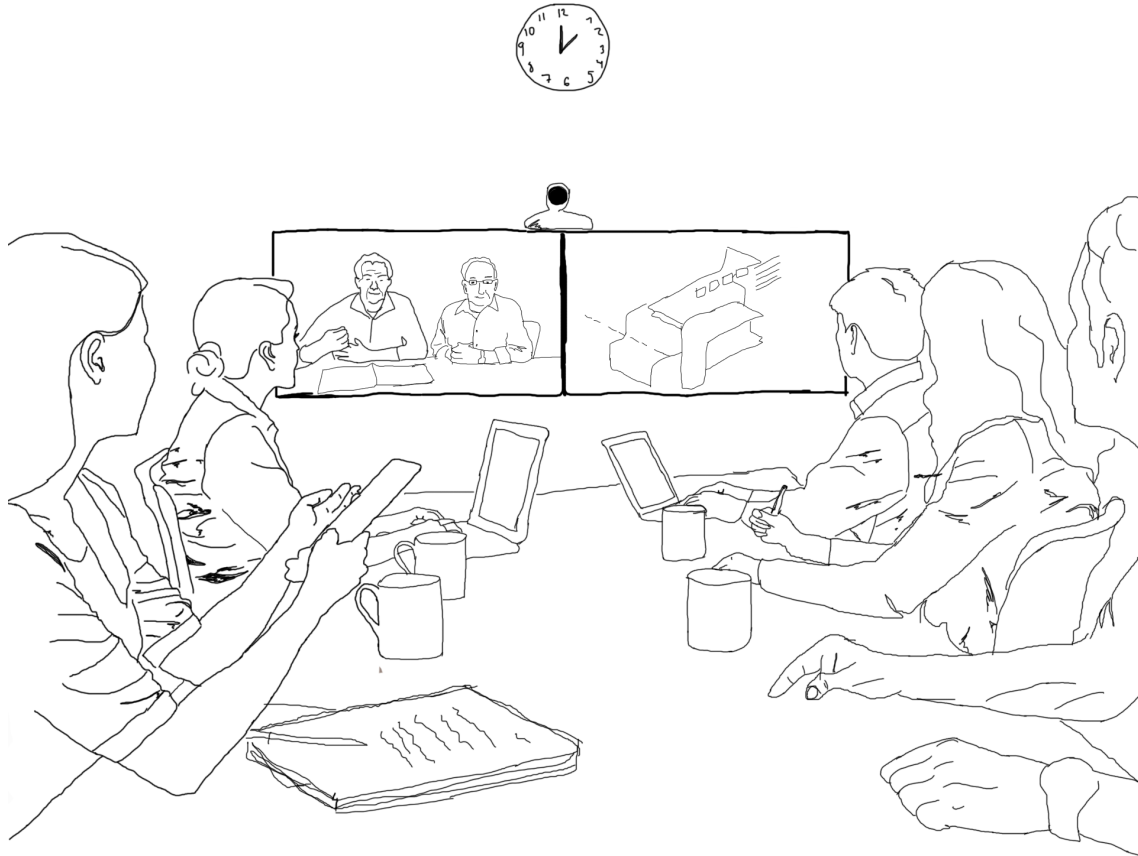




CHALMERS
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Through interface design, enhancing communication and promoting a shared understanding amongst meeting participants of formally structured remote meetings

UX in Remote Collaboration

Master's thesis in Interaction Design and Technologies

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Department of Applied Information Technology

CHALMERS UNIVERSITY OF TECHNOLOGY

Gothenburg, Sweden 2016

MASTER'S THESIS 2016:129

**Through interface design, enhancing
communication and promoting a shared
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Cover: User Context and Technical Setup in formally Structured Meetings

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Through interface design, enhancing communication and promoting a shared understanding amongst meeting participants of formally structured remote meetings
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Abstract

Remote collaboration has become a greater part of today's workplaces, making it possible to put together specialized teams that are geographical distributed in a cost saving way. This primarily due to being able to communicate through technology such as videoconferencing systems. Although, despite the growing popularity for conducting meetings remotely it is difficult to match the fullness that face-to-face meeting brings. Compared to physical meetings there are several factors which inhibits remote meetings to rise to its full potential, having a negative impact on the joint understanding for meeting content as well as meeting participants understanding for one another. Thus, the overall aim of this study is to contribute with research within the field of remote collaboration, having communication between remote sites as a focal point. The primary focus lies upon on how to enhance communication and promote a shared understanding across meeting participants

The MERCO-project (Mediated Effective Remote Collaboration) lays as the base for this study, where our fields of responsibility in involved conducting a preliminary study and creation of all prototypes. During this process both usability tests and heuristic evaluations were performed.

Furthermore, the fruit of this study is an interactive mockup where the functions and features are evaluated and discussed in relation to the five media characteristics promoted by the Media Synchronicity Theory, and how convergence may be obtained. Conclusively, whether communication is enhanced and a shared understanding promoted are dependent mainly on three prominent factors; *equivocality and uncertainty*, *group establishment* and *employee hierarchy*.

The MERCO-project was conducted on behalf of Ericsson AB, Semcon AB, Chalmers university of Technology, ETH, AVS, Intelliconcept and Touchtech.

Keywords: Remote Collaboration, Videoconferencing Software, Interface Design, Communication, Convergence, Formal Meeting Structure, Media Synchronicity Theory.

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*...**To each other**, we have been a great team, complementing each others weaknesses and strengths. This period have put our skills from the program to the test and providing us with a lot of knowledge. In addition to the thesis we have also created a foundation for a lifetime of friendship*

Malin Nyström, Hedda Ottersten Gothenburg, 06 2016

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1

Introduction

This section introduces the field which this study focuses on, where problem domain, focus, aim, research question as well as the study's limitations are described. Additionally, the MERCO-project which the study revolved around is presented by introducing its purpose, stakeholders and an overview of the working process.

1.1 Background

In today's society technology is constantly developing and it is difficult to imagine a human society without it. Technical solutions is more or less an integrated part in our everyday life's and it can be argued that we have gradually become dependent on technological support (Hinds and Mortensen, 2005). Furthermore, one of the possibilities that the advance of information technology has contributed to is allowing companies and organizations to operate on different geographical locations. This primarily due to distributed teams being able to collaborate and communicate remotely through videoconferencing systems. Hence, factors like location and proximity plays a less important role since we are no longer limited to physical environments. One of the implications that this brings for the organizations themselves is the possibility to allow research, and software development to be strategically placed in various places order to effectively utilize resources that are available (Hinds and Mortensen, 2005; Karis et al., 2016). The opportunity to facilitate collaboration amongst distributed teams also decreases traveling expenses due to processes not requiring physical meetings. It also gives companies a chance to stay closer to customers, enabling face-to-face interactions, thus entailing an increased chance to sustain and enhance customer relationships (Karis et al., 2016).

Although, the advantages of remote collaboration from an organizational perspective should not overshadow the challenges that derives from teamwork between individuals who are geographically distributed. The authors Hinds and Mortensen (2005) raises this issue and argues that companies and project teams not operating within the same geographic location is more difficult to handle and often falls short in performance expectations. Nevertheless, even though projects is conducted remotely, it does not mean that it automatically leads to lower performance compared to those teams who is working within a co-located space. One of the factors that has a major

impact on remote work and its success is project structure. Meaning, if the project or tasks are independent of each other and can be worked on separately, it stands a better chance of succeeding compared to when the tasks are interdependent and requires close cooperation and complex communication between project members. In the latter case this puts remote teams in position where the importance of operating as a cohesive team increases, due to the pressure of being able to handle short feedback loops and multiple streams of information. An example of a situation that puts such high pressure on communication is in the context of remote meetings (Karis et al., 2016).

1.2 Problem Domain

Despite the growing popularity for conducting meetings remotely it is difficult to match the fullness that face-to-face meeting brings (Hinds and Weisband, 2003). More specifically, compared to physical meetings there are several factors which inhibits remote meetings to rise to its full potential, where translation of non-verbal cues, temporal dispersion, lack of presence awareness are a few examples. These factors makes meetings difficult to perform since today's communication tools, i.e. video conferencing software, can not sufficiently support and compensate for these shortages (Karis et al., 2016; Hinds and Weisband, 2003).

Consequences of the rise of such unfortunate factors have been observed to be coordination problems, lack of trust between individuals and formation of subgroups within the project teams. However, yet another implication is that the shared understanding for the meeting content and goal decreases. Highlighted should be that a joint understanding amongst meeting participant would most likely ease the negative impact of the already mentioned consequences, one of the reasons being a positive influence on team spirit (Hinds and Weisband, 2003).

1.2.1 Focus Area: Shared Understanding

The implications of today's videoconferencing software not being able to support and translate the whole complexity of human communication are many. The scope of this study has therefore been narrowed down to solely focus on the communicative aspect of remote collaboration and how to create and sustain a shared understanding amongst meeting participants. This refers to the participants present during a meeting, but also including those who, for some reason, can not take part in the meeting but are still in need of understanding the meeting content.

Moreover, the study will utilize the Media Synchronicity Theory (Dennis and Valacich, 1999) as a take-off point in the later discussion chapter of this study. The main reason to why this specific theory was chosen was because it relates to how different medias could accommodate the need, of people who communicate over distances,

to perform certain tasks. This in order to support either one or both of the two fundamental communication process, i.e. conveyance or convergence (Dennis and Valacich, 1999), where this study focuses on the latter. The theory is further described in the section *2.4 Theoretical Frameworks*.

1.3 Aim

The overall aim of this study is to contribute with research within the field of remote collaboration, having communication between remote sites as a focal point. Hence, the primary focus lies upon on how to promote a shared understanding across meeting participants.

The fruit of this work will be a videoconferencing system in the form of an interactive prototype, including re-designs of existing functions and features (used in other videoconferencing software), as well as providing new innovative solutions that attempts to improve communications capabilities in remote meetings.

1.4 Research Question

What factors should one consider when designing an **interface** (of a video conference software) to enhance **communication** and promote a **shared understanding** amongst meeting participants of **formally** structured **remote** meetings?

By formally structured meetings we refer to meetings with more linear processes and does not involve a higher degree of creative and dynamic activities. Examples of meeting types which falls into such description are sprint, report/update and synchronisation meetings.

1.5 MERCO

The foundation of this study lies is the research project called MERCO (Mediated Effective Remote Collaboration). The project was introduced in 2014 and expects to finish by June 2016. The end-goal is to facilitate and enhance collaboration within distributed teams. There have been two previous semesters of master thesis work bringing this project forward. The first thesis focused on remote collaboration but solely limiting the use context to one-to-one meetings. A framework composing important factors to enhance efficiency in remote meetings was delivered. The second master thesis focused on understanding how face-to-face meetings differed from remote meetings, where the primary outcome was a new framework of informality enablers. The focus of the two previous projects was thereby on *research* within the area of remote collaboration, which enabled our team to proceed by developing a

first working *prototype*. Subsequently, this master thesis project is the third and last one before the project due date.

The MERCO project 2016 is lead by a team with six team members including us, all with different roles and backgrounds - Interaction Design Technologies, Communication, and Telecommunications Engineering. We had the role as Scrum Masters and Interaction Designers where the field of responsibility covered data collection to be able to extract needs and elicit requirements. This was used as a foundation for the design work where prototypes with different fidelity were created and used to detect issues through usability tests and heuristic evaluations. One of us was hired by Semcon AB (Hedda Ottersten) and one by Ericsson AB (Malin Nyström). A third student, from the same master program (Interaction Design and Technology) had responsibility for the front-end development. Two of the three remaining team members had a background in telecommunication and therefore focused on back-end development. Lastly, the sixth member had a background in communication and focused on how different theoretical approaches in communication could be used in order to improve design elements of the remote collaboration software.

1.5.1 Stakeholders

The MERCO project is a collaboration between several companies: Semcon AB, Ericsson AB, Chalmers University of Technology in Sweden, ETH Zurich, AVS, Intelliconcept in Switerland and Touchtech AB.

Semcon's main interest in the project's outcome is to potentially support in-house work in addition to improve the communication capabilities with international clients. At Semcon there were mainly two stakeholders involved in the project, one of them being David Gillblom who was the project's supervisor and one of the two project owners. The second was Sicheng Chen who had the title as the project co-ordinator. One of the stakeholders was an employee from **Ericsson**, named Ulrica Cullen which was the second project owner. In this project, Ericsson's desire was to see how remote collaboration between the company's domestic offices can be improved. Furthermore, **Chalmers University of Technology** and **ETH** (Switzerland's leading technical university) were research partners where one PhD student from each university was working in the project. **AVS** is a company that, amongst other things, installs videoconferencing systems and wishes therefore to have close partnership with research institutes operating in this area. **Intelliconcept** and **Touchtech** are companies which contributed with profound knowledge relevant for the project, namely providing cutting-edge knowledge of customer-specific tailored net-based conference rooms and software solutions.

1.6 Project Process

The MERCO-project was initiated by a preliminary study which came to be divided into two larger phases, where the first aimed to determine project scope and included identification of the "gap" which the project would focus on. In the latter phase data was collected in order to elicit requirements. Highlighted should be that the preliminary study was conducted in parallel as the implementation of the system architecture. This as an strategic attempt to ensure that, when we reached the point of starting the design work, the developers of the team would be able to progressively start implement software functions.

When the preliminary study was complete the design work began, which also was the time where the Scrum process was initiated. As this agile software development framework advocates three different roles; product owner, scrum masters and development team (Sims and Johnson, 2012), they were employed and divided amongst the project team members. The roles were distributed as follows; two project owners, one employee from Semcon AB and another employee from Ericsson AB. The role as scrum master was assigned to us, and since the framework advocates a cross-functional development team we were also able to take the role as interaction designers (responsible for prototyping and test). Furthermore, a backlog was created holding all desired product features and was used when structuring and planning the sprints. While planning we tried to ensure that there was enough time for every iteration (covering design work, tests and implementation). Moreover, each sprint had a set time frame and the progress was followed up by daily stand-ups and sprint meetings, where each sprint was followed up (Sims and Johnson, 2012). Figure 1.1 below sequentially displays our line of work in this project.

1.7 Limitations

The study's scope in regards to limitations is as following:

- Even though this master thesis should be seen as separate from the work on the MERCO project, the scope and focus of the problem description was formed in order to suit the overall project goal.
- The representatives of the target population was restrained to only engaging employees in the Semcon and Ericsson spaces. This leading to only considering formally structured meetings, in addition to the prototypes only tested in offices of the two mentioned companies.
- Limitations made in respect to user studies were, excluding remote meeting between company and clients thus limiting the use-context to in-house meetings. Due to technical restrictions the number of connected remote sites in one meeting was limited to a maximum of 6 sites.

1. Introduction

- Aspects such as gender, age or cultural discrepancies were not considered during either user studies nor analysis of the captured data.
- The study has also been limited by only designing for software i.e. not designing hardware.

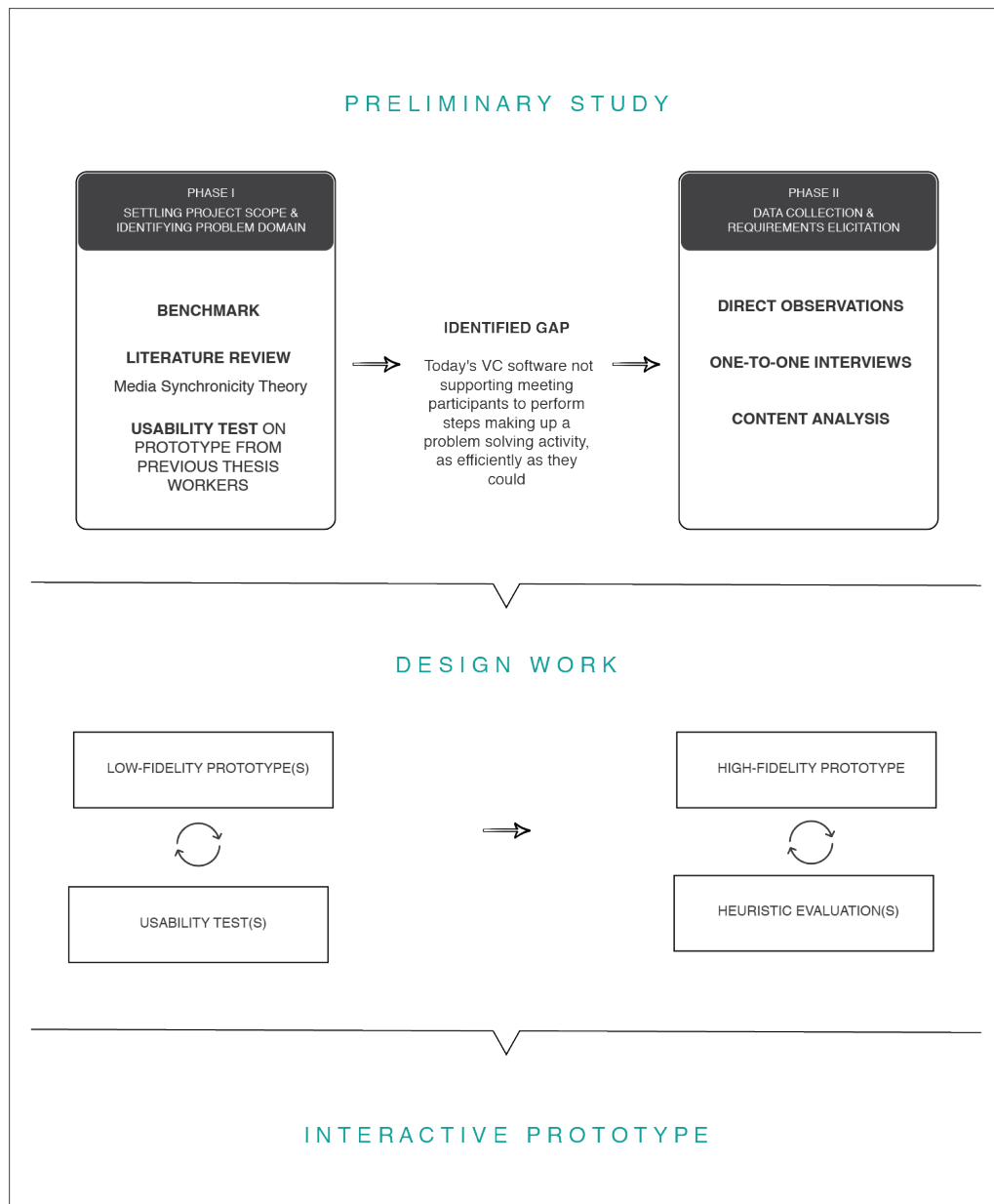


Figure 1.1: Project Process: Displaying our Fields of Responsibility

2

Theory

2.1 Meetings

Meetings is a broad term and used in several different ways and often differs in context and degree of formalities (Francis et al., 2013). Since meetings vary in different ways it's important to provide a definition of the term, where the quote below is one of many examples;

" A group of people thinking purposefully together" (Barker et al., 2011) p6

In today's society the number of meetings are increasing, this due to changes in organisations structure. The pyramid organisational structure is nowadays becoming less used and exchanged for a flat hierarchy, leading to organisations making use of outsourcing which sets the ground for more cooperation (Barker et al., 2011). Furthermore, there are several factors that determines the form of a meeting structure, such as purpose, meeting context, agenda, participants and time. The agenda holds a more central role, since it enables the meeting facilitator to present the topics that will be discussed during the meeting. This brings advantages as for example providing participants an opportunity to prepare for the meeting (if the agenda is sent out in advance). Similarly, the lack of an agenda could result in information loss, thus inhibiting the conditions needed to enhance a collective understanding amongst meeting participants (Lewis et al., 2009). Size-wise, it is suggested that a meeting group shouldn't consist of more than 12 participants. Bigger groups are more difficult to manage, one of the reasons being creation of sub-groups within the meeting group (Barker et al., 2011).

2.1.1 Video Conference Meetings

Videoconferencing (VC) is something that has been around for a long time and was first introduced by Bell Labs who, in the 1920's, demonstrated the first video-conference. Although it was not until in the beginning of the twenty-first century that VC technology started to get improved. This, amongst other things, due to the access to increased bandwidth (Barlow et al., 2002).

As described in the introductory chapter, the way we communicate and collaborate over distances has lead to a decrease in traveling costs. This because more mature technologies can be utilized to accommodate needs of people attending meetings, making them more efficient (Barker et al., 2011). Technology enabling people to work remotely is referred to as computer-mediated communication (CMC), i.e. communication that takes place by using either a phone, the web, or a video conference tool and transmits information to people that is not close in proximity. Along with this, new difficulties have aroused as for example the difficulty to decode visual cues, gesturing and facial expressions (Gibson and Cohen, 2003). However, high-quality videoconferencing systems seems to be the most promising mediated communication tool in order to create a shared understanding across participants (Veinott et al., 1999).

There are several factors that has had an impact on the increased usage of videoconferencing technology, below four of these is presented. Firstly, the overall quality continues to be improved at the same time as costs decreases. Meaning, today VC can be directly connected to other systems, which makes the interactions more spontaneous. The low prices will in turn lead to an increase in users. The second factor relates to the way of controlling cost and save time for businesses. More specifically, the main selling point for VC is not the actual cost and time which the companies earn, but rather the VC software leading to more structured meetings entailing that the meeting time is often more wisely spent. Thirdly, people utilizing VC software becomes more flexible in their work, i.e. easier to connect and contact both clients and colleagues. Lastly the increased usage of VC tools is also due to the environmental benefits which ut brings. Many organisations are more environmentally aware and therefore chooses alternatives that have as little negative impact as possible (Barlow et al., 2002).

2.2 Shared understanding in Remote Meetings

When it comes to collaboration, a central aspect is the shared understanding for the common goal. A shared understanding in teams sets the base for a collective knowledge, which can have positive influence on the performance and the synchronization of work (Hinds and Weisband, 2003). Meaning, a shared understanding enables team members to predict the behaviour of others, leading to being able to move forward in a fast pace (without constant contact with others in the team). This has the impact of allowing members to work individually but still contributing to the overall goal. Secondly, a collective understanding assures increases the chances of resources being used in an efficient manner, reducing errors and rework. Additionally a shared understanding often brings an increase of the team members motivation to perform well and the sense of belonging, resulting in bringing both the team and the work forward (Hinds and Weisband, 2003).

There are several different factors that could lead to a shared understanding within a team, such as sharing a similar background or sharing experiences, interacting with

each other over time or simply by being able to communicate and share information. Although, when communicating over distances these factors become harder to reach. The technology used as a communication tool becomes central but can not provide the same fullness as a face to face conversation, due to delays and the difficulty of interpreting non-verbal cues (Hinds and Weisband, 2003; Karis et al., 2016).

2.3 Factors affecting Communication over Distances

Below factors that affect remote meetings are described, initiated by a section describing communication and followed by three subsections highlighting social, technical and design aspects.

2.3.1 Communication

Communication is central in our everyday life and we communicate in some way almost every minute that goes by. Despite this, communication is complicated and there are several variables that affect the communication process such as nonverbal cues, behavior, used channels, and the relationship between the people who are communicating. All these together affect the procedure of communication and if one of them would to change, so would the whole conversation (Pearson et al., 2011).

Communication consists of several different components, where messages, codes, encoding and decoding are some examples. That is, before a conversation is initiated humans send out messages which occurs in both verbal and nonverbal forms. It can be everything from facial expressions, gestures, movements and the tone of our voice. Nonetheless, when the conversation has started people use codes to create meanings in the mind of another person. These codes can be both verbal and nonverbal where the verbal code holds our grammatical arrangement, and the nonverbal codes is the way we move, the use of time and space, duration of our speech and sounds (Pearson et al., 2011). Basically, codes that are not in the form of the spoken word. Since human uses several different codes when they communicate, encoding and decoding is a central part. Encoding is something that happens when an idea or thought is transformed into a code, whereas decoding happens when the receiver has built an own model of that thought or idea (Pearson et al., 2011).

Furthermore, it is the nonverbal cues that often causes misunderstandings, this since people uses these cues in different ways implicating that they have different meaning to different people. This makes nonverbal communication complex. Henceforth, our facial expressions is important when conveying what we mean and similarly, its also how we read other peoples feelings. Body movement enhances the facial expressions and help us read how intense the feelings might be (Pearson et al., 2011).

2.3.2 Social Aspects

The social aspects described are prior experience and face-to-face meetings informal communication, group structure, as well as turn-taking and the situation of primary room dominance.

2.3.2.1 Prior experience and Face-to-Face meetings

Human cognitive thinking plays a major part in how collaboration over distances are perceived and the quality of the meeting's outcome. More specifically, any cognitive content which is held true has an influence on user experience. This supports the findings from studies stating that, even though a remote meeting is held by two participants where both are located in the same city, just the belief that one of the two is sitting in a distant city could have a negative impact on collaboration, coordination and power of persuasion (Karis et al., 2016).

Nevertheless, the negative effects of geographical dispersal can be mitigated by strengthening the interpersonal relationships within and between the distributed teams. In order to accomplish this that remote meetings, if possible, should be complemented by physical face-to-face meetings (Karis et al., 2016). This would establish a so called "common ground", instigating trust and a sense of familiarity between the remote partners - enhancing the perception of a shared identity. Moreover, strengthened interpersonal relationships will facilitate close to all activities involved in a remote meeting procedure, including cooperation, clarifying roles and determining meeting goals. The presence of familiarity is especially important in meetings between larger teams (referring to number of participants) with a wider geographical spread. This mainly due to that the complexity of collaboration increases (Karis et al., 2016).

2.3.2.2 Informal Communication

Already in the beginning of the 90's, the importance of informal communication within companies and organizations was recognized. In this case informal communication is referred to as establishing relationships, building up a loyalty and embracing the organizational culture. Moreover, by preserving informal communication amongst geographically distributed organizations and team members would contribute to the feeling of a shared identity and maintain a high performance (Karis et al., 2016). Informal communication has many benefits, it is expressive and frequently used, it increases awareness of each other and makes it easier to exchange information (Yuan et al., 2013). Informal communication is something that is vital when it comes to the synchronisation's of work and to extend the relationship which sets the base for collaboration (Fish et al., 1992).

When people in an organization are in a co-located space there are many opportunities to interact and communicate face-to-face and is often rich on information. When people communicate face-to-face the conversation supports the informal communication, the conversation is expressive and interactive. Hence, the expressiveness in the conversation provides an opportunity to make use of cues and to express the spoken words in different ways. Due to this, there are usually short feedback-loops since they have a chance to provide feedback directly (Fish et al., 1992).

2.3.2.3 Group Structure

A meeting structure is complex and works as a dynamic system, where an individual could take on different dimensions where status, role, leadership and power are some examples (Barker et al., 2011).

The dimension of leadership has changed over the last years, where a meeting "leader" nowadays often is someone who facilitates the meeting rather than steering the group as a leader (Barker et al., 2011). Moreover, the status could be either formal or social, and when referring to the first mentioned, aspects as rights and obligations are often relevant. Status is based on others perception within the group. An individual's role within the meeting is also affected by the perception of others and is connected to the power the individual have over the group (French et al., 1959).

2.3.2.4 Turn-Taking and "Primary Room Dominance"

In a conversation where several people are involved, the activity of turn-taking is fundamental (Sacks et al., 1974). When individuals communicate face-to-face there is a simultaneous process of decoding and encode messages and cues in order to maintain consistency in the conversation (Pearson et al., 2011). Hence, these cognitive factors set the base for turn-taking in conversations (Čech and Condon, 2004).

When it comes to larger video conferences there could be difficulties with identifying the location of, and who the active speaker is. This due the video feed being too small to notice facial expressions and body movements (Karis et al., 2016).

In a case where the number of participants present at the different connected sites distinctly differs in size, there is a risk that one or two of the sites dominates the meeting (Karis et al., 2016). In these situations, the conversation between the participants (within the dominant site(s)) transfers rapidly, and tends to forget about the other sites. This brings a difficult for the other remote sites to interact and engage in the conversation in a natural way. In order to eliminate dominance in remote meetings, Karis et al. (2016) defines that one solutions could be to let everyone in the meeting participate as individuals rather than as a group.

2.3.3 Technical Aspects

The technical aspect relevant to highlight for this study is the impact of audio and video in remote meetings.

2.3.3.1 Audio,- versus Video Conferencing

Karis et al. (2016) elaborates around the significance of audio and video connectivity in remote collaboration and to what extent absence of these would effect team performance and meeting quality. It is concluded that dialogues which involves exchanging opinions, i.e. negotiations leading to some kind of decision making stage are more dependent of audio and video feeds than dialogues consisting of simpler problem solving. In the latter case, audio only would be sufficient enough. Although video conferencing's superiority to audio conferencing should not be overshadowed by this statement. Even though some tasks can be successfully achieved only using audio as a communication channel, video streams bring other advantages to the table. Firstly, video is more likely to maintain participants attention. reducing the risk of multitasking (for example, answering email, etc.) One might believe that being able to multitask while participating in a meeting is an effective way to get things done, but Karis et al. (2016) claims the opposite. What this implicates is when a participant is not fully engaged in a meeting, the possibility of providing feedback to the active speaker and the other participants through non-verbal cues is stripped away. Meaning, increased attention often leads to an emotional connection to the subject being discussed, evoking participants to use body movements, gaze and facial expressions to signal comprehension and engagement. This type of non-verbal cues also adds to the flow of the conversation.

2.3.4 Design aspects

The design aspects which are described are number of remote sites and the difficulty of time management.

2.3.4.1 Number of remote sites

With a increased number of remote parties, the user experience of a video conference is argued to deteriorate (Karis et al., 2016). This primarily due to video feeds being scaled and decreased in size as more participants enter the meeting. This constrains the ability to be attentive to facial expressions and body languages. With increasing number of participants on each site it is argued to be hard to keep track of who has been given the word, in addition to difficulty to remember who are sitting in what location (Karis et al., 2016).

2.3.4.2 Time Management

In all meeting it is important to keep track of time, and this is especially important in videoconferencing meetings where participants might have other activities scheduled after the meeting. Thus, it is vital to keep track of time and letting everyone in the meeting understand different time signals. Central in the aspect of time is the agenda, which (as earlier explained) indicates what and when certain topics will be discussed. The agenda could also hold information on whom the presenter is (Barlow et al., 2002).

2.4 Theoretical Frameworks

The theoretical framework applied is the theory of Media Synchronicity, used in the later discussion chapter.

2.4.1 Media Synchronicity Theory

A central theory for media use is the "media richness", a theory implying that the performance of a task will be enhanced when the users needs for communication is complemented with a medium (Daft and Lengel, 1986). However, Dennis and Valacich (1999) has built upon this theory and developed a new approach called the Media Synchronicity Theory (MST). It relates to how different medias could accommodate the need of people who communicate over distances, to perform certain tasks, and there are mainly two communication processes which composes these tasks, *conveyance* and *convergence*. The aim of the first mentioned is to reach a high understanding of shared information, whereas convergence is the shared meaning for others interpretations for the information. Although, the two processes are not mutually exclusive, meaning that all tasks (at some point of time) consists of both conveyance and convergence (Dennis and Valacich, 1999).

Significant to the theory is also that there are five desired media capabilities to support the two communication processes, namely; *Immediacy of Feedback*, *Symbol variety*, *Parallelism*, *Rehearsability* and *Reprocessability*. *Immediacy of feedback* regards how quickly the user are able to give feedback and *symbol variety* concerns the different ways that information can be transferred. The *parallelism* capacity refers to the number parallel conversations the medium allows. Furthermore, *rehearsability* deals with how the media let's the user to refine a message before sending it and lastly, *reprocessability* covers the ability to process the content in the context of the event, after it has been sent (Dennis and Valacich, 1999).

When it comes to the aspect of convergence, there are two capabilities that are desired to be high - rehearsability and feedback. Its also beneficial if parallelism is low since a higher level of parallelism could bring to much information to the meeting

participant's attention, which in turn could affect the shared understanding. Reprocessability would add to the shared understanding but is considered to be more important for conveyance where the need to reflect upon information is more important. Immediacy of feedback is highly desired in order to reach convergence since it doesn't interfere with getting a shared understanding. Rehearsability of information is more important with frequent information sharing (Dennis and Valacich, 1999).

3

Methodology

This chapter consists of two larger sections; methods applied in the MERCO project's preliminary study and the iterative design work. The chapter ends with a description of the ethical considerations which have been taken into account.

3.1 Contextual Inquiry - the Research Strategy

This master thesis project took an overall research approach called *Contextual Design*, which is a costumer centered approach for software based products (Beyer and Holtzblatt, 1998). Contextual design is a term that holds seven different structured approaches to collection and interpretation of information derived from fieldwork, where this study applied the one called *Contextual inquiry* (Beyer and Holtzblatt, 1998).

Contextual Inquiry is based on four main principles: *context*, *partnership*, *interpretation* and *focus*. These principles highlight the importance of gathering information from the users context (Sharp et al., 2011), which we accommodated through applying direct observations. The second principle, partnership, emphasizes the value of collaboration between researchers and users, therefore interviews was conducted with end users. Thirdly, the interpretation principle implicates that the data must be interpreted in order to elicit requirements used for design. Here the qualitative data-analysis method called Content Analysis was employed to interpret, translate, transform the data into functional and non-functional requirements. Lastly, the focus principle states that data gathering should be focused in order to capture data relevant to move towards the set goal. In order to gather such information this research formed an aim in the first phase of the preliminary study.

3.2 Preliminary Study

In order to both answer this study's research question and efficiently bringing the MERCO project forward, a preliminary study was conducted which was divided into two phases with two separate goals:

1. Settling on scope as well as identifying problem domain/ eventual gap.
2. Selection of data collection methods to apply in order to gather data and elicit requirements.

This process is shown in the figure below.

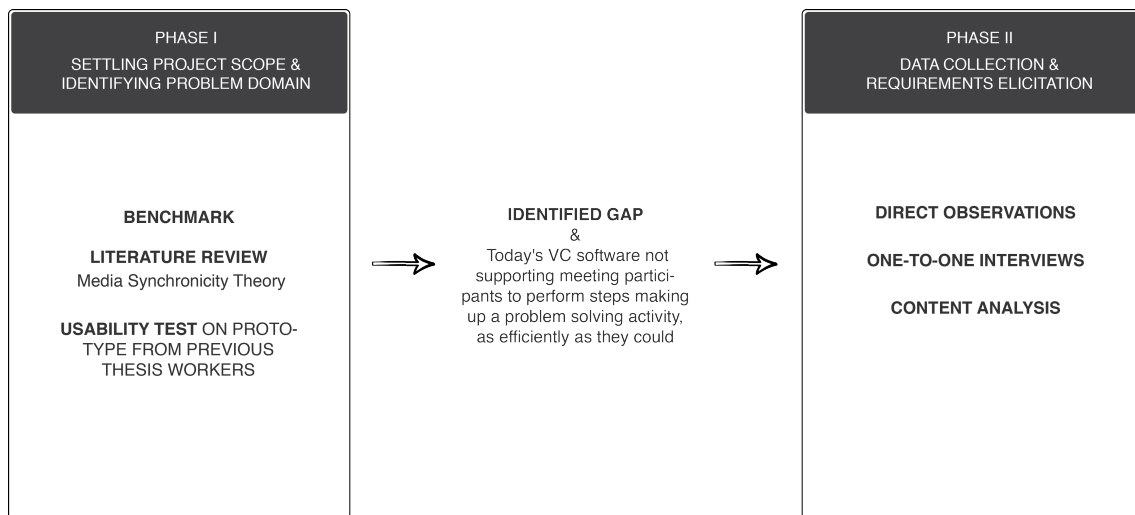


Figure 3.1: Outline of Methods and Theoretical Framework applied in the Preliminary Study

3.2.1 Phase I - Determining Project Scope and Focus

The overall aim of the first phase was to set the scope of the MERCO project. This was done by firstly performing a benchmark, basically to evaluate currently used video conferencing software available on the market today. Together with an extensive literature review a gap was identified, namely; today's video conference software not supporting the activity of problem solving process (or rather the stages that the activity composes) as efficiently as it could. Additionally, as described we are the third set of thesis workers employed to run the MERCO project, which makes it important to highlight that we were given a prototype developed by the previous thesis workers. Although the prototype had not been sufficiently tested with users this became one of the tasks in this phase where the results created a first foundation for the upcoming design work.

3.2.1.1 Benchmark

Benchmark is the process of improving performance by identifying, understanding and adapting to the industry leading practises from other companies. The essence of conducting a benchmark is to find and implement best practise (Kelessidis, 2000). But the aim can vary (Elmuti and Kathawala, 1997), in this study the benchmark was conducted in order to enhance our knowledge of today's videoconferencing systems. Thus the benchmark provided us with insights on what functions and features that works well, which could be improved as well as those being absent from use.

One of the main limitations with benchmarking is that it focuses on the data and do not focus on the process of reaching the data. Therefore the method where used as a guide and not for statistical precision (Elmuti and Kathawala, 1997).

3.2.1.2 User-test of prototype

As described, the first phase included a usability test of the prototype developed by the previous thesis workers in the MERCO project. The primary reason to why this activity felt necessary to perform was due to the previous tests not involved testing of the prototype as a whole, but rather on individual design elements. Thus, in order to determine the starting-point for the later design work this was a necessary activity to plan for.

Important to highlight is that the fruit of the latest thesis work was a prototype, but where only a part of the concept was implemented. Meaning, their concept was built upon the user being given opportunity to choose between three different modes depending on what activity he or she wants to carry out; *conversation mode*, *text mode* and *interactive mode*. Additionally, the first mentioned also holds a so-called *presentation mode*, where the user can collaborate by sharing information. It was also this mode that there was a implemented version of, hence the mode which was possible to plan a user test around. Chapter 4 holds a more detailed description of how this test was practically executed.

3.2.1.3 Literature review

A literature research was performed as an introduction to the subject of remote collaboration where the the aim was to find a research gap which would help to form the scope of the MERCO-project.

Literature research is a method used to critically discuss the current state-of-the-art literature and how the various work relates to each other (Blessing et al., 2009; Hegde et al., 2015). Hegde et al. (2015) also describes that if the study is an extension of previous studies this should clearly be brought out. The literature review worked as a framework to place this study on the scientific map. We utilized several online databases when conducting the review; ACM, Chalmers library and Google scholar.

As mentioned the review was initiated in the first phase of the preliminary study in order set the base of project. Although, since the MERCO project as well as this study were iterated along the way, the literature review was not completed by the end of the preliminary study but was rather conducted until the very end of the project.

3.2.2 Phase II - Data Collection and Requirements Elicitation

What we brought with us while entering the preliminary study's second phase was the focus of targeting the scene of problem solving in a remote meeting setting. Hence, to address this gap in a efficient manner direct observation and one-to-one interviews where chosen. The first mentioned where meant to generate hands-on insights and experience of remote meetings, and the interviews focused more on the users prior experience dealing with situations covering the different stages of problem solving. This to potentially capture data which can not be gathered by the observations alone.

3.2.2.1 Observation

There are three main observation based methods used for collecting qualitative data; participatory observation (Kawulich, 2005), self-observation and direct observation (Trochim and Donnelly, 2001). The first-mentioned differentiates from the other two in the way that the researcher himself taking part of the activities being studied, striving to become a part of the target group and belonging culture/ or context. If this method where to be applied it would require actually taking part in the meetings, working side-by-side with different teams and embracing organizational cultures. This would not have been possible in regards to the set time frame for this study. Secondly, making use of the self-observation method would entail that meeting participants themselves, through for example diaries and photo journals, expresses their experiences, opinions and thoughts of meetings and interactions with the software. Even though such detailed information would be beneficial for this study, it would at the same time prohibit the possibility of gathering data about for example compensating behaviors and interaction patterns (both in-group and between remote sites). Consequently, direct observation was the observation type which was selected, a method aimed to observe the activities which takes places before our eyes (Trochim and Donnelly, 2001).

Independent of type, all observation based data collection methods can have different degrees of structure; unstructured, semi-structured and structured. Neither an unstructured, nor structured observation would allow for the research question to answered in an adequate manner. More specifically, an unstructured observation would implicate that one would have to try to grasp what is happening by an attempt to monitor all aspects of the remote meetings that seem essential. This would

not be necessary since the focus and problem area already has been determined. A totally structured observation (also known as systematic observation (Denscombe, 2010)) would be executed in a well-defined and procedural manner, but on the other hand also limited the aspects to observe. This level of structure would be more appropriate for observations aiming to collect quantitative data which is not sufficient enough for the MERCO project's or this study's purpose. Therefore, the choice of structure level was semi-structured.

In addition to the motivation why not any of the other two structures were appropriate, a semi-structured observation makes use of a pre-determined structure but still allows for new issues to emerge during the ongoing observation. This we made use of by utilizing a framework, created by Lantz (2001) and Olson et al. (1997), which had been used in observational practices before. The framework consisted of a table including important variables one should consider when conducting observations in the field of remote meetings; *group size, type of meeting, communication, type(s) of technology, usage of functionality, group characteristics* and *measurements of group processes*. Highlighted should be that this framework was merged with a second framework constructed by (Blessing and Chakrabarti, 2009), where one of the reasons being to simplify the later analysis of data.

Nevertheless, when planning the observations there were two difficulties in particular that were reflected around; (1) the challenge of sustaining an objective point of view, or at least being able to differentiate between objective and subjective observations, and (2) creating an awareness of the so called "observer effect" (Denscombe, 2010) and the best way to inhibit it to arise. Both of these aspects are further discussed in *4.1.3 Direct Observations*.

3.2.2.2 Interviews

As mentioned, the motivation for applying interviews was mainly because they would complement the insights from the observations, by gathering in-depth and detailed data (Denscombe, 2010). Hence, it was the interviewees opinions, experience and feelings towards situations involving problem solving activities within remote meetings that were the focus of this part of the project.

Moreover, there are different ways to conduct interviews including focus groups, group interviews, one-on-one interviews and interviews conducted through the web (Denscombe, 2010). The approach which we found to suit both the MERCO project and this study the best, was one-to-one interviews. In addition, when planning for these sessions there were two aspects in particular which we believed were ought to be thoughtfully planned, namely; interview structure and its set-up (set-up is explained in *section 4.1.4*).

Regarding the first mentioned aspect we chose between the three structures; structured, semi-structured or unstructured interview questions (Denscombe, 2010). The structure determines the space and conditions under which the interviewees develop

their own thoughts and ideas (Denscombe, 2010). Nevertheless, neither structured nor unstructured questions exclusively were considered as optimal for this study since the information sought to be exhaustive and detailed, yet controlled so that no redundant information were included. Our interview structure was thus a semi-structured one, entailing that the interviews would consist of a number of fixed questions, allowing the interviewees to steer the conversation but still ensuring that we covered the same subject matter in all interview sessions (Denscombe, 2010). Highlighted should be that we also allowed follow-up questions. Additionally, the questions were targeted to obtain as broad a spectrum of a problem solving activity as possible, capturing the interviewees experiences and feelings towards the four defined stages in a problem solving such activity; *Defining the problem*, *Generating alternatives*, *Evaluating and Selecting alternatives* and *Implementing solutions* (Kaiser, 2001). To further ensure that the interview generated comprehensive answers, we avoided design jargon, expressing the questions instead as they would be used by the target group.

3.2.2.3 Content Analysis - Qualitative Data Analysis

Content analysis was selected as the data analysis method due to it being suitable for analysing content of recorded communication (Denscombe, 2010). The application of the method allowed us to pick out sentences that were relevant, encode them (through open coding) to finally identify bigger themes and sub-categories. This brought an understanding of the meeting participants reasoning and thoughts. (Denscombe, 2010).

The weakness of the method is that the formation of themes and categories are somewhat based on interpretation of the raw data, meaning that much responsibility was on us to remain objective and dispassionate in the analysis. More specifically, when quotes were extracted from the transcriptions we were aware of the risk that subjective conclusions could be drawn, not reflecting the quotes implications in a truthful manner (as they were found in the context) (Denscombe, 2010).

3.3 Design work

The section details the methods applied for the MERCO-project's design and test activities.

3.3.1 Low-fidelity Paper Prototypes

A low-fidelity prototype is often constructed to illustrate concepts, show alternative designs and screen layout. This type of prototyping can be used in different phases of the design and is developed to validate the overall look and doesn't focus on details of the application (Rudd et al., 1996) .

Several low-fidelity prototypes were developed in order to communicate the design to the project team, as well used as material in usability tests. Advantages were that the prototypes could be rapidly created and smoothly solved much of the interface problems. The prototypes were used in two usability tests and were later used as input for the high-fidelity prototype.

3.3.2 High-fidelity Prototype

A high-fidelity prototype has a different focus from low-fidelity where layout and functionality often is in focus. In a high-fidelity prototype the focus is on navigation and flow in the design. This type of prototype is interactive and lets the user perform different actions as if it would to be the final design. Therefore this type of prototype is good for testing final stages in a design (Rudd et al., 1996). The advantages of using are they providing a better ground for evaluation with the users, in addition to the feedback being easily be incorporated into the design (Rudd et al., 1996).

3.3.3 Usability Tests

A usability test can be conducted in several different ways and each with different objectives. Although, from an overall perspective it gives value to the product by gathering data covering users thoughts on design, and can uncover design issues early on as well as throughout the whole design process (Rubin and Chisnell, 2008). Moreover, there are mainly three goals with this kind of test, the first one being *informing design* where aspects of usability are gathered. Secondly, its an efficient way to *eliminate design problems and frustrations*, where the value is to meet the users expectations of the product. Lastly, *improve probability*, meaning if the product is easy to use and meets the users expectations its likely to increase sells as well as minimize less service later on (Rubin and Chisnell, 2008).

Usability test can be conducted in three different ways - *exploratory/formative*, *assessment/summative* or *validation/verification*. In addition a comparative test could be performed in conjunction with any of the other three types (Rubin and Chisnell, 2008). A *exploratory/formative* test is preferred to use early in the process and lets users interact with a low-fidelity prototype. The focus lies upon layout, structuring of different functions and high level operations. The goal is more or less to test the effectiveness of the first design notions. The *assessment/ or summative* test can, similar to the exploratory test, be executed early in the development process

but it is as common to apply it half-way through. The intent is primarily to assess the usability of lower-level activities and elaborate on the outcome derived from an (eventual) first exploratory usability test. Thirdly, *the validation/verification test* is quite straight forward in its purpose, where the aim is to measure and confirm that prior usability issues have been solved, as well as assuring that no new ones have come into existence. In comparison to the two former types this one is usually applied late in the product life-cycle (Rubin and Chisnell, 2008). Moreover, this study applied two usability test in different stages of the design process, the first ones being an exploratory/comparative test followed by a exploratory/formative test.

However, even though the advantages are many there are limitations which should be kept in mind. Firstly, if performing a test in an artificial setting (as for example a lab) it most probably will differ from the actual situation of use, and could therefore affect the outcome. Another factor is, mainly depending on type and number of people participating in the test, there is no guarantee that they truthfully could represent the whole target population (Rubin and Chisnell, 2008).

3.3.4 Heuristic Evaluation

This method is usually used when the goal is to, in a quick manner, evaluate a user interface. Needed are mockups/ or screen shots, a group of evaluators whom assess the design and judge's the accordancy to the so called "heuristics", i.e. usability principles. If conducted with great detail the process usually consists of five steps: *planning, choosing evaluators, briefing them on the ten heuristics, conducting the evaluation and analyzing results* (Danino, 2001).

Regarding the planning aspect there are three main approaches to choose amongst. The first one being similar to how a common usability test is performed, namely creating tasks which the evaluators attempts to fulfill. The second approach is doing the reversed, that is allowing the evaluators to develop their own tasks based on the system goal(s). The third and last approach was the one applied in this study's two evaluation sessions. It differs slightly from the former two through letting the evaluators assess the efficiency of the design elements that conduces a dialogue with the user. Moreover, when it comes to choice of evaluators there are two options, involving those with or without experience in the field which the system would be utilized. The main difference is that the former could lead to revealing 81-90 percent of existing usability problems, versus the latter who usually only reveals 22-29 percent (Danino, 2001). Thus, since the opportunity of engaging evaluators with experience was available it was utilized in this study's two evaluation sessions. The 10 heuristics that the evaluators used as a foundation for assessment were as follows;

Visibility of System Status, Match Between the System and the Real World, User Control and Freedom, Consistency and Standards, Error Prevention, Recognition Rather than Recall, Flexibility and Ease of Use, Aesthetic and Minimalist Design,

Help Users Recognise, Diagnose, and Recover from Errors and *Help and Documentation* (Danino, 2001).

How the evaluations were conducted and what the analysis resulted in are narrowly described in the upcoming chapter, 4. *Execution*.

3.3.5 Ethical Aspects

When applying direct observations and one-to-on interviews we accounted for a few ethical considerations. As a first it was highly important to ensure that there were trust from the participants side, and not to suspect any type of misuse of data. Thus the intentions and the ways the data would be used were presented in addition to ensuring confidentiality and anonymity. Therefore, both NDA and CoBE papers were signed.

Highlighted should also be that one of the design elements (in the final design solution) involves activation of a recording function. More specifically one person on each remote sight gets the opportunity to enable the recording, which can be activated without everyone having to give their consent. This ethical issue was not solved, although mitigated through providing information of which site that had enabled the function (this is further developed on in the next chapter).

4

Execution

4.1 Preliminary Study

This section details how the methods composed by the preliminary study were executed.

4.1.1 Benchmark

There are in general four different types of benchmarking processes, one of them taking a competitive approach and also the one applied in MERCO-project. The main characteristic is that company products, services or work process's are compared to each other, this by following a five sequential step process. (Elmuti and Kathawala, 1997). How the benchmark was moulded according to these steps is described below:

1. Identifying the intent of the benchmark to see if the outcome would be beneficial for the concerned organization(s) (Elmuti and Kathawala, 1997). *To determine the project's focus, further knowledge regarding today's leading videoconferencing tools was needed. Ten different VC softwares were analysed, namely; Sococo, Sqwiggle, GoToMeeting, BlueJeans, JoinMe, Videxio, WebEx, Vidyio, Zoom and Skype for Business (Lync).*
2. Forming the team that would perform the benchmark, and it is beneficial if the members derives from various disciplines (Elmuti and Kathawala, 1997). *The benchmark was therefore conducted by all six team members involved in the MERCO-project, all coming from different backgrounds; interaction design, communication, development and telecommunication engineering. This enabled capturing a broader span of data, i.e. covering different angles of the analysed VC systems.*

4. Execution

3. The third step is data gathering (Elmuti and Kathawala, 1997). *Since the MERCO-project was an ongoing research project the benchmark was performed with the previous findings in mind. The most salient traits found were categorized into different themes; Presence, Processability, Informality, Hierarchy, Collaboration, Turn taking, Mapping to reality, User group, Chat, Layout and Additional Features. A short review of what type of findings each theme contained is presented below.*



Figure 4.1: Benchmark

Presence: different solutions of projecting presence was identified e.g utilizing face detection technology, where a black-and-white filter was added when a meeting participant was not captured within the camera view. *Processability*: how users could process and prepare information before and during meetings. An example is enabling testing audio functions before joining the meeting. *Informality*: different ways of enhancing informality was identified, one of the examples being a “virtual lobby” where participants could interact before entering the meeting. *Hierarchy*: different ways of showcasing different levels of moderation, e.g. being able to grant requests to speak. *Collaboration*: different technical solutions of collaborating remotely, mostly focusing on creative tasks such as digital whiteboards. *Turn taking*: solutions of facilitating turn-taking activities, such as highlighting who the active speaker is by enlarging the video feed. *Mapping to reality*: The most interesting finding was a call being promoted to be as easy as "a tap on the shoulder". This was translated into a call being initiated by a single click. *User group*: Mapped which user group (if clearly identified) typically turned to which type of software. *Chat*: Different

ways of sending a private and public chat message. One solution was to use the @-sign when initiating a chat stream. *Layout*: different types of layouts, included both positioning of specific functions and the interface as a whole. One system enabled users to re-position the video streams. Lastly, *Additional Features*: a collection of features which we couldn't find a suitable theme for.

4. After gathering data the analysis process starts (Elmuti and Kathawala, 1997). *The result showed that launched VC software lacks function and features facilitating, that enhances activities such as idea generation (including creative collaboration) and decision making.*
5. The final step in the process is the planning of how to reach the desired outcome, i.e. how the research, design and implementation process are conducted (Elmuti and Kathawala, 1997). *The result from the benchmark, literature review and the first usability test formed the focus of the MERCO-project, namely: today's VC software not facilitating the stages of a typical problem solving activity as much as it could. Thus, the observations and interviews were planned and structured to capture data in order to solve this issue.*

4.1.2 A first Usability Test

Type of test

The first usability test was structured in the form of a validation test. This type of test is often preformed in the later stages in a design process (Rubin and Chisnell, 2008). However, in order to move the MERCO-project forward and set the baseline for the later design work, the prototype developed by the previous two thesis students ought to be tested early in the process.

Choice of Participants and Testing Setup/ Environment

The test was divided into two sessions where two people participated in each session, all possessing knowledge of interface usability. The reason behind the choice of participants was due to the importance of revealing how the different functions and features was understood, but also to observe how they would be used. Thus, the focus lied upon the overall impression and understanding of the elements of the prototype.

The test was performed in the offices at Semcon and was structured as following; in each session the participants were divided into two groups and positioned in separate meeting rooms. This so they wouldn't be able to either hear or see each other. Each group were provided with one computer, and due to the prototype being a web-based solution they were given the same meeting link to visit. They were then asked to explore the interface and to "Think Aloud" in order for us to gather as much information as possible. After followed a digital questionnaire and a few post-interview questions which the participants where asked to answer. The sessions lasted for approximately one hour.

Assigned Roles

Two team members of the MERCO-project took part in each test session, one taking the role as an observer (focusing primarily on non-verbal cues such as facial expressions), whereas the other took the role as the interviewer.

4.1.3 Direct Observations

The two following sections describes how the observation and interviews were conducted, each section divided covering the aspects; *choice of participants and context*, and *assigned roles*.

Choice of Participants and Context

In total we observed four remote meetings, all which where performed between Ericsson employees distributed amongst different domestic and international offices. The meetings were held both between project teams as well as between people on a higher manager level. The meetings lasted between one and two hours. For each observation we made sure to be around 10-15 minutes early in order to meet with the host (which in most cases took the role as the meeting facilitator). A second reason for arriving earlier was to ensure that we got to observe the time period before the meeting was initiated (looking at technical setup, any eventual late-arrives, conversation topics and so on). When the meeting had started we introduced both ourselves and the purpose of the observation, hence the scope of the project. *Assigned roles*

In total we were three people from the MERCO project who attended and observed these meetings. Furthermore, in *section 3.2.2.1 Observation* it was mentioned that in the planning process we reflected around two well-known difficulties one could encounter when conducting observations, namely; maintaining an objective viewpoint and how to manage a situation if the the so called "observer effect" would come into play.

Regarding the first point, since the process of an observation generally don't include any direct contact with the the people being observed, the basis for the collected data is mainly based upon personal assumptions and interpretations. Although, since it is almost unfeasible to produce a totally objective outcome, a framework created by (Blessing and Chakrabarti, 2009) was used to document the events and at least be able to distinguish between subjective (reflective) and objective (observational) observations. Note that we merged this framework with the one created by Lantz (2001) and Olson et al. (1997).

The second challenge discussed was the risk of the "observer effect" occurring. The effect is an explicit proof of the difficulty of blending into the observed context without having an negative affect on the people being observed, such as them altering their behavior (Denscombe, 2010). One way to elude this from arising could be to apply unobtrusive measures, that is, ensuring that the meetings participants would

not feel our presence. Although, since this was not possible we tried to position ourselves at the very back of the meeting room, trying to affect the meeting as little as possible.

4.1.4 One-to-One Interviews

The interviews were intended to provide deeper insights of meeting participants experience regarding situations comprising one or several steps which can be found in a problem solving process (*defined in section 3.2.2.2*). Subsequently, an interview template was developed which was structured according to these four steps.

Choice of Participants and Context

In total five interview sessions were carried out, all within the offices located within Ericsson and Semcon spaces. The interviewees were therefore employees which also took part in the meetings which were observed. The reason for choosing their workplace was an attempt to conduct the interviews in an environment being as most convenient and unimposing for the interviewees as possible. The length of each interview varied between 40 minutes up to one hour.

Furthermore, one of the advantages of interviewing one person at a time is that it promotes flexibility in terms of settling on time and location (Denscombe, 2010). This became explicitly apparent at this stage since it was the interviewees that got to decide on when and where to perform the interviews. This because we didn't want to create any disturbance to their daily working schedule. It also ensured more time efficient transcribing work. Although, one disadvantage was that it limited the number of interviews which we were able to conduct (Denscombe, 2010).

Assigned roles

As in the observations, we were three people managing the interviews, everyone taking on different roles. More specifically, for each interview one person was assigned as the moderator, responsible to lead the interview which included tasks such as posing questions and preventing unnecessary deviations in the discussions to occur. Another important aspect that was discussed on beforehand was the degree of influence which the interview technique could have on interview results. Thus we prioritized two things; creating as natural situation as possible and to make use of a manuscript. The main reason for utilising a manuscript was to ensure that each interview was performed in the same manner, also enhancing the data's validity (Denscombe, 2010). This became especially important since we took turns taking on the role as the moderator. We also tried to avoid to ask leading or biased questions, opting for questions that would make the interviewees expand on their experiences, rather than expressing an opinion. Finally, in order for the interviewees to get comfortable with the situation we structured the questions so that the interview began with more general and factual questions, gradually moving towards more specific and personal ones.

The remaining two acted as observers, looking at aspects such as increased intensity of non-verbal cues in relation to discussed topics and similar. These observations were documented in the form of simple note-taking. In addition the audio were recorded, a responsibility which the observers also governed over. Worth pointing out is that the recordings were transcribed and used as material for the later content analysis. This aimed to prevent bias and subjective interpretations of the data, hence ensuring a high validity outcome (Denscombe, 2010). The analysis procedure is described and presented in section 5.1.1 *Content Analysis Process*.

4.2 The Iterative Design Work

The section will detail how the design work was structured and executed. The following sub-sections have been moulded after the design iterations made in the MERCO project (note that one iteration could span over one or several sprints). Nevertheless, the focal point of all iterations mainly lies on conducted usability tests and heuristic evaluations, i.e. how and if the feedback generated any change in the design. Important to highlight is that the three flows (1. *Easy to Initiate a call*, 2. *Simple to Send and Receive Information* and 3. *Turn-Taking Should be easy and flexible*), identified through the requirements list has been the basis for the design work. Thus, every function which was commented on during the test,- and evaluations was sorted into one of the three flows based on which of the three it correlated with the most. In addition, they should also be viewed as a milestone in the process of answering this study's research question. The identification process and motivation behind these flows are described in chapter 5.1.3.1 *Interpretation, Translation and Transformation*.

Furthermore, in order to ensure a solid understanding for the following sections a summary of the project's scope and the interfaces it comprises are presented;

- The system primarily targets meetings with a rather high formality level where some moderation is required, i.e. not consisting of so much collateral activities requiring a great deal of collaboration.
- The system constitutes of three interfaces; a *lobby*, a *command page* (where all human-computer interactions occur during the meeting) and an interface *displaying all video feeds* (one per remote site). The first two are accessed through a desktop whereas the latter is depicted on an external monitor. Moreover, the lobby is thought to be used by the person who calls for/hosts the meeting and is therefore used before the meeting has been initiated. The second mentioned is the interface which is used by the meeting participants during an ongoing meeting and differs slightly (when it comes to available functions), depending on if you are the person connected to the camera and therefore hosting the video feed, or not.

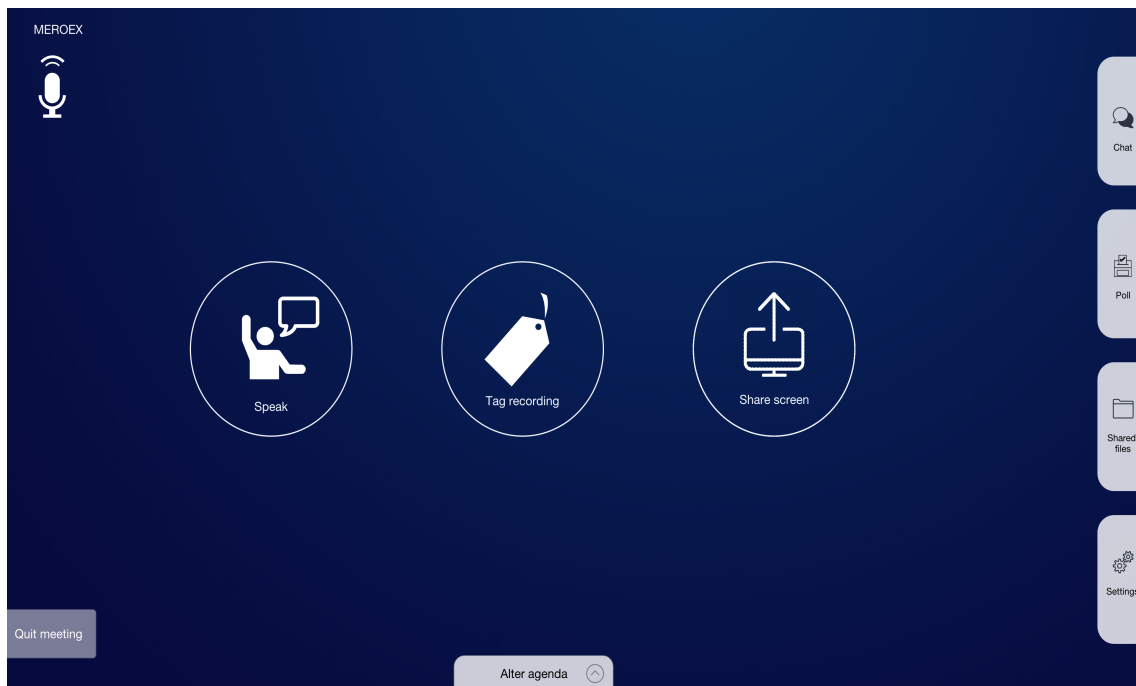


Figure 4.2: Command Page Interface - for Person Hosting the Video Feed

- It is a web-based solution designed to be used in a studio-based environment, such as a meeting room. See figure 4.3 below. In addition, a maximum of six remote sites could be connected simultaneously.

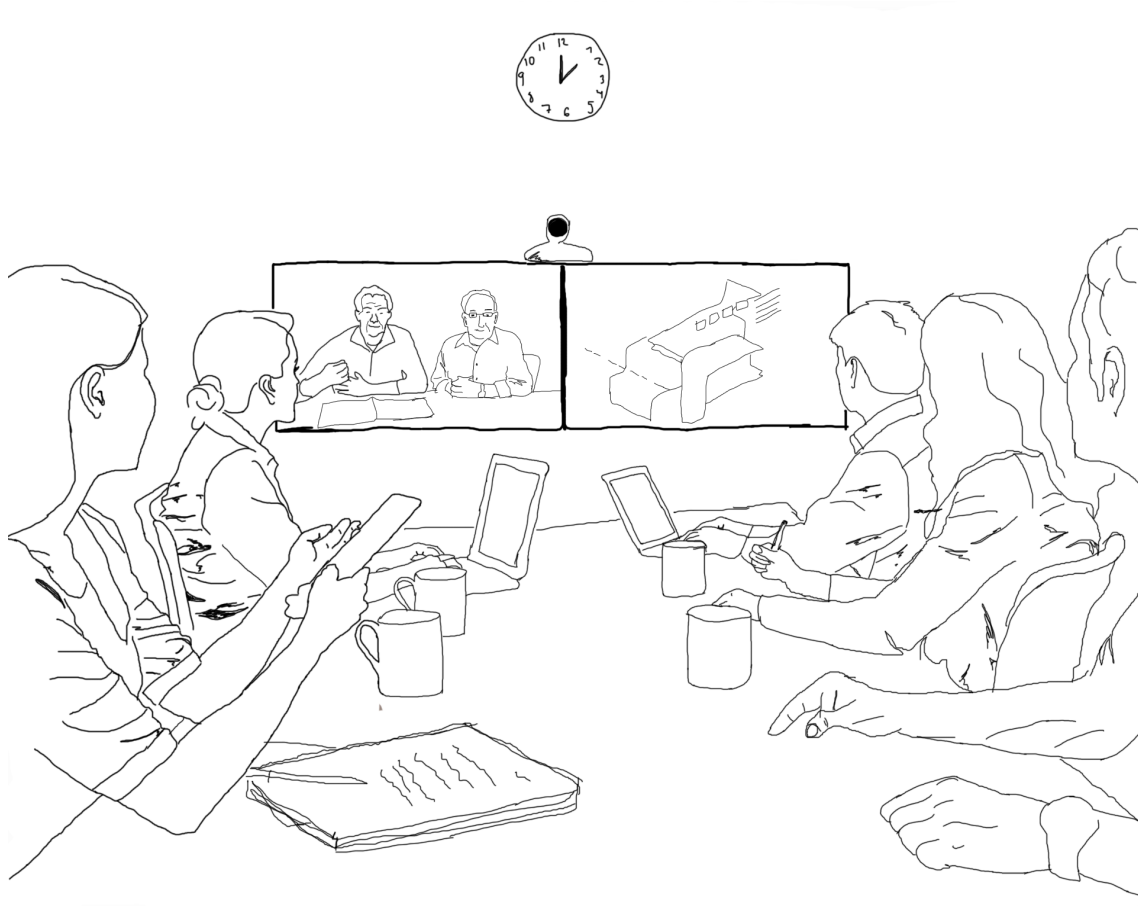


Figure 4.3: User Context and Technical Setup

4.2.1 Iteration 1: A Very First Framework

Time-wise, the first iteration spanned over the very first week of the MERCO-project. As explained in the introduction chapter the design work was performed in parallel with the work on frontend and backend so the project could proceed in a time efficient manner. Therefore, a very first framework (of the whole system) made up by simple digital wireframes was designed and delivered to implementation already in the first week. The mockup was worked on and iterated within the members in the group, meaning that no formal usability test was conducted.

4.2.2 Iteration 2: One Function at a Time

By the start of the second iteration the plan was to design, test and iterate one function at a time until the whole system would be complete. First up was the function, which at that time was referred to as *Engage*. The function emerged from

the requirements conveying meeting participants need of wanting to indicate when wanting to add content to an ongoing discussion by raising concern and/or questions. In addition there was also a desire to be able to indicate "emergency status" of the topics they want to raise. Based on this two paper prototypes were built and used in a usability test.



Figure 4.4: Paper Prototype in process - Engage Function

4.2.2.1 Usability Test I

Here type of test, choice of participants and testing environment, assigned roles in addition to results derived from usability test I will be described.

Type of Test

The usability test was of the exploratory and comparative type (Rubin and Chisnell, 2008). Two different versions of the Engage function (including the list displaying all requests to speak) were produced and compared to see which one that were of more substantial weight, according to representatives of the target population. Conclusively, the overall aim was to investigate if the design communicated the proposed workflow and how well the interface supported the participants endeavour to complete given tasks (Rubin and Chisnell, 2008).

Choice of Participants and Testing Setup/ Environment

Two test sessions was conducted with two participants in each session. The prerequisite for the selection of participants was that they had to have experience of formal meetings.

The environment which both tests were conducted in was the participants own residence. This mainly due to it being the easiest way to adjust to their daily schedules. The setup was as follows; the participants were positioned at a table, opposite to each other, where a wooden board separated and prevented them to see how the other one interacted with the paper interface. The test was initiated by a presentation of aim, purpose and structure, and a scenario was read out loud to make it easier for the participants to recognise the context and get into character. Thereafter, they were progressively presented with representative tasks which they were asked to preform. The audio was recorded to put less pressure on note-taking, hence strengthening the validity of the later design modification by eliminating faulty perceptions of what was said. The test sessions ended by a short interview to get deeper insights of what had been observed.

Assigned Roles

Two of the team members from the project took part in the test. The process was of the informal kind, i.e. the moderator encouraging the participants to think-aloud but also free to pose questions if uncertainties should arise. Such informality level is a known characteristic in regards to exploratory tests (Rubin and Chisnell, 2008). In addition to the moderating role, both had to act "computer" - simulating the interactions between participant and system.

4.2.2.2 Outcome from Usability Test I

The Engage function was settled to primarily relate to the third flow since it's purpose was to facilitate turn-taking between meeting participants. Further details regarding feedback and outcome is described below.

Flow 3: Turn-Taking should be easy and flexible - Command Page and Video Feed Screen

- *Engage Function and List for Request to Speak*

At this point of time the function was displayed solely by an icon and referred to as "Engage" which one of the participants reacted on, "*P1: Engage, what does that mean?*". This lead to a change in the functions name, and was therefore switched to "*Speak*".

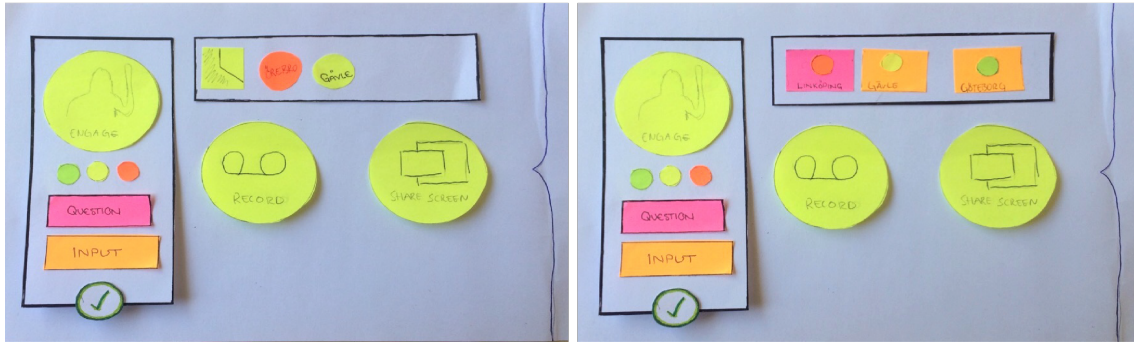


Figure 4.5: Comparison of the List for Request-to-Speak feature

As seen in the figure above the participants were provided with the opportunity to not only request the role as the active speaker, but also adding emergency status (by color) and determine the type of input. The latter was early on discarded and the discussions mainly revolved around whether the status feature would be beneficial to have or not. One of the comments that derived was as following;

"P2: But then there's the problem that all will find their question and/or input as the most important? so the question might be if "status" can cause problems too ..?"

The main outcome of the test was the decision to exclude the features allowing users to determine input type and emergency status.

4.2.3 Iteration 3: A Change of Strategy

After processing the activities performed in the previous iteration, arriving at the next and third iteration we decided to change our design strategy. That is, instead of designing and testing one function at a time, we chose to take on a more holistic approach, i.e. working iteratively with design and test of the *whole system*. Thereafter a new paper prototype was created which was used in a second usability test. The derived feedback was interpreted and translated into design changes, and incorporated in a first high-fidelity interactive mockup (used in iteration 4).

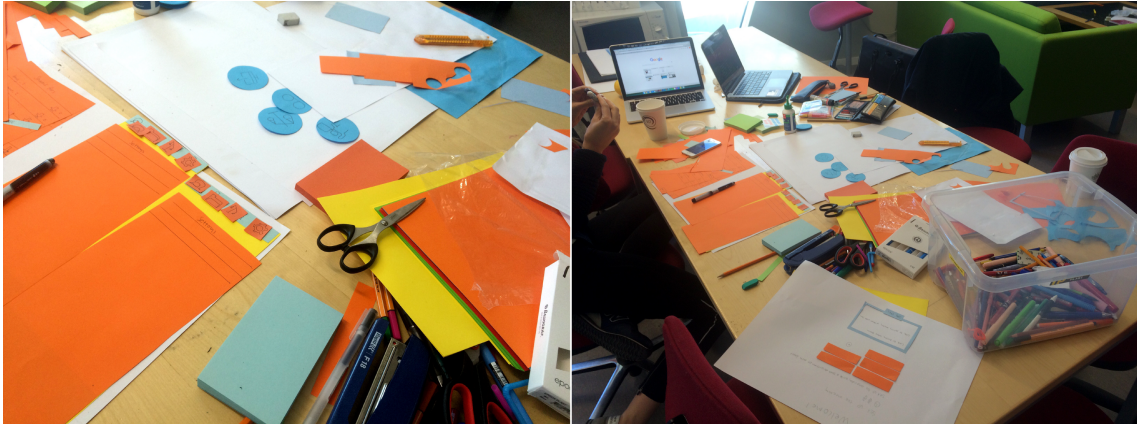


Figure 4.6: Paper Prototype for Usability Test II in the Making

4.2.3.1 Usability Test II

Type of Test

The test was structured with the characteristics of a typical exploratory/formative type. The primary reason for this choice was that it suited the goal of the usability test, i.e. improving layout, structuring of functions and high level operations (Rubin and Chisnell, 2008).

Choice of Participants and Testing Setup/ Environment

One can employ different types of test environments to structure a usability test. For these two test sessions the so called "Simple Single-Room Setup" (Rubin and Chisnell, 2008). All participants (test participants, moderator and observer) were placed around a large table, the number one reason being that both the moderator and the observer needed to act "computer" enabling that participants to interact with the prototype. The setup is depicted in the figure below.



Figure 4.7: Test Setup for Usability Test II

Both sessions were performed at Chalmers University of Technology for the simple reason that it was accessible to all test participants. Furthermore, due to the recommended number of participants to involve in order to detect the most serious usability problems being between four to five participants (Rubin and Chisnell, 2008), this was something we tried to achieve. In the end we gathered a total of 2-5 people for each test. The type of participants we requested, were people who had experience of formal meetings, but since the focus was to expose design issues it was of greater importance that they had experience of working with interface usability.

Assigned Roles

As just mentioned our primary role were to act "computer" in order to simulate the interactions between participant and system. Additionally, one of us also took the role as the moderator being responsible for clarifying the aim as well as reading the introductory scenario and presenting the tasks which the participants were asked to accomplish.

4.2.3.2 Outcome from Usability Test II

What follows is the result from the second usability test in addition to descriptions of how the feedback were considered and translated into new design outcomes.

Flow 1: Easy to initiate a call - Lobby

- *Timer (input)*

In the lobby the host is given the opportunity to provide the system with input data generating a countdown timer, which is displayed on the monitor holding the video feeds. At this stage in the design process, the provided input option was solely to enter the total meeting duration, i.e. as in hours and minutes. Feedback regarding this emerged in both of the test sessions, emphasizing the need for being able to add a start time when settling on meeting duration. As seen below, figure 4.8 depicts the outcome of the derived feedback.



Figure 4.8: Inserting Time Values: Tested function and Design Outcome

- *Generating meeting links*

Since the system is a web-based solution, participants enter the mediated environment through a link found as an attachment in the email inviting them to the meeting. The host gets access to the link in the lobby, although noted should be that there are two links which the host includes in the meeting invitation; one for each person who is responsible for connecting to the camera, i.e. hosting that remote site's video stream, and a second link used by remaining meeting participants.

As can be seen in figure 4.9, this feature was displayed by an empty rectangular box, not containing any URL. This brought some confusion where one of the participants (during the second usability test) expressed; "*P3: It may require a bit more explanation on what the links are*". This lead to a change in where an example-link where placed within one of the rectangular containers, attempting to enhance its meaning and purpose.

A second feature which was modified was the "copy links" button. It early on became apparent that the button lacked affordances of a button, a claim supported by one of the test participants expressing that he perceived it as a information-box rather than a button.

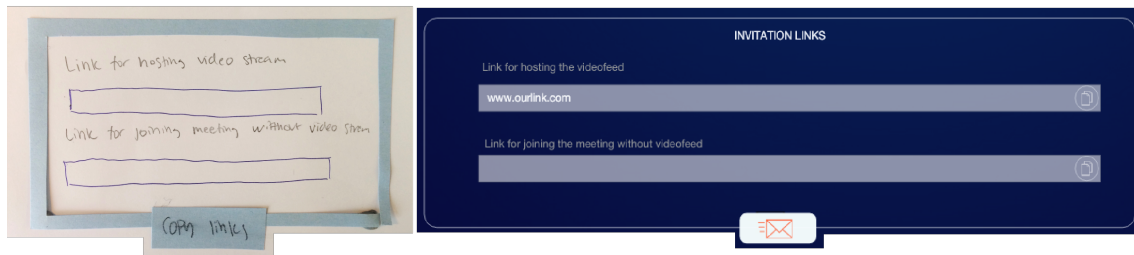


Figure 4.9: Meeting links and Sending Out Invitations: Tested function and Design Outcome

- *Sending out invitation*

After reviewing the transcribed recording of both usability tests, we very soon realized a quite urgent design mistake - there was no button to use for sending meeting invitations. This was something that all participants, during both test sessions, wondered about. One of the participants expressed the following,

"P1: so I will just copy by pressing this button and then pasting it into an email maybe? Sending it by mail or using a chat function .. ?"

Subsequently, the rectangular frame surrounding the text "copy links" (at that time representing a button) was exchanged for a button designed to indicate integration to mail client. In addition, the copy command instead became displayed as an icon, placed in the right corner in each of the containers encapsulating the links. Even these changes are visible in figure 4.9 above.

Flow 2: Simple to Send and Receive Information - Command Page

- *User Name Generation (pop-up)*

When the meeting participants enters the meeting they are greeting by a pop-up where they are encouraged to enter information as their personal name and choose/or generate a group name (depending on if you are the person hosting your site's video feed or not). The motivation for filling in your personal name is mainly to be able to utilize different functions such as poll and private messaging. The so called "group name" is generated by the person connected to the camera and can thereby be chosen of everyone else. The purpose of this ID is to be able to offer additional information of your site for every other remote sites to see i.e. the group name is displayed as a text-string in the lower-left corner on the video feed. See figure 4.18 for clarification.

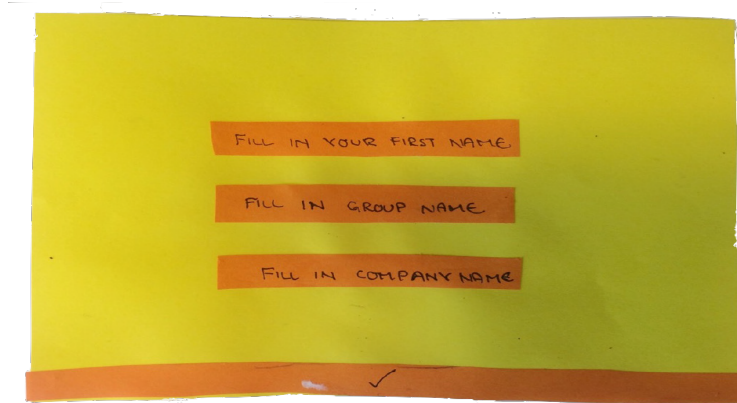


Figure 4.10: User-Name Generation: Tested function

Although at the time of the usability tests this "user-name-generation-step" was not detailed enough, leading to some of the participants having some difficulties guessing what it actually was meant for. Thereof, one of the design alteration was adding a description of the purpose and also exemplifying what a group-name could be (examples; company, department or location). See design outcome in figure 4.11 below - the right pop-up is the one presented to the person connected to the camera and the left is shown for everyone else)

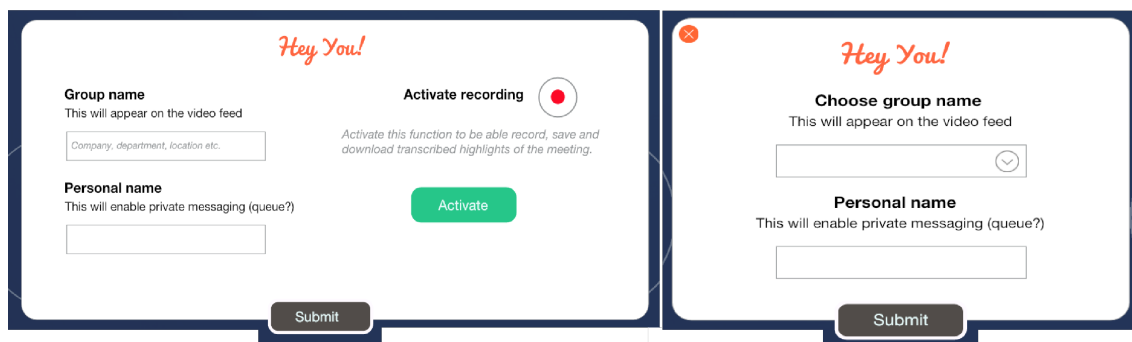


Figure 4.11: User-Name Generation: Design Outcome

One other suggestion was that the system should store this data, that the users entered so they wouldn't have to redo the same process for each meeting. At that particular time this wish could not be accommodated, due to the information being deleted as soon as the user closes the browser.

- *Recording*

The tested recording function looked as figure 4.12 shows. Moreover, similar to the other two most prominent functions, the button was displayed by an icon only which two of the participants (in the first session) commented on; "P1: I

did not understand what the icon was trying to portray?", P4: "I didn't even know what it was?". This transformed into a design alteration of changing the icon for another but also adding a description of the function (as a complement to the icon).

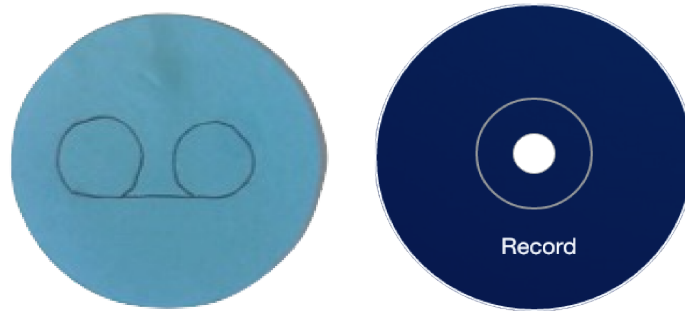


Figure 4.12: Record: Tested function and Design Outcome

When expanded, the users were given three choices; start-and-stop record (the two rectangular-shaped buttons) and two pre-sets where the user could choose to either fetch the last three, or five minutes of the recorded conversations. Feedback on the first-mentioned recording options was given, *P2: "it looks like two tabs, like that there is a type of hierarchy"*. Because of the rectangular shape the start and stop buttons were perceived as having a greater hierarchy, and also being of greater importance compared to the other two options. To diminish this perception, the buttons were given a circular shape. Another design addition was providing the user with a text field to change/ edit the name of the recording.

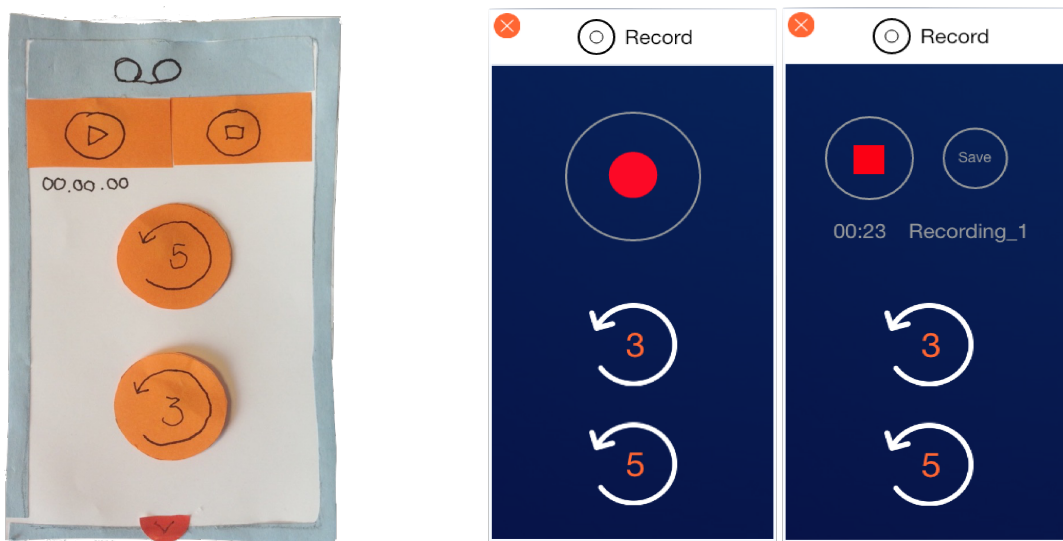


Figure 4.13: Record (expanded): Tested function and Design Outcome

Furthermore, at the time when the user tests were conducted the recordings could both be saved as both private and/or public files. Figure 4.14 depicts where the private files would be found (in a container located below the expanded recording function), whereas the public files would be listed in space called "shared files" hidden in the slider located on the interface's right-hand side. The public file were available for where every person present at the meeting to review and locally download. The response of having both private and public files caused confusion and the participants did not see the purpose of not just having public files. Hence, recordings were made public and shown in the "shared files section". In addition we modified the detail level of the displayed information of the recording, i.e. only showing total recording time.

- *Slider (right-hand side)*

The slider located on the interface's right-hand side held the following function and features: chat, shared files, poll and settings. When the slider was not expanded it was shown by small arrow icon, thus hiding all functions for the users. Feedback regarding this derived from both sessions and primarily concerned that, only having an icon as a visual cue was not sufficient enough. Quotes supporting this claim is as follows,

"P1: okey so what happens when I press this one?", "P3: Why is there a sidebar, why isn't the icons visible so we see what functions that are available? It looks very simple but there is a lot of functionality that is hidden..?"

The outcome which the feedback brought was the arrow icon being exchanged for a toolbar, making all functions visible even when the slider is not expanded.

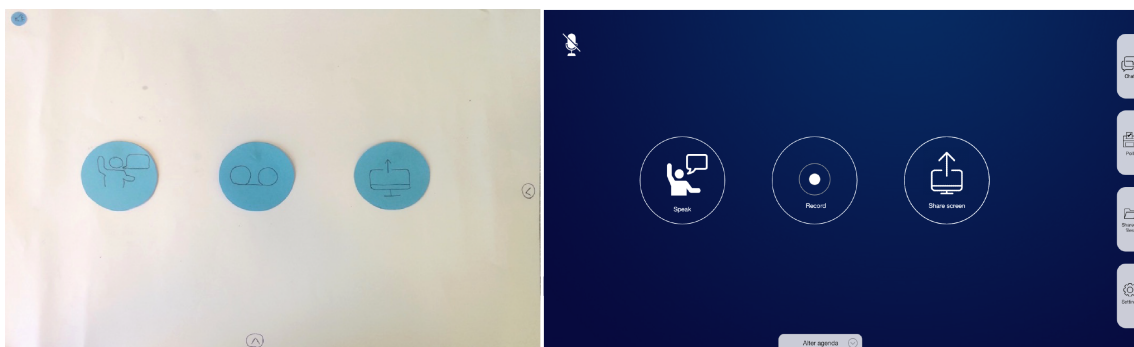


Figure 4.14: Slider (right-hand side): Tested function and Design Outcome

Other comments that strengthens the choice of a toolbar was when the participants were asked to find functions hidden within the slider. For example, the following remark was made when trying to localise the poll function, *"P3: 'Hmm? Ah, I am a bit unsure of where I could find it to be honest'".* This design change is depicted in figure 4.14.

- *Agenda Modification*

Similar to the slider positioned on the right-hand side, the slider containing the agenda (for the host to edit) was, when not expanded, only depicted by an arrow icon. Naturally, this generated similar feedback and we chose to emphasize the sliders existence by adding additional aesthetic cues. The result is shown in figure 4.14 above.

- *Chat*

As described, the chat is one of the four functions available in the slider positioned on the right-hand side of the interface. When tested, public and private messaging were designed so they shared the same space but was separated by two tabs - making them mutually exclusive. Questions participants had mainly concerned, how the different private messaging would look like and where and how they would be displayed. Additionally, the application of tabs directly implies an extra click for the user (if switching between private and public). Based on this, the chat area was re-designed by splitting it in into two sections, separating private and public chat.

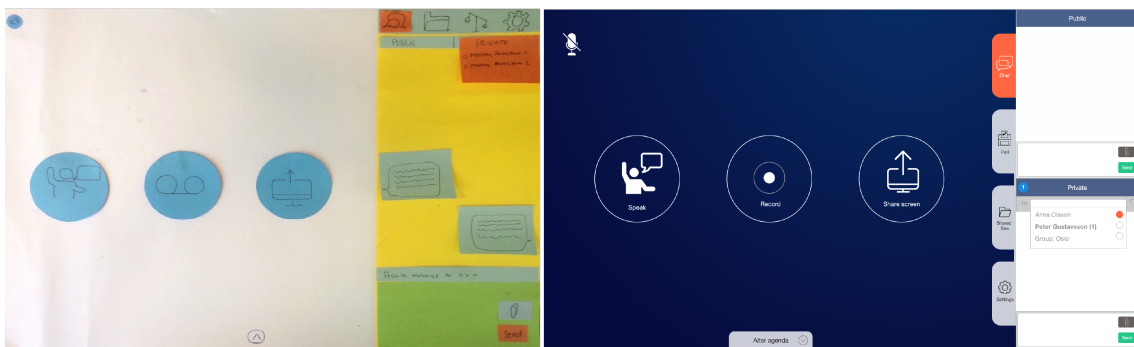


Figure 4.15: Chat: Tested function and Design Outcome

- *Shared files/ library*

The only comments towards the Shared files sections regarded the fact that the user wasn't given any confirmation when a file had been added. Thus, a notification system was design indicating new and unseen events.

Moreover, a suggestion from one of the participants in the second session was to add a real-time activity feed, where all participant easily could follow when someone was recoding, a file had been added and so on. The proposal was regarded as quite well-reasoned but due to lack of time and technical limitations we did not proceed with the suggestion.

Flow 3: Turn-Taking should be easy and flexible - Command Page and Video Feed Screen

- *Speak Function*

As with the other two prominent functions, the speak function was depicted by an icon only resulting in participants from both usability test sessions believing that the icon represented a chat function - "P1: Mm, I think this is a chat function". To solve this a descriptive title was added. Moreover, once they came to realize what the function was they instinctively looked for a text field where they could input keywords or the question(s) they wanted to pose. The motivation for this was as follows,

"P3: Writing down what you actually want to talk about.. it's seems important because sometimes I have questions and then when when its my turn to speak I have forgotten what I wanted to ask. But I had written them down I would have remembered".

The outcome was a text field where the submitted description would be displayed (when hovering) over the icon representing the meeting participant in the queue for request to speak (the queue is feature is shown in figure 4.17).

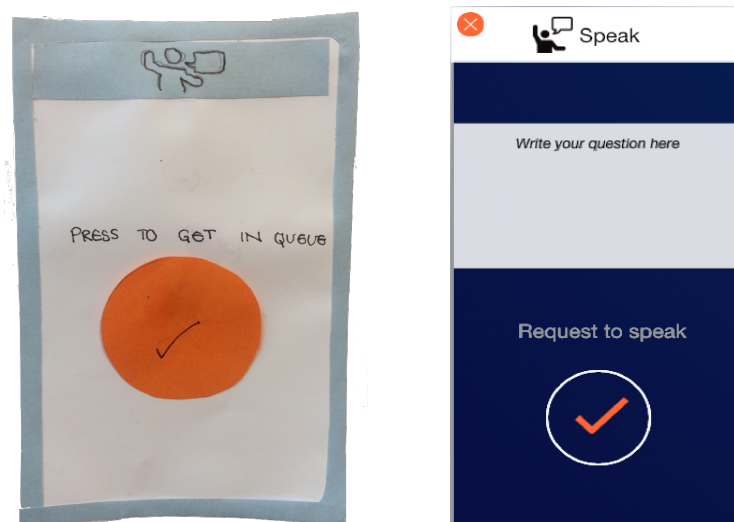


Figure 4.16: Speak: Tested Function and Design Outcome

Worth highlighting is the design proposal to connect the speak function with the chat. When we developed on this suggestion we came up with the following idea; when a participant stands in line, (requesting the role as the active speaker) and also has submitted a question, then whomever wants to respond to that question could do that directly in the chat. This by clicking on the icon representing the participant who posed the question, which automatically would generate a new private message where the question could be answered. Subsequently this would indirectly make the meeting more time efficient. Although, the idea was not designed to test in the next iteration (heuristic evaluations) but was however applied later in the design process.

- *List for Request to Speak* (Test II and III)

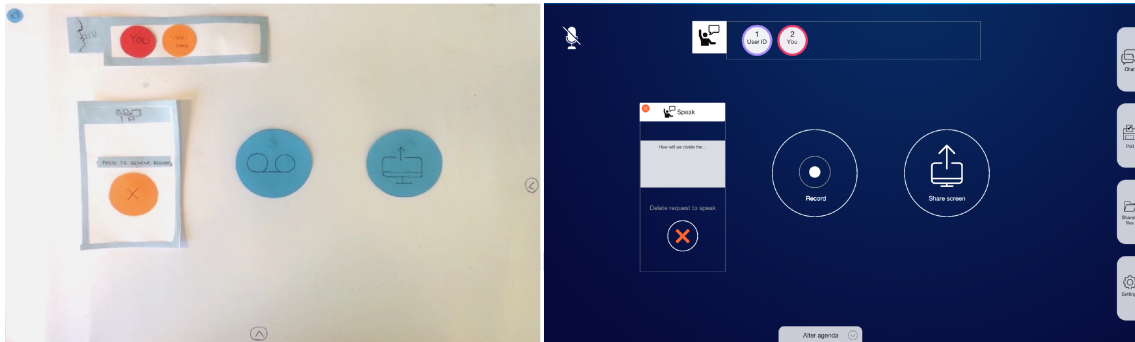


Figure 4.17: List for Request to Speak: Tested Function and Design Outcome

When testing the function of request to speak the circle containing the user's ID where also visualised on the video feed. The correlation and mapping between the two appeared to be unclear for the users.

"P1: and now P2 wants to talk and then I press that (pressing the avatar/icon in the queue space)"

The design outcome was these elements being designed to make the mapping between icons in the queue and the notification on the video feed more apparent and intuitive. That is, the people in queue where numbered as in the video feed, keeping the information flow consistent. The outcome is presented in figure 4.17 and 4.18.

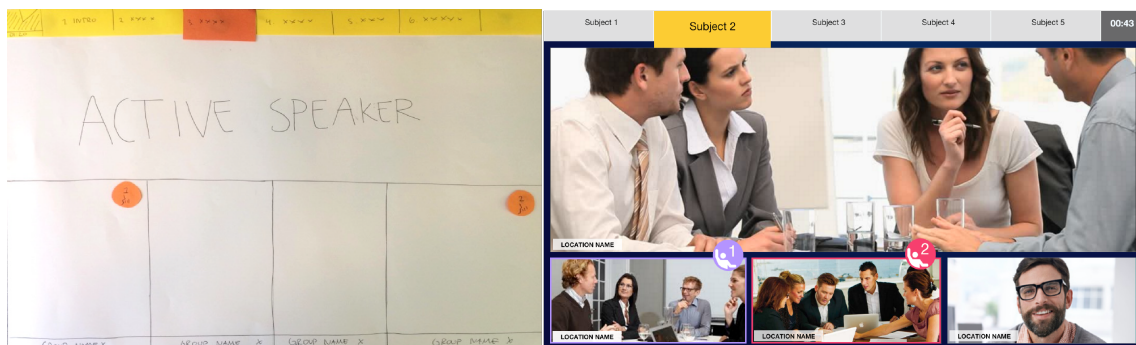


Figure 4.18: Video Feeds and Agenda: Tested Function(s) and Design Outcome

4.2.4 Iteration 4: Turning to the Experts

The fourth and last iteration was the one where all findings from previous usability tests were used to build the first version of the high-fidelity interactive mockup. This was then evaluated twice which brought the final prototype.

4.2.4.1 Heuristic Evaluation I and II

As described in the previous chapter the chosen approach for how to conduct the evaluation was to let the evaluators to assess the design element that created one or several dialogues with the user. Additionally the two evaluation sessions were recorded and transcribed in order to summarize the feedback regarding each function. At the end of they were asked to grade the system according how they perceived how it fulfilled the requirements for each of the ten heuristics.

Choice of Participants and Testing Setup/ Environment

The evaluations were performed in the office spaces at Semcon and the two groups consisted of employees which had many years of experience of the field the system intended to be used in, as well as possessing knowledge in interface usability. The first group consisted of three evaluators and the second of two. The setup of the first session is displayed in figure 4.19.

Assigned Roles

One of us initiated the evaluation by describing its purpose in addition to debriefing them about the system's design and structure. Besides that, both took the role as observers, letting the evaluators discuss and interact freely with the prototype.

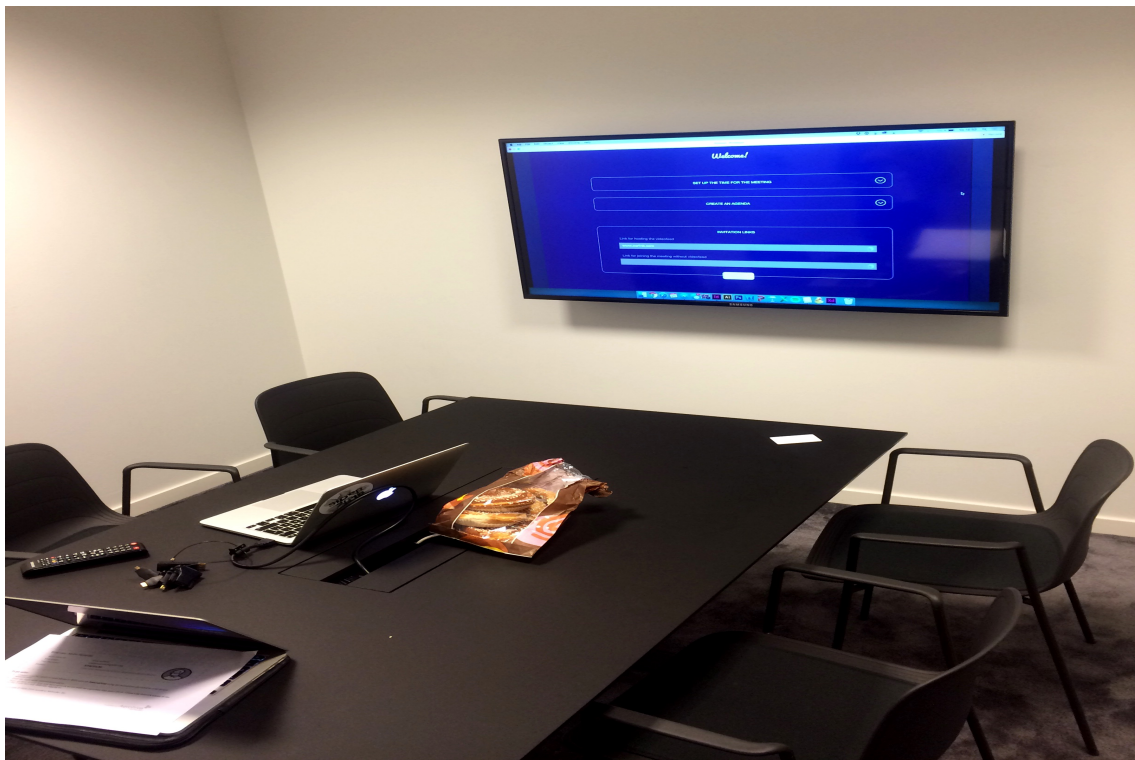


Figure 4.19: Setup of Heuristic Evaluation I

4.2.4.2 Outcome from the Heuristic Evaluations

What follows is the result of the first and second evaluation in addition to descriptions of how the feedback were considered and translated into new design outcomes.

Flow 1: Easy to initiate a call - Lobby

- *Timer (input)*

As in usability test II, feedback and questions regarding structure and design of inputting time values emerged in both evaluation sessions. One concern that all participants raised regarded the options for input, i.e. entering start time and total duration (see figure 4.20). Comments made were;

P2: Start and Estimated duration, but not start and end?" and "P1: Okey so i have a start time, and duration but what if i know when the meeting ends?"

The emphasis of this discussion was on, the reason for entering total duration time instead of just entering a stop time. Motivation which speaks against entering total duration is the user having to perform additional calculations which brings a higher (and unnecessary) cognitive load. Subsequently this feedback lead to the "estimate duration time" being changed for the option of entering a stop time. The total meeting time was instead displayed within a parenthesis, aimed to act as feedback (see figure 4.20).

The screenshot displays a meeting setup interface. At the top, a dark blue header contains a clock icon, the text "SET UP THE TIME FOR THE MEETING", and a close button. Below this, there are input fields for "START" (14:30) and "ESTIMATED DURATION (HOURS)" (01:00), followed by a green "SUBMIT" button. The middle section, titled "INVITATION LINKS", provides two links: "Link for hosting the videofeed" and "Link for joining the meeting without videofeed", each with a "Copy link" button. Below the links, there are two buttons: "SET UP TIME FOR THE MEETING" (with a green checkmark) and "CREATE AN AGENDA". The bottom section features a calendar for February 2016, with the 10th highlighted. To the right of the calendar, there is a time zone selector set to "GMT+00:00 SWE", and fields for "START TIME" (14:30) and "END TIME" (15:30). Below these fields, it says "Estimated duration 1h". A bottom navigation bar includes an envelope icon.

Figure 4.20: Inserting Time Values (2.0): Tested function and Design Outcome

Remaining feedback derived solely from the second evaluation, where one of the most significant comments regarded the sequencing and prioritisation of the three prominent elements (timer, agenda and sending out invitation links). For example, the two boxes holding input options for the timer and agenda are optional, but due to the sequence this did not come across and was perceived as mandatory as sending out invitation links. The following quote emphasizes this,

"P1: Especially when accordance looks the way it does. You have three separate boxes, cause this density wise it's not that clear. That the one at the bottom is the one i need to focus on, because all look very similar. They don't have equal density but its not far from it. In this case the sequence is more prominent than the size of the box. And since there is text telling me to do stuff i would instantly do that".

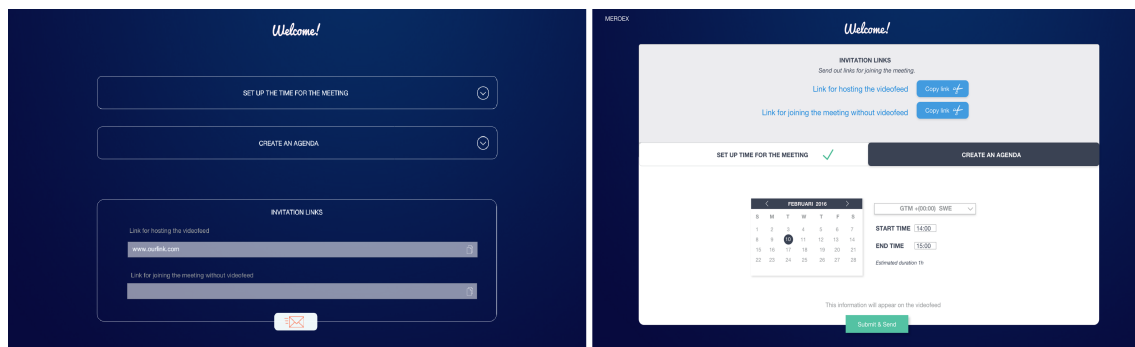


Figure 4.21: Lobby (2.0): Tested Function and Design Outcome

Remaining comments were of lighter weight and were more about terminology, choice of phrasing and to continuously provide the user with feedback - "P1: *"[...] is there any way for me as a user to know that i have set the time? [...] what happens when you click submit?"*. The tested interface and its design outcome derived from the feedback is displayed in figure 4.21.

- *Agenda (input)*

After glancing through the transcriptions it became evident that the sequence of the three boxes also brought some confusion amongst the evaluators, "P2: *"Should I start with creating an agenda so I know what I'm inviting people to?"*. Thereof, we began to discuss whether the box holding the invitations links should be presented at the top.

In addition the evaluators expressed the need of being able to add/ estimate time for each subject in the agenda. One of the participants argued that in smaller and more formal meetings, you can afford to not be so picky with time because you want to discuss, but since we are designing for formal, semi-big meetings (up to 6 remote sites) managing time is vital to ensure to finish at

expected time. This was taken into consideration at incorporated in the design (figure 4.22).

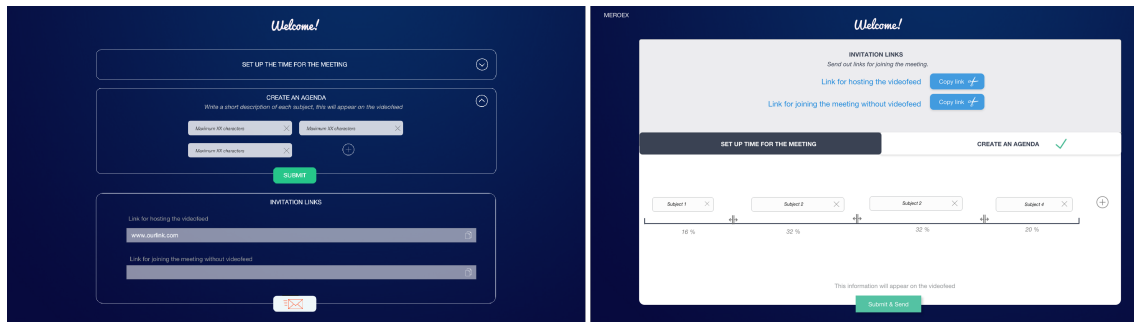


Figure 4.22: Agenda (2.0): Tested function and Design Outcome

- *Generating meeting links*

The design faults of this element were purely founded in precipitous design choices. As seen in figure 4.23, the containers surrounding the invitation links is filled with a light blue color. This created the impression of the being editable, i.e. affordance of input. In addition, invitations links usually appears in the form of a long link which, as seen in figure 4.22, was not what the participants could see in the prototype. This caused a slight insecurity whether the links actually were were invitation links. This feedback emerged in both evaluation occasions.

A third matter which seemed dubious for one of the participants in the first evaluation was the motivation for displaying the links at all in the lobby area. The person in question stated, "P1: *"I'm just wondering what the motivation behind displaying these links are..?"*", implicating that this step seemed unnecessary since the only time it actually becomes important to see (and use) the links is in the mail which all meeting participants receives. This feedback was judged as valid and was therefore taken into consideration when altering the design. Although, the host should still be able to utilize other medias than just mail to distribute the links. Outcome showed in figure 4.23.

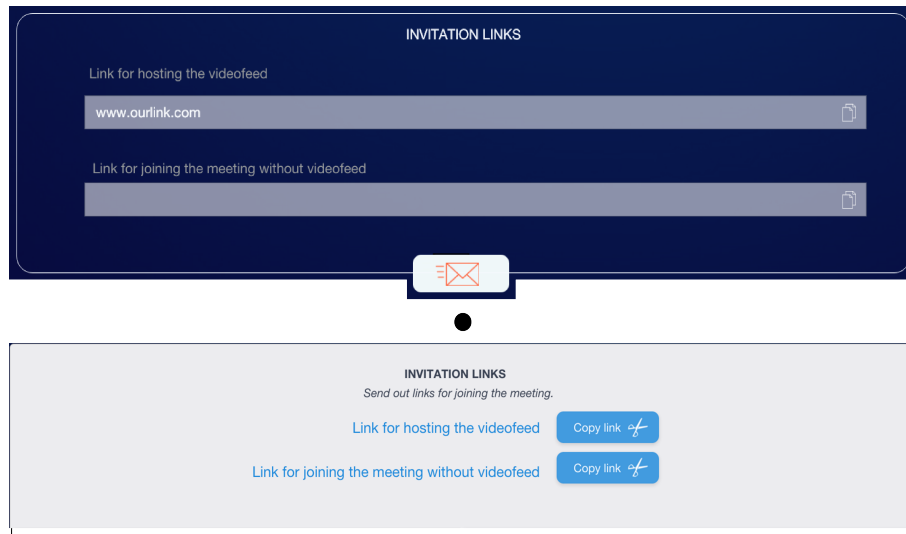


Figure 4.23: Meeting links and Sending Out Invitations (2.0): Tested function and Design Outcome

- *Sending out Invitation's*

Here there were two aspects in particular which were brought up. Firstly, it became evident that there were issues regarding the icon, mainly that it was not intuitive enough leading to the majority of the participants not being able to perceive its purpose. Figure 4.24 displays the design change attempting to accommodate this feedback.



Figure 4.24: Mail Icon (2.0): Tested function and Design Outcome

Flow 2: Simple to Send and Receive Information - Command Page

- *New* Tag Function*

After the first evaluation, we decided to redo the concept and use of the recording function. This due to not finding it to accommodate the user needs to a satisfactory level. Subsequently, the concept of being able to tag specific durations of the recorded was invented. The idea was transformed into a first design proposal and tested during the second evaluation session. The feedback and design changes are described below.

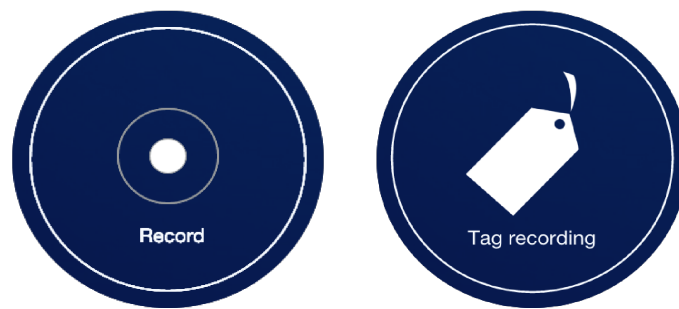


Figure 4.25: Record Exchanged for Tag: Tested function and Design Outcome

At the time of the second evaluation the idea was that the user could tag period of times which was perceived as interesting. An opportunity to add keywords or a description of the tagged duration had also been designed. The tags were automatically logged in a text file (created in the shared files section), where the audio file was saved as a separate file. The intention for this was to enable to user to later be able to use the log as a reference when fast-rewinding to the minute of the audio file that was of interest. Noted should be that the host still had to enable the recording function to be able to tag. This was also redesigned, but is further explained in the next section.

Moreover, the main feedback was that settling duration is not really necessary since the tagging activity it is more about defining and describing a specific occasion. Here is one of the comments which supporting this claim,

"P2: usually it's a keyword that makes you react. I guess that the person who wasn't in the meeting and listens to the recording afterwards is quite smart and will think " they are still talking about this, so i will keep on listening. [...] You wait until that topic is finished, you don't need a duration. It's more a precise moment"

This lead to the "stop tagging" button became redundant and was therefore removed. The result of the tag function is displayed in figure 4.26.

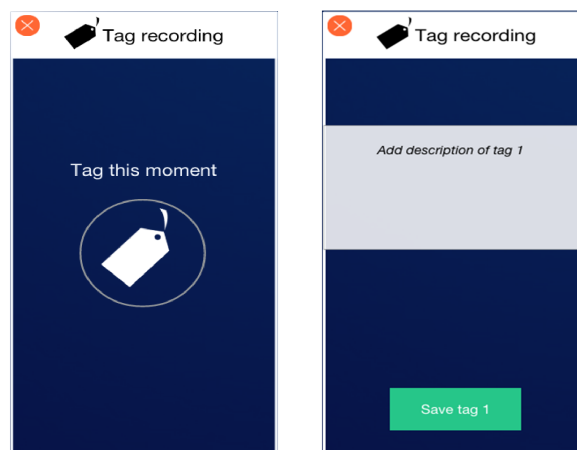


Figure 4.26: Tag: Design Outcome

- *Activate Recording*

Up until the point of the second evaluation, the host had been given the opportunity to activate the recording when generating personal, and group names. Although, since the only reason for activation was so the meeting participants could utilize the tag function, the design was changed to convey this mapping.

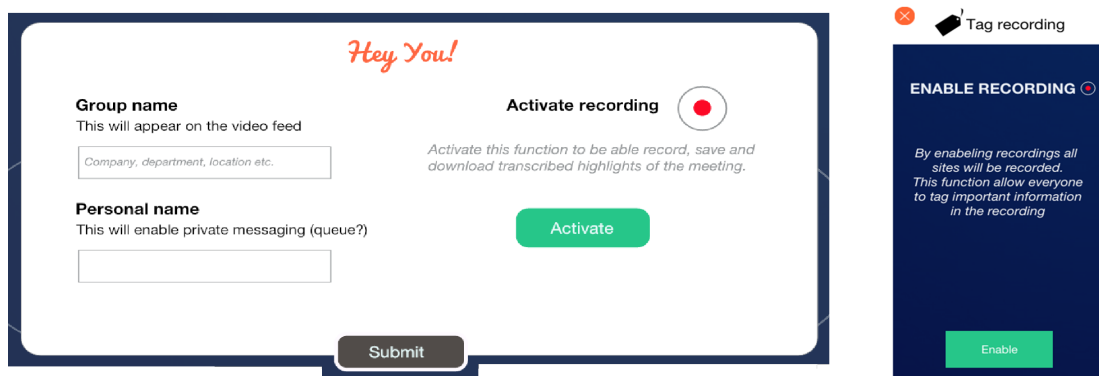


Figure 4.27: Activate Recording: Tested Function and Design Outcome

In addition, as one person in each remote sight gets the opportunity to enable the recording it means that the function could be activated without everyone giving their permission. Extracted quote supporting this claim is,

P1: "The biggest issue here is that someone is recording me, i would like to know if the others are recording me since this data will be stored and accessible for everyone".

This could (potentially) become a sensitive ethical for some participants, and since removal of the recording was not an option the attempt to mitigate the situation was providing information of which site that has activated the function. This was designed in the form of an icon, displayed on each site's video feed.

- *Chat*

The evaluated version was divided into two sections, one public and one private chat. This raised quite a discussion, and the participants in the first evaluation were torn whether how beneficial such division would be - *"P2: I just think it takes a lot of space, but to merge them increases the risk that you'll writing to everyone when you just want to write to a specific person..."*. Additional feedback was that there was a lack of informational architecture, i.e. the user not being given sufficient information to enable a clear overview of who sent the message (without having to interact with the text box). The outcome was a merge of the public and private chat and we also added descriptive notifications for the system to better guide the user.

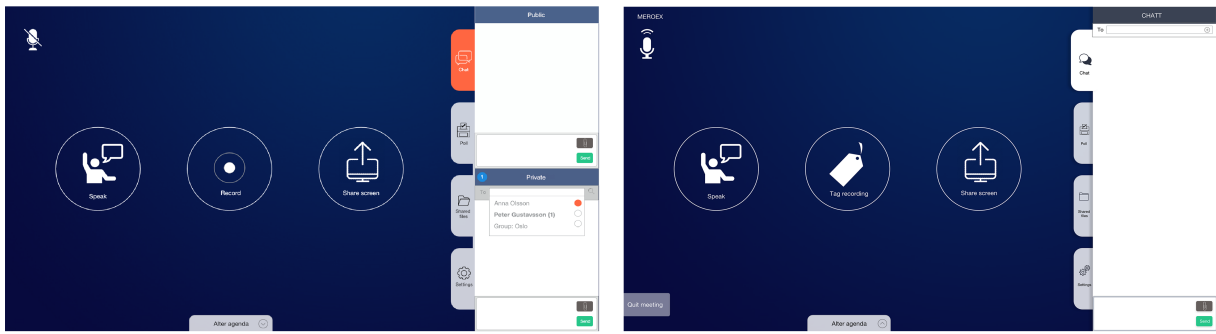


Figure 4.28: Chat (2.0): Tested Function and Design Outcome

Another suggestion was to grant the moderator the authority to limit the use of private messaging. The reason behind this proposal was expressed to be risk of people who know each other from before turning their attention away from the actual meeting to the chat. This was something that we chose to not take any further due to judging this risk as smaller than the benefits a private chat would yield.

- *Shared files/ library*

There were three specific suggestions for improvement; adding a "select all button" and correspondingly, changing the location of the button enabling the user to download all files simultaneously. A second recommendation was to add the possibility to filter by user or type of file (such as mp4, png, txt.files etcetera). The third was to delete the word "shared" in order to reduce the redundancy of the term. All of these suggestions were translated into design changes.



Figure 4.29: Shared Files/library (2.0): Tested Function and Design Outcome

- *Poll*

The participants from both evaluations concurred in their feedback concerning the poll function, which mainly revolved around abundance of steps (clicks) the user needs to undergo to perform an action. They also commented on the lack of feedback, i.e. maintaining the flow of information between the user and the

system. Another insight gained was users tend to just go with alternatives which are pre-defined and seldom modifies them. This could be both positive and negative indeed, but the evaluators argued that if the answering alternative "neutral" is a predefined option, there is a risk for it becoming overly used.

Based on this feedback we removed the "send button" (when answering the poll), thus eliminating a click and therefore making the process more time efficient and less tedious. A second design change aimed to ease the process of creating a poll, by only making the "yes and "no" as pre-chosen answering alternatives, impelling the user to use "neutral" as an alternative only when it is actually needed.

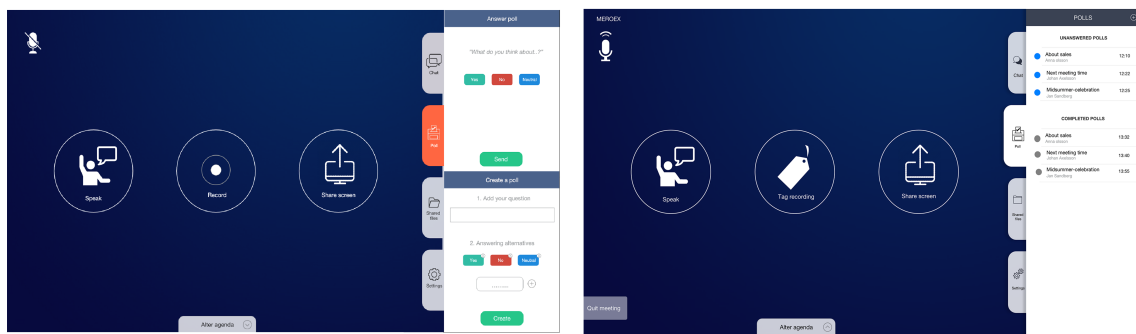


Figure 4.30: Poll (2.0): Tested Function and Design Outcome

- *Settings*

The only feedback came from the second session where one evaluator questioned the need for actually keeping the alternative enabling the user to change their personal name -

"P2: I wonder, settings wont be that useful. You always write your name in the beginning. You are not suppose to change your name after 1 hour"

Although, even though it was a valid point, the comment alone was not perceived as enough for removal.

- *Agenda Modification (input)*

Comments regarding managing the agenda (marking discussed topics and editing) only derived from the second evaluation where the ordering of the topics were discussed. One of the participants pondered on whether the direction that one had to read corresponded to users mental model i.e. left-right, or as it was designed at that time, up-down in a zigzag pattern. Another suggestion of improvement was to transform the current horizontal slider to a vertical one (thereby moving it to the left-hand side of the interface), primarily to save space. A suggestion which was not considered. The final outcome is displayed below.



Figure 4.31: Agenda Modification (2.0): Tested Function and Design Outcome

- *Self-Mute*

One of the participant in the first session made a remark on that it was quite difficult to perceive weather the icon indicated that the mute function was activated/ or deactivated - *P2: "Oooo, I had guessed that we were muted. [...] It would have been more obvious if it was green "*. This was clarified as shown in figure 4.32.



Figure 4.32: Mute (2.0): Tested function and Design Outcome

- *error Prevention*

The lack of keeping users informed about what was going on in the form of feedback was, as has been described throughout this chapter, a common response from all evaluators. Some of the comments regarded system security, or more specifically, users experience of system security. That is, since the system is a web-based solution it implicates that meeting participants gets disconnected from the meeting when the browser is closed. Although there was a lack of confirmation. For example, even though the browser was closed there was no feedback of that the recording had been activated. Thus, a solution (shown in figure 4.33) was designed attempting to accommodate this need - a "quite button" positioned on the interface's left short side, and a pop-up (clarifying the tenor of the action) . The pop-up would be appear both when the user clicks on the "quite button" as well as if trying to close the browser.

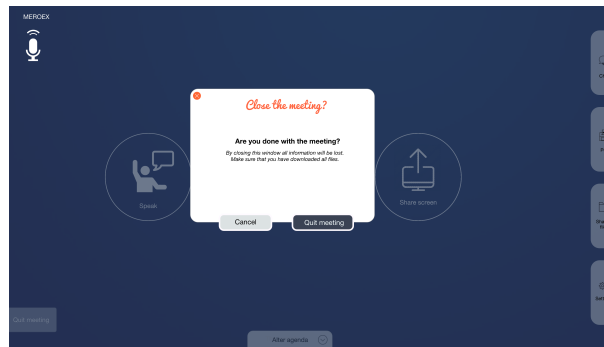


Figure 4.33: Security (error prevention): Design Outcome

Flow 3: Turn-Taking should be Easy and Flexible - Command Page and Video Feed Screen

- *Timer (output)*

Similar to the agenda, the host enters input in the lobby which then generates an graphical output on the same screen where the video feeds are shown. The output comes in the form of a countdown timer (displaying remaining meeting time) and a bar enabling the participants to see how meeting time progresses.

One of the points which was considered was polishing the design, making the progressive bar and the countdown timer to be more cohesively portrayed. Additionally the participants had a difficult time distinguishing if the countdown timer was showcasing how much time that had passed, or if it displayed total remaining time. They also wished for the possibility to switch between displaying remaining time of the whole meeting, and time remaining per topic. A last pointer was that we should take a second look on how to display hours, minutes and/ or seconds. For example, as seen in figure 4.34, the timer shows 00:43 which caused uncertainty, "*does it mean 43 minutes or 43 seconds?*". The final alterations are shown in figure 4.34.

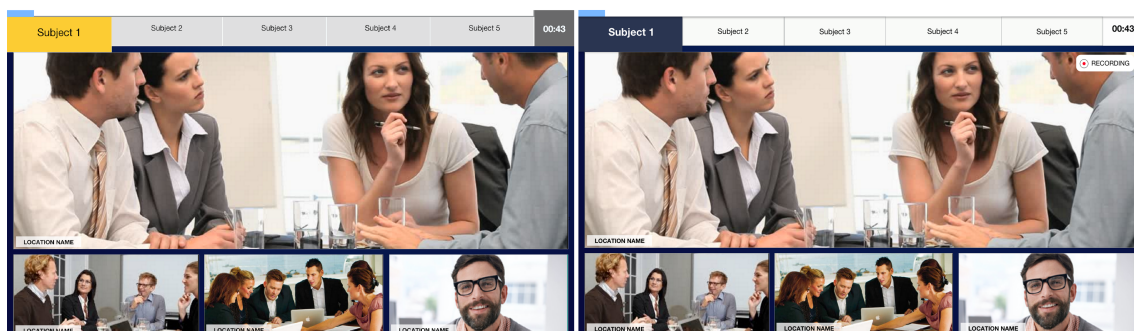


Figure 4.34: Timer (output): Tested Function and Design Outcome

- *Agenda (output)*

The feedback regarding this feature has already been described in the section *Agenda (input)* above, namely the wish to provide the host (in the lobby) with the possibility to estimate time for each agenda subject in order to efficiently manage time. The redesigned version is shown in figure 4.34 above and the following quote supports the assertion,

P1: "As it looks, all subject are equal big which tells me these subject will take equal amount of time [...] but if you could see which ones that would take more time to go through, and one topic still goes over time, I'm able to predict that it gives us less time for subject 2. You can make ad hoc decisions"

- *Speak Function*

Overall the speak function got positive response and the only expressed wish was, *"P2: I would like a shut up button, allowing everyone in the meeting to know that we need to step forward and finish quickly"*. Even though this was valuable input, such function was predicted to better suit other types of meetings such as larger meetings with more remote sites and connected. Thereof, we chose to not proceed with this feedback.

- *List for Request to Speak*

This list was part of the speak function and is basically a container displaying the order of meeting participants who has requested the role as the active speaker. Here the evaluators where curious if the meeting moderator/facilitator have the authority to change and prioritize the order of the queue, which at the moment of the evaluation not was the case.

5

Result and Analysis

5.1 Preliminary Study

The result and analysis of the data collection from the observations and interviews are now to be presented. The first two sections holds a description of the analysis process's and it they were structured. This is closely followed by a section which explains how the analyzed data was translated and transformed into user needs and lastly functional and non-functional requirements. The requirements were then mapped into three different system flows, which was viewed as a milestone for both the MERCO-project as well this study.

5.1.1 Content Analysis Process

The part of the analysis process that was the same for both interviews and observation were the two following steps; Firstly, reading through the transcribed interviews and observation notes, more or less to get a full comprehension of what had been said and thus reduce bias and own interpretation. Secondly, based on the quotes that stood out the most in terms of relevancy, larger themes and belonging subcategories, i.e. concrete and specific topic of discussions where all quotes where placed within, were created. Additionally, the quotes could not belong to more than one subcategory and all quotes and subcategories were given a coded identifier (through open coding), this in order to make everything traceable.

The following themes were identified;

- *Interview*: Decision Making, Ideation, Turn-Taking, Safety, Working Anonymously, Software, Distribution, Social Aspects and Documentation, comprising a total of 46 unique subcategories.

TURN-TAKING					
T1-H8, Roles (human-human)		T1-H8, Roles (human-software)			
T2. Informal/ formal meeting		T2. Informal/ formal meeting			
T3. Pre-defined/ un-defined agenda		T3. Pre-defined/ un-defined agenda			
T4. Attentive moves		T4. Attentive moves			
T6. Communication Symbiosis		T6. Communication Symbiosis			
T8. Connectivity		T8. Connectivity			
T7. Hierarchy		T7. Hierarchy			
T9. Non-verbal cues		T9. Non-verbal cues			
P1	P2			P3	P4
T1-H8 Uncontrolled	T1-H8 Uncontrolled	T1-H8 Uncontrolled	T1-H8 Positive	T1-H8 Positive	T1-H8 Uncontrolled
T1-H8 P1 (U), "Depends on the type of the informal session."	T1-H8 P1 (U), "MII, yes, so have you experienced conferencing?"	T1-H8 P2 (U), "Yes usually the one who calls for the meeting. Like a project manager or team leader or a team member. It can be whoever gets the objective to run a certain task."	T1-H8 P3 (P), "I don't have a fixed moderator, like a "fixed" moderator. It's more likely that the person who organizes the meeting takes a more "leading" role. But in these meetings we are so self-going, we don't need a moderator. We know what we want to get. It's a lot easier to communicate if you know each other from before, or if you have met."	T1-H8 P3 (P), "But I have come across meetings where this might have been decided in advance at the same meeting a moderator would have been needed in order to support that."	T1-H8 P4 (U), "I've met an all dier som tillämplig möte heller driver förklarar och det skulle väl vara då att det är ett integrerat system som kan hantera och agnara var en del av det."
T1-H8 P1 (U), "I think a meeting chair is the person who also runs and leads the meeting"	P1. Yes, in training!"				T1-H8 P4 (U), "Set up roles for the meeting? Ethically, I don't very often. I think it comes with the person you know each other from each other in the computer screen or in the room, so you know the hierarchy."
T1-H8 P1 (U), "If there is a meeting with a defined purpose, maybe a review meeting, or what we call an inspection, and if you use that we have a moderator, a software facilitator who facilitates the communication."	T1-H8 P1 (U), "Yes, in training! [...] There is a moderator doing certain things, you have a software facilitator who facilitates the communication."	T1-H8 P2 (U), "You receive a new building construction, so you become like a moderator, so everybody knows how you called in like a moderator of the meeting. But it's not like that in large arenas, you started a group chat, but not other visible role distinctions."	T1-H8 P3 (U), "No we don't anyone who is called to fix the moderator or secretary or else"	T2 Uncontrolled	T4 Negative
T1-H8 P1 (U), "If there is a meeting with a defined purpose, maybe a review meeting, or what we call an inspection, and if you use that we have a moderator, a secretary, you may have a presenter (be the moderator also). But these three roles are dependent on how many people you are, as well as circumstances. Could also be the author. It's also used if it's extremely well-"				T2 P4 (U), "I'm exempted, can't tell the world if you formulate, det blir exempelvis beräkningen som är det i ofta, nämligen som driver det mest data och det är ofta den första biten som försvinner och det är den första biten som försvinner och det är den första biten som försvinner."	T4 P4 (U), "It's very difficult to take the world if you formulate, det blir exempelvis beräkningen som är det i ofta, nämligen som driver det mest data och det är ofta den första biten som försvinner och det är den första biten som försvinner."

5.1.1.2 Analysis Process modified for Observations

Similar to the quotes being labeled as positively, negatively or neutrally charged, the observation notes were marked as either *observational* or *reflective* (this suggested by the applied framework). In addition to this, the analysis process included the following aspects; *meeting type*, *group size* and *software* (see table 5.2 below). Conclusively there were two qualities which all remote meetings shared. Firstly, each meeting had a predefined moderator facilitating the meeting by bringing the it forward, most often following a pre-defined agenda. Secondly, all meetings leaned towards a more formal setting and revolved around decision-making, information-sharing and planning. Examples of such meeting types are synchronization and status update meetings, touching upon aspects such as strategic,- and sprint planning. In addition the number of meeting participants making up each remote site varied between one single person up to 10 participants. When it came to the number of remote sites that took part in each meeting, three out of four included two sites whereas the last one had four connected remote sites

MEETING NO#	MEETING TYPE	GROUP SIZE	SOFTWARE	HEAD CATEGORY	SUB CATEGORY	OBSERVATIONAL NOTES	REFLECTIVE NOTES	COMMENTS
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	DECISION MAKING	DM1: Reaching a consensus	DM1: O1: "SP participants asks if any comments or thoughts - very silent response, people nodding but not taking the word. One person finally speaks up SP participants seems a bit uncomfortable and makes a second effort to gain response"	DM1: O1: "SP participants asks if any comments or thoughts - very silent response, people nodding but not taking the word. One person finally speaks up SP participants seems a bit uncomfortable and makes a second effort to gain response"	- Need for a feature that supports "passing on the ball" - to facilitate decision making and probing the occasional silence?
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			DM1: O2: "P1 ask "are we find with that?" P3 is the only one answering, with a silence and nod."		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom				DM1: O4: "Participant from ottawa: "so that is what you are thinking, right? ..."	- such comments could indicate an uncertainty for the active speaker if the other meeting participants has understood what he has talked about? Function for this?
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom				DM1: O4: "Linköping asking Kista "can you summarize the action points her for me" (after the topic has been discussed and on the move to the next)	- is there a need for something here? communication symbol?*
2	Sprint planning meeting	SE: 4, CH: 4	Polycom		DM2: Note Taking	DM2: O2: "P1 site discusses something and adds it in the document but didn't tell the remote site."		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom		DM3: Occasional Silence	DM3: O2: "There is a lot of silence when a question has been asked"		- problem with sound, group dynamic?
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			DM3 O4: "when talking about next week, for scheduling another meeting the active speaker says "okay I don't hear any objections" - and then people starts to speak."		- Again, there is a silence where the presenter or active speaker has to make a comment or ask the question again to make people start talking
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			DM3 O4: "you are all soo quite" - woman at Kista		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			DM3 O4: "P2 " Is this ok with everyone?" - only one answer on the same site "I guess its ok"		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	PERSONAL SUPPORT	P1: Tools	P1 O1: "everyone in the meeting has its own personal computer, pen and notepad"		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			P1 O3: "The moderator is the one with a laptop, same as in the remote site."		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			P1 O3: "4 out of 10 people have laptops opened, 2 out 10 have a notepad, 4 don't have any other tools."		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			P1 O4: "60% has their own laptops with them"		
	decision-making,	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom					- how long has he been

Table 5.2: Observations - Extraction from of Analysis Process

5.1.2 Mapped Results

After translating and categorizing the quotes, sorting them into formal themes, transforming them into needs and requirements, we had the information needed to make a summary of the results. To facilitate this process, we performed further processing that would make it easier to match requirements and categories generated from between the two methods. The result was a table aimed to clearly show the

mapping of the analysis process. In short the table shows the number of comments made and the number of needs and unique requirements that were generated out of each comment. For each sub-category there is a "description column", providing a brief explanation (in the form of user needs) which are based on what the meeting participants brought up during the observation,- and interview sessions. This table is shown in *appendix H, Mapped Results of Observation and Interview*.

5.1.3 Requirements Formation

In the following section, we detail how the analysed data from the observations and interviews were condensed and then interpreted, translated and transformed into functional and non-functional requirements.

The analysis process resulted in 226 quotes in total, 95 from the observations and 131 from the interviews. In order to easily grasp the bigger picture we chose to manually transfer the quotes on to a spreadsheet, together with their encoded id's (generated in the analysis) and associated sub-category. This enabled effective sorting and thus a good overview of the data.

5.1.3.1 Interpretation, Translation and Transformation

The process of translating and transforming data (notes and quotes) into needs and requirements was a time consuming activity, this mainly due to the actual number of comments as well as the reality that one comment could render more than one requirement. Subsequently this process resulted in 233 requirements in total, 82 from the observations and 151 from the interviews. Note that these are not solely unique requirements but a sum of all of them together. Nevertheless, due to the fact that much time and effort were spent on interpreting the entailment of each quote (when identifying themes and sub-categories), this process went quite easy.

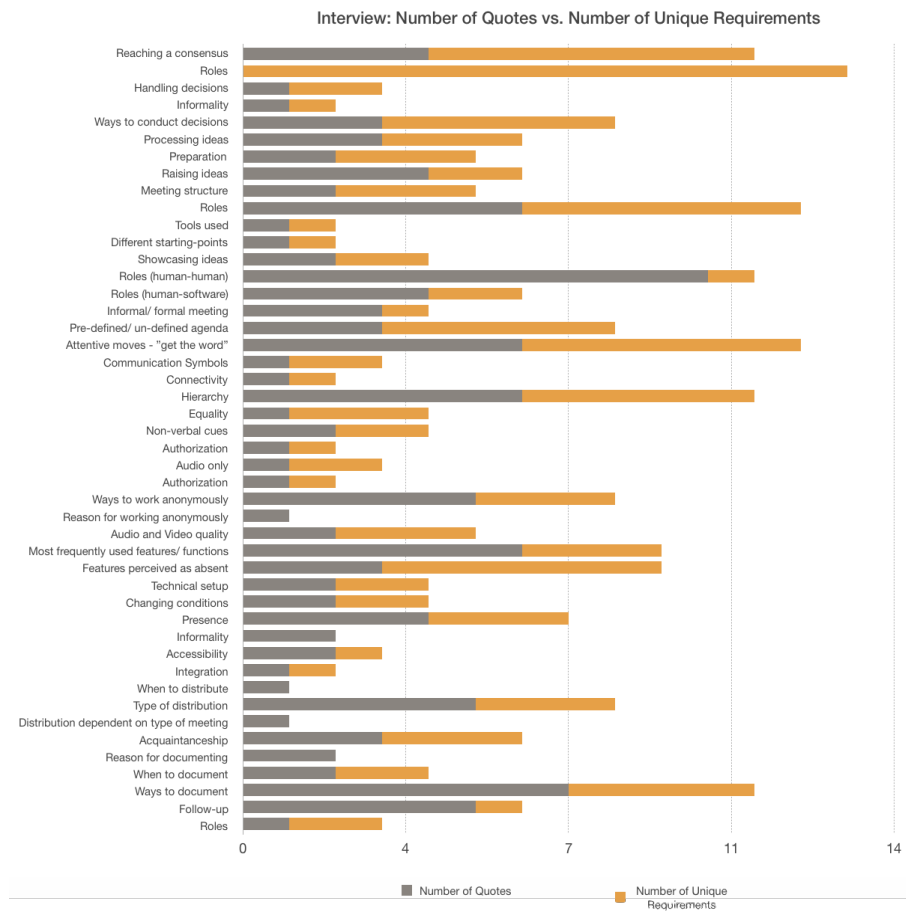


Table 5.3: Interviews - Number of Quotes vs. Number of Unique Requirements

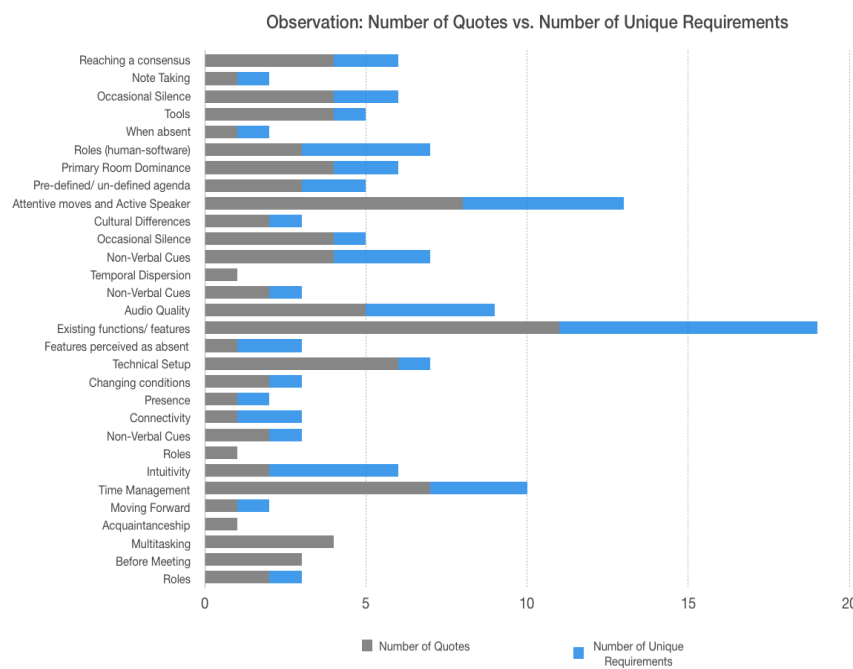


Table 5.4: Observations - Number of Notes vs. Number of Unique Requirements

As seen in the two figures above, some categories elicited more and some fewer requirements than the number of quotes. The latter are believed to be a result of the conversation not being as meaningful in content as others, but also us not putting as much value in the matter (in relation to the MERCO-project's goal) and therefore somewhat dismissing the topic. Another reason could be that the “wrong” quotes were chosen from the interview transcripts, not representing the issue at hand effectively. An additional measure implemented during the requirements processing was consolidating the language of the requirements. This enabled comparison between the elicited requirements from the observations and interview sessions. As described above the a total of 131 quotes were elicited from the transcribed interviews and generated 117 unique requirements. Similarly, the observations resulted in 95 quotes which led to 55 unique requirements. These 172 unique requirements were structured and categorized into a requirements specification, including both functional and non-functional requirements (The full set of requirements can be seen in appendix I).

Furthermore, when all requirements were gathered they were mapped into three bigger directions/flows. This to firstly set the base for the design and also narrowing down the scope and the direction for the project, and secondly for settling the base for answering this study's research question. The identified directions/flows were,

1. Easy to initiate a call
2. Simple to send and receive information
3. Turn-taking should be easy and flexible.

How this was used as the base for the design work was by employing them a foundation as structural base for the feature backlog (as explained in chapter 4.2 *The Iterative Design Work*).

5.2 MEROEX - The Final Prototype

The fruit of this study was an interactive mock-up creative in the software, Adobe Experience Design.

The two upper mockup's in figure 5.1 illustrates the flow of the host using the lobby interface to set up the meeting and sending out invitations to all concerned parties. The host is provided with the opportunity to settle on time as well as to create an agenda. The following two screens shows the command page and the pop-up(s) which greets the participants when entering the meeting. Here the users creates/or chooses (depending on if connected to the camera or not) a group and personal name.

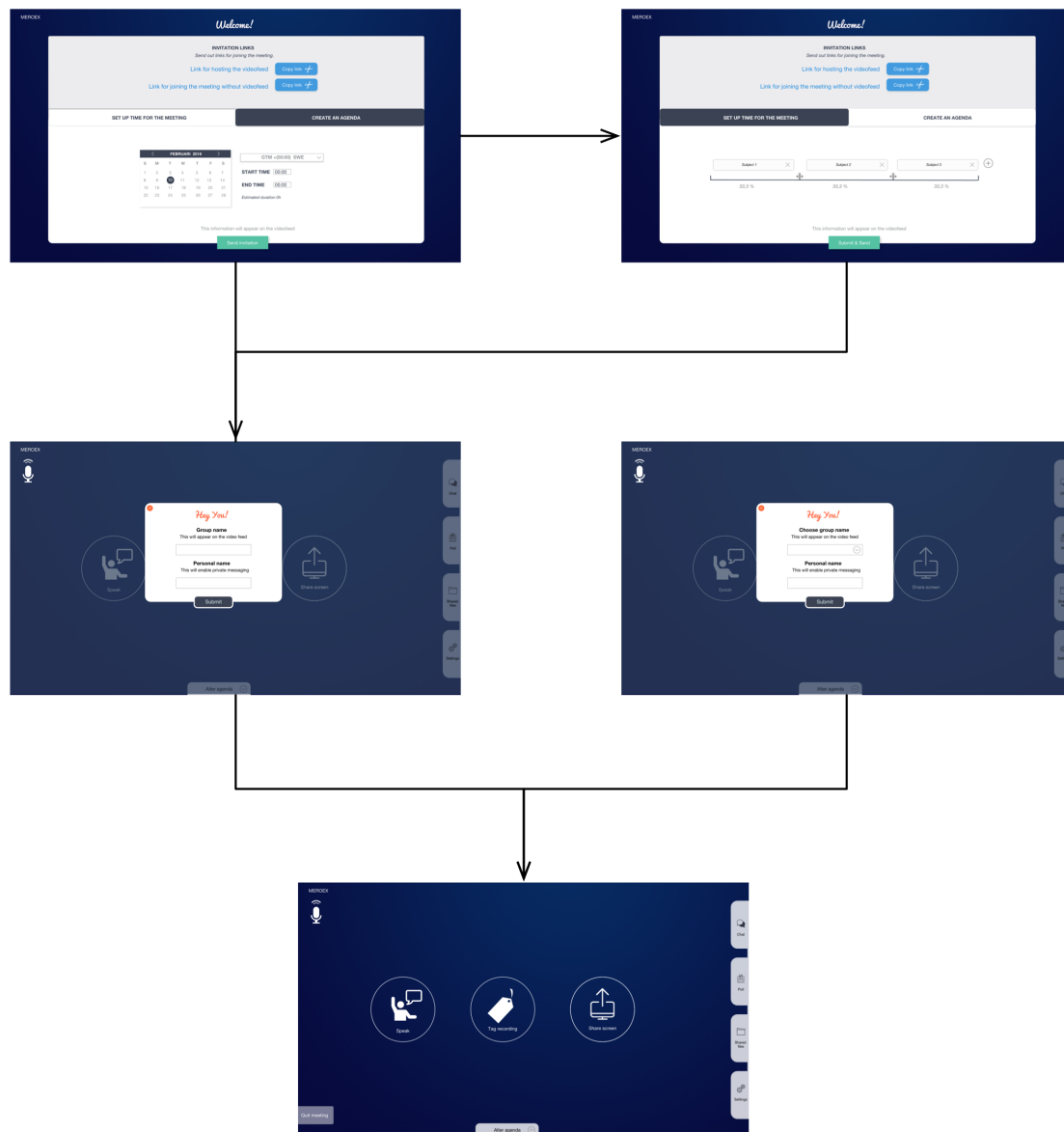


Figure 5.1: Final Outcome: Lobby and Command Page

The flow of the tagging function is shown in figure 5.2. The first step is for the one person (on each remote site) that is connected to the camera to activate the recording. After that all other participants are able to utilize the function by tagging different moments in the meeting. In addition, if the moderator/person connected to the camera for some reason has not enabled the recording, the others have the possibility to send a message that encourages activation. When the meeting is over the recording can be disabled.

Furthermore, all tags are automatically stored in text file (in the shared files/ library) where the description and time of the tag is displayed. The meeting participants could then, post-meeting, fast wind to the specific point of time in the audio file.

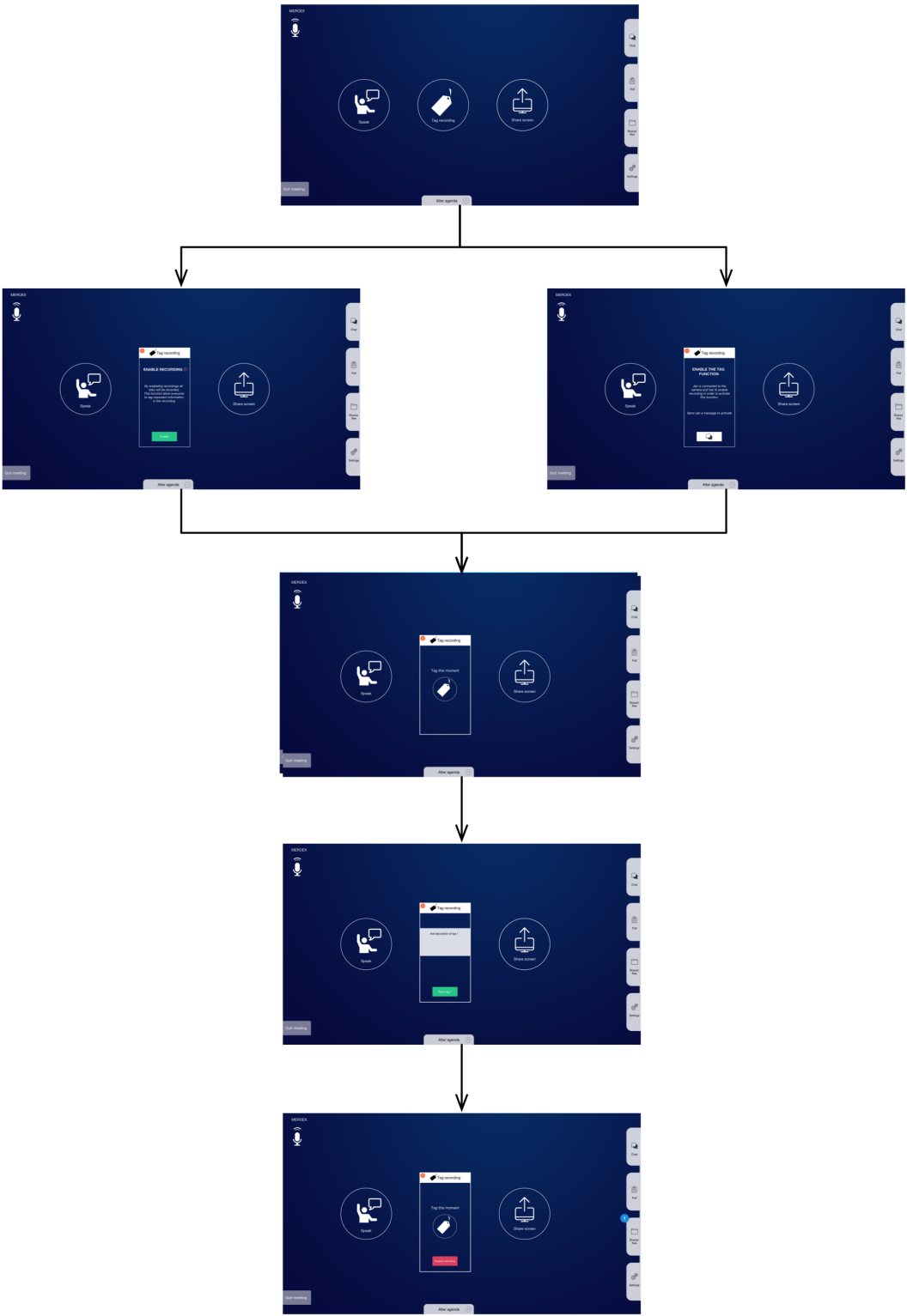


Figure 5.2: Final Outcome: Tag Function

Moreover, the speak function is illustrated in figure 5.3, showcasing the flow of the meeting participants requesting the role as the active speaker, while also adding

a description/keyword(s) of their question or input. In addition, everyone has the opportunity to answer a question on beforehand by hovering over the icon representing the participant (that posed the question) which automatically opens a private message between the two.

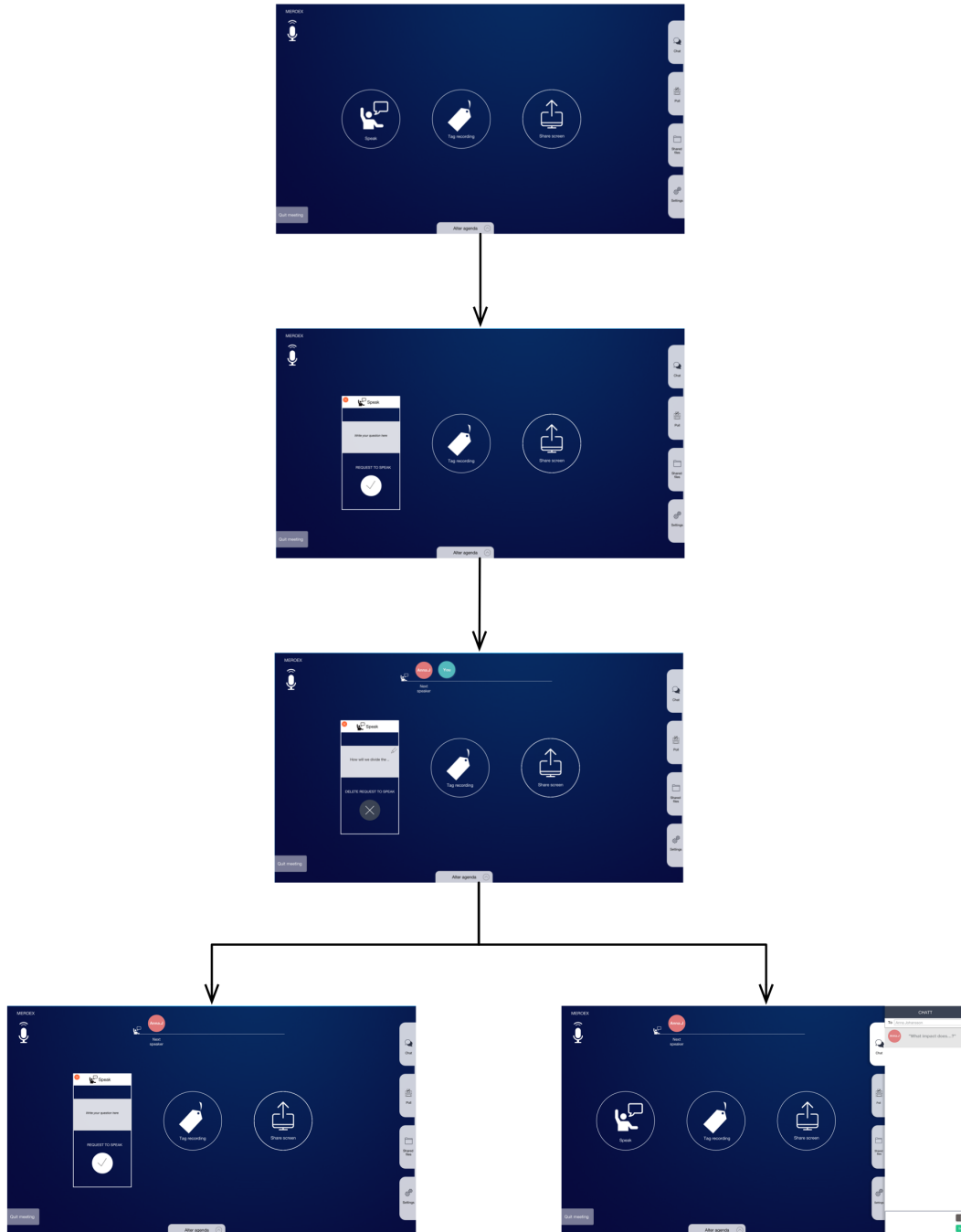


Figure 5.3: Final Outcome: Speak Function

The share screen function illustrated in figure 5.4 and displays how it looks when

the plug-in has been activated. By pressing on the icon a pop-up will appear letting the user choose which application they would like to share.

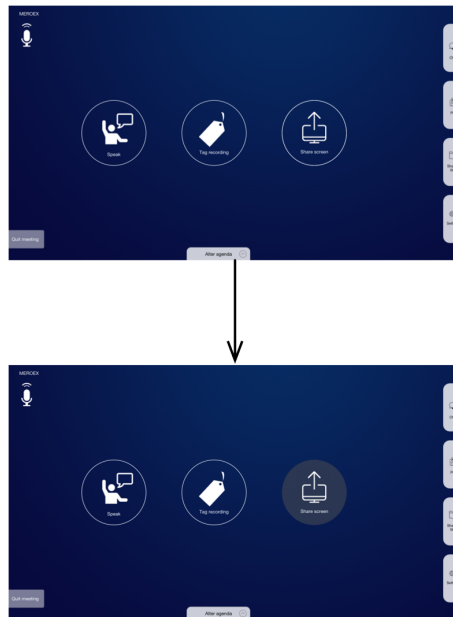


Figure 5.4: Final Outcome: Screen Share Function

In figure 5.5 the user flow of the chat function is illustrated. The meeting participants are given the opportunity to create private and public messages as well as creating group conversations. Receivers of the message are selected in a drop-down menu.



Figure 5.5: Final Outcome: Chat Function

In figure 5.6 the flow of creating and answering a poll is showcased. When opening the tab the meeting participants are presented with an overview of all polls, both unanswered and completed ones. Answering requires two clicks, one by selecting the poll and a second when choosing an answering alternative. The joint result will be displayed immediately. After submitting an answer it will not be possible to change (this to prohibit biased answers).

When creating a new poll two pre-determined answering alternatives are provided (Yes and No) and there is also a text field where the participants can generate new ones. They can also choose if this poll should be answered individually or as a group.

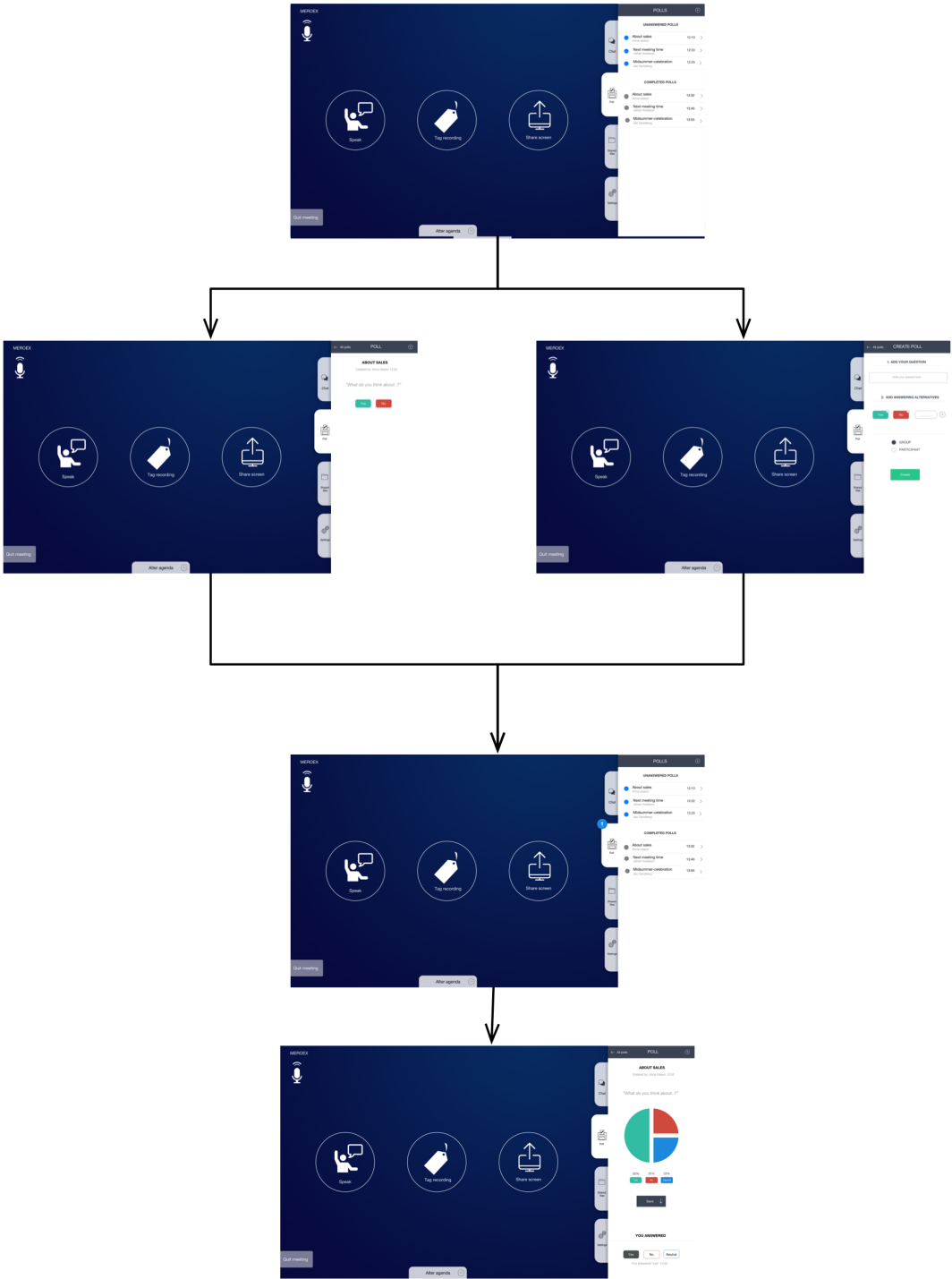


Figure 5.6: Final Outcome: Poll Function

Figure 5.7 illustrates the shared files tab. Here the meeting participants are able

to search for a specific file, select only a single, a few or all files to download. All files will be accessible up to eight hours after meeting has been completed. The participants are also able to upload new files by drag and drop or by selecting a file from their local server.



Figure 5.7: Final Outcome: Shared Files/Library

In the settings, shown in figure 5.8, the moderator has the opportunity to change group name, mute the site and enable the recording function.



Figure 5.8: Final Outcome: Settings

Figure 5.9 illustrates the pop-up which appears when a meeting participants clicks on the "quit meeting" button (located in the lower-left corner) or tries to close the browser. This is an attempt to prohibit them from accidentally leaving the meeting, i.e. error prevention.

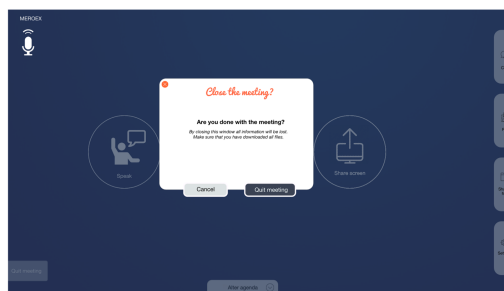


Figure 5.9: Final Outcome: Error Prevention

The interface displaying all video feeds is illustrated in figure 5.10. When no one has entered the meeting only the placeholders are shown. When a site connects to the meeting a video stream will appear. Moreover, further information shown

are an icon showing that someone has enabled the recording, in addition to icons representing the first and second in queue for the active speaker role. On the top the agenda and progressive timer (ticking down) are displayed.



Figure 5.10: Final Outcome: Video Feed Interface

6

Discussion

This chapter is divided into two larger sections, one where the data from the preliminary study, design choices and outcomes will be elaborated on in relation to the Theory of Media Synchronicity (Dennis and Valacich, 1999). This so the research question can be answered. The second section will contain a method discussion, providing a thoughts of how the applied methods could be evaluated against variables as validity, reliability and generalizability. The chapter ends with suggested improvements for future studies.

6.1 Tying up Loose Ends

There are mainly two identified communication processes, conveyance and convergence (Dennis and Valacich, 1999), where the MERCO project and this study have primarily focused on the latter. Additionally, as the theory's title insinuates it is to be applied on synchronous activities, which suites this study since communication between meeting participants takes place at the same time, also assuming that there is a need for a collective understanding for the meetings purpose.

Conclusively, due to the research question focusing on what one should consider when designing an interface to enhance communication and promote a shared understanding amongst meeting participants, the Media Synchronicity Theory (MST) were believed to sufficiently contribute to a profound foundation to this discussion.

6.1.1 The Five Media Characteristics

The five characteristics of media (*symbol variety, parallelism, immediacy of feedback, rehearsability and reprocessability*) are capabilities which can affect communication processes in the media, and whether the communication between meeting participants is effective or not depends on how well the media characteristics matches the needs of the fundamental convergence process (Dennis and Valacich, 1999). Although, not to be forgotten is that communication is complex and there are several factors besides the chosen communication channel which affects communication, e.g. non-verbal signaling and interpersonal relationships (Pearson et al., 2011). If one

variable were to change so would the whole communication process. An additional aspect to consider is the different roles the individuals take within the meeting (Barker et al., 2011) and the perception of others (French et al., 1959). In short, all these aspects are important to consider when designing tools for communicative purposes.

For group communication processes in which convergence is the goal, use of media providing high synchronicity (high feedback and low parallelism) will lead to better performance (Dennis and Valacich, 1999; Hinds and Weisband, 2003). The following sections will focus on the media developed in the MERCO-project, how the functions and features it holds, relates to these five media characteristics and how convergence can be obtained.

- *Symbol variety*

When referring to the media characteristic Symbol variety, one looks at the selection of various communication modalities (Dennis and Valacich, 1999). Thus, the focus lies on how symbol variety can enhance a joint understanding through enabling all meeting participants to have their say, in addition to assuring that everyone else understands when someone wants to talk, i.e. providing different ways to transmit a message. The functions which primarily promote high symbol variety are the *Screen Sharing*, *Chat* and *Speak function*.

The speak function holds a queue system which meeting participants can use to ensure that all voices are heard in a fair manner. The final version had its base in the four communication symbols found in the prototype which the two previous thesis workers of MERCO project designed. As described, one the outcome from that usability test was the symbols meaning being perceived differently by the different test participants. Hence an example of the participants mental models not corresponding, i.e. insufficient understanding of others interpretations of the symbols (Dennis and Valacich, 1999), preventing a joint understanding of the message they where trying to communicate.

Yet another example confirming the importance of the function leading to high symbolic variety is found amongst the findings from the observations. There it was noted that a few of the participants tried to express feelings and emotions through non-verbal symbols such as inhaling and various deictic gestures. However, as this was not perceived by all participants it resulted in omitted information (voices not getting heard), working against the conditions necessary for bringing convergence. A similar scenario where non-verbal symbols was observed to be inadequate to support symbol variety was when a situation of a so-called "primary room dominance" (Karis et al., 2016) appeared. More specifically, during the first observation we witnessed a situation where one remote site dominated the discussion, probably not by fault but rather due to having the majority number of participants, which led to the participant situated in another remote site became neglected. Hence, in situations where one site has room dominance and a strong social/and or company culture, one could argued that it becomes more difficult for other site's to engage in the

conversation. Yuan et al. (2013) and Fish et al. (1992) both describes that such informal communication has many benefits for a group, such as facilitating the process of exchanging information. Although, this requires that everyone shares/are aware of this culture. Consequently, by providing the speak function as a mean to increase symbol variety, turn-taking and communication interaction are facilitated, thus supporting convergence. Although, as MST suggests meeting participants who have worked with each in the past, and thereby established a solid working flow, are in less need of high symbol variety (Dennis and Valacich, 1999).

- *Parallelism*

As suggested by MST, for optimal performance the presence of parallelism is advised to be low. The significance of enabling the meeting participants to perform multiple conversations simultaneously is also dependent on the number of participants taking part in the meeting. Thus, smaller meeting groups would not benefit from high parallelism as larger one would (Dennis and Valacich, 1999). What this implicates in regards to the developed VC system is rather unclear since there is no definition of what a small group constitutes of, i.e. is "a group" a summary of all connected sites or solely pointing at one single site, and in any of the cases, how many participants is required for a group to be viewed as a "big". Nevertheless, one of the MERCO project's limitations was the software not holding more than six connected remote sites at the same time, which therefore could be claimed to be utilized by both smaller and bigger groups (depending on the number of participants located at each site). The functions which mainly conduces to the presence of parallelism are the *Speak* and *Poll* function.

Furthermore, there is a issue in enabling participants to manage several parallel conversations namely that is becomes difficult to foster and maintain a joint understanding of everything (Dennis and Valacich, 1999). However, one function that this does not apply to is the poll function. Polling is an effective way to gather inputs from the meeting participants and displaying the result for everyone to see. Attempting to reach a similar outcome by talking separately with every participant or collectively deliberating the views, is argued to be less effective. The function is very context-dependent, meaning it can be used only for supporting tasks with determined purposes, such as settling on a decision or used when addressing sensitive matters. All which contributes to a shared understanding of what has been decided.

Next function aimed supporting convergence amongst participants in distributed meetings and encourage the parallelism quality of the system is *Speak* function. This is a attempt to assure that everyone gets an equal chance of getting their voices heard, preventing room dominance (Karis et al., 2016), and at the same time increasing participant engagement in discussions. Nevertheless, relevant to this discussion is the function providing the meeting participants the opportunity to add a written description of what they want to talk about.

This may be in the length of a sentence, or just one or a few keywords. Thus, this allows everyone in the meeting to absorb information in a perspicuous manner and opens up the possibility to communicate through two different tracks, i.e. written and verbal. Nevertheless it's also important to take in consideration that a higher degree of parallelism could affect and take focus from the video feeds, where communication also happens through nonverbal cues. As stated by Pearson et al. (2011) and Gibson and Cohen (2003) it's the nonverbal cues that often causes misunderstanding. Even though the queue is a function used to neutralize different ways to speak the usage of the function could take focus from the meeting itself. Other researcher such as Sacks et al. (1974) have uttered how fundamental turn-taking is when it comes to larger groups.

To access the informative description one can hover over the icon symbolizing the person placed in the queue system. By seeing what others want to bring up, the understanding increases participants are also given time to litigate on eventual thoughts before verbally responding. We are aware that this borders on also strengthening the reprocessability quality of the system, but judged the primary contribution is to a high parallelism. Henceforth, the second possibility to respond and converse around the provided description is via the chat function. However, we are aware of that this feature deviates from the objective of promoting convergence. This due to that is might be the case where several participants have the same or similar question. Hence, by answering/ providing information in a closed chat forum entails the others missing out on the information, probably leading to the same question being raised several times. An exemplary solution could be creation of "threads" enabling everyone to see the written information. However in such case it can be argued that the parallelism quality becomes too high and interferes with the goal of creating a shared understanding of the conversations. In addition it is not guaranteed that all participants have a personal laptop to their disposals during the meetings, which means that it is the verbal communication that should be promoted.

- *Immediacy of feedback*

Immediacy of feedback is the media characteristic that has been designed for the least, but is nonetheless an important characteristic to consider when aiming to prompt convergence. Moreover, high feedback often brings a quicker and precise communication between sender and receiver, for example allowing a chat message to be quickly edited. This in turn is suggested to increase interactions between the different parties (Dennis and Valacich, 1999).

The two functions which can be referred to when discussing immediacy of feedback is *Chat* and *Poll*. A first factor which this media characteristic depends to remain on a high level is to have a strong connection that remains stable during the whole time the meeting is ongoing (Dennis and Valacich, 1999). Furthermore, for the chat and poll to uphold a high immediacy of feedback

also requires that the sender (for example the person creating the poll) and the receivers (all other meeting participants) to interact synchronously (Dennis and Valacich, 1999). To accomplish this a notification system has been designed, which notifies the participants when a poll has been created and requires attention. A second difficulty that is suggested to be addressed is the assumption that high feedback often encourages overhasty replies and therefore hinders people to reflect on their answers (Dennis and Valacich, 1999). This problem concerns the chat function more than polling, but is nonetheless not looked upon as an issue since the chat function should be used as a secondary communication portal.

- *Rehearsability*

Being given the opportunity to refine a message before sending it to the receiver(s) one can believe is an obvious way to enhance performance, as well as one of the ways to prompt an understanding which is accepted and shared by meeting participants (Dennis and Valacich, 1999). Situations where high rehearsability becomes important in the context of remote meetings is when a message (or any other informational source) becomes intricate or/and when equivocality increases. This due to it fostering and contributing to a better understanding. Although, according to MST a media which composes high rehearsability usually brings a decreased level of immediacy of feedback (Dennis and Valacich, 1999).

Furthermore, one of the primary outcomes designated to solve such situations is the software feature, "*agenda*". The intention for the agenda is to act as a backbone for a meeting, displaying all key points which are to be discussed. The feature is thought to be effective for meetings where there's a motivation to diminish high uncertainty as well as high equivocality. Examples would be when there is insufficient information about meeting objective and several individual interpretations of meeting objective, roles and/or substance. Thus, the agenda is not necessary when there are few meeting-points to address, i.e. low uncertainty the and/or meeting participants having a clear picture of the meeting content and people involved.

There are mainly two ways/situations where the agenda is aimed to ease the process of creating a shared understanding. Firstly, as mentioned the agenda is created in the lobby and then included in the mail inviting concerned parties to the meeting. By providing the meeting participants with such written information, it opens up for the possibility to prepare for the meeting. Secondly, during the preliminary study it was observed that latecomers often felt the need to ask questions to grasp what has been said and what topic that was currently discussed. This uncertainty have been approached by displaying the input data inserted in the lobby shown as output on the external monitor as a horizontal bar displaying all the topics/meeting-points. By providing such outline the meeting participants have the opportunity to plan when to raise

certain questions or concerns, thus increasing the chance of greater joint understanding. This is also discussed by Barlow et al. (2002) who describe that the agenda could be utilized for time management within the meeting.

- *Reprocessability*

Compared to rehearsability, a characteristic targeting the event before a message has been sent to the receiver(s), reprocessability concerns the event(s) after the message has been received. More specifically, high reprocessability enables the meeting participant (Dennis and Valacich, 1999), to process the information to assure to gain a complete understanding of its content.

The functions that this media characteristic relates to is mainly the *Tag* and *Poll* function together with the *Shared files/Library* feature. How these two functions bring high reprocessability, is through storage of the data in the program feature Shared Files, a library which provides direct acquisition to all shared files and are also downloadable.

This supports convergence mainly by providing the people who were not able to attend the meeting, but still have the need of acquiring the same information as the people who were present. By disseminating information to those who were not at the meeting, opens up the ability to access information and thus prolonging the communication process. Although, even for the people to took part of the meeting discussions, this written information enables evaluation of the information post-meeting, which would be valuable for convergence when deliberation is required. This especially if there exists a high equivocality of the information.

6.2 Method Discussion

In this study, measures have been taken to ensure a high reliability. Some of them being usage of a manuscript to ensure that each interviewee was provided with the same information. In addition, assessment errors have been attempted to be eliminated by always involving two or three members of the team in the interview sessions. Although, since every interview were conducted on different places it could have an adverse effect on the studies reliability.

When it comes to the study and whether it can be generalized or not, the generalizability of the results is thought to be relatively low. This is based mainly on involving too few respondents in relation to the overall population, which also could be seen as affecting the validity of the results negatively. Although, by utilizing the two frameworks when collecting data during the observations could be argued to have had a positive effect. That is, it ensured that the same base of information was gathered from every observation, allowing us to compare the observational notes later on - increasing validity.

6.3 Future Work

Below are some aspects that have been considered but judged not to fit the scope of this project (and study), which makes them suitable as suggestions for future work:

- Utilizing more smart and advanced technology, one example being making use of mixed, or virtual reality techniques. This would enable meeting participants to, in a more detailed level demonstrate and showcase artifacts.
- This research did not include any creative processes such as for example brainstorming (or other ideation activities). Therefore it would be interesting to perform future work on how to accommodate meetings participants needs regarding such activities.
- A third suggestion for future work regards the social dynamic within the meeting, now especially referring to moderation. How would a higher degree of moderation affect the meeting and how could that be utilized in design? One example could be to let the moderator control the order of the queue.

7

Conclusion

The research question this study aimed to answer was:

What factors should one consider when designing an **interface** (of a video conference software) to enhance **communication** and promote a **shared understanding** amongst meeting participants of **formally** structured **remote** meetings?

Based on the findings derived from the study, including preliminary study, performed usability tests and evaluations in addition to the Media Synchronicity Theory, there is no single handed answer to the posed research question. Rather, whether communication is enhanced and a shared understanding promoted one can argue are dependent on the following three factors - *equivocality and uncertainty*, *group establishment* and *employee hierarchy*.

Equivocality and Uncertainty

- *Rehearsability*

The uncovered findings does not oppose to MST's statement that the rehearsability level in media used for video-conferencing should be high. One of the foremost outcomes aspiring to diminish high uncertainty and equivocality is the agenda. Although the designed function and its belonging features showed not be as necessary when there were few meeting-points to discuss. Conclusively, the MST's statement doesn't necessarily stay to true for all situations and it is therefore **suggested that one should design for rehearsability level between medium-high level.**

- *Reprocessability*

In accordance with MST the study detailed a great need of designing an interface which **supports high reprocessability**, prompting a joint understanding through providing a second chance of reviewing meeting highlights. An opportunity which is given to both people who did not attend the meeting as well as for those who were present, especially needed when the volume and the complexness of the meeting content are high.

Group Establishment

- *Symbol variety*

As the speak function showcases the need to address the most prominent issues, it is suggested that a video-conference media **ought to be designed with a high, alternatively medium-high, level of symbol variety**. The situations where the participants struggled with turn-taking processes and other communicative interactions occurred between both those who both knew, and had a professional working-history, as well as between participants who were non-acquainted with each. Hence, opposing MST's statement that groups who have established a working flow, are in less need of high symbol variety.

- *Parallelism*

When aiming to reach convergence MST prompts that a media's parallelism should remain low, this especially for groups who, as time passes by, evolves and establishes social norms. Nonetheless, as it is of great importance to maintain meeting participants attention to one another, this study has generated results **allowing one to argue for the parallelism level to be low-medium**. By adding a function which brings an additional way to perform a conversation doesn't necessarily have to decrease the chance of reaching a shared understanding, if designed in an *innovative way*. As showcased in the final prototype, an integration of the two functions, speak (including queue feature) and chat, can rather be looked upon as an "extended function" than two functions increasing parallelism and prohibiting convergence to be obtained.

Employee Hierarchy

- *Rehearsability*

As recognized during the preliminary study there were different needs regarding functions designed for rehearsability, one of the depending factors being on which level in the employee hierarchy the meeting participants were positioned. Conclusively, meetings held between managers tended to express a greater need for features such as the agenda and progressive timer than participants located further down the hierarchy, as for example project teams.

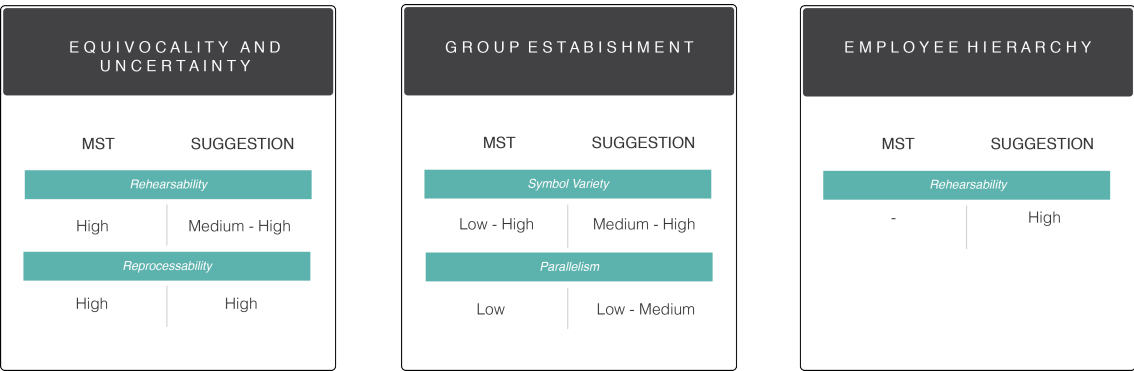


Figure 7.1: Conclusion Summary

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A

Usability Test Template

YOUR OVERALL EXPERIENCE OF THE SOFTWARE FUNCTIONS

PARTICIPANT INDICATOR FUNCTIONS

_____VISUAL FEED_____

**Definition of term, visual feed = video stream.*

I perceived the size of the visual feed to contribute to an overall satisfactory impression of the other remote participants.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

I perceived the size of the visual feed to be adequate enough in order to see and read non-verbal cues (e.g. body language, facial expressions etc)

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

I experienced the position/alignment of the video feeds to enable me to get a good view of the other remote participants

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

_____NETWORK STATUS_____

I perceived the indicator for the network status to be clear.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

SOUND INDICATOR

I experienced the way of showing the active speaker as clear.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

COMMUNICATION SYMBOLS



I perceived the four communication symbols (as a whole) as intuitive.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

I perceived the communication symbols (as a whole) to add to a positive meeting experience.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

I perceived the communication symbols as an effective mean to facilitate communication between participants.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

I perceived the communication symbols to ease turn-taking between participants.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

A. Usability Test Template

I believe this



(communication symbol) would be meaningful in a remote meeting.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

I believe this



(communication symbol) would be meaningful in a remote meeting.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

I believe this



(communication symbol) would be meaningful in a remote meeting.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

I believe this



(communication symbol) would be meaningful in a remote meeting.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

PERSONALIZATION

BACKGROUND

I perceived the personal background to contribute to a more informal and relaxed meeting context.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

INSTANT MESSAGING FUNCTIONS

CHAT

—

I experienced the chat function to complement the interactions made through the video feeds .

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

SETTINGS FUNCTIONS

SETTING OPTIONS

I perceived the purpose of the various alternatives in the settings function as clear.

Strongly agree ☐ ☐ ☐ ☐ ☐ ☐ ☐ Strongly disagree

Comments:

B

Observation Template

Framework constructed by: Lantz (2001) and Olson et al. (1997)

Date xx/xx - 16

Meeting #No.
Company, Location City

HUMAN AND TECHNOLOGICAL ASPECTS	VARIABLES TO TAKE INTO ACCOUNT IN THE FIELD OF MEDIATED COMMUNICATION
GROUP SIZE	<i>Number of meeting participants</i>
TYPE OF MEETING	<i>Problem-solving, status update, decision-making, etc.</i>
MEETING PROCEDURE	<i>Collaboration, problem solving, planning, training?</i>
COMMUNICATION	<i>Signals, Signs, Linguistics, paralinguistic, non Linguistics, Physical behavior body and arms, face, nods, gestures, turn taking, spatial relationships, glances, eye contact, nonverbal cues?</i>
TYPE(S) OF TECHNOLOGY	<i>Desktop and/or video conferencing system? Name of software</i>
USAGE OF FUNCTIONALITY (AVAILABLE IN THE SOFTWARE)	<i>Audio, Video, Chat, White Board etc..?</i>
GROUP CHARACTERISTICS	<i>The individual characteristic features and composition of the group, organizational factors, what is special just for this occasion (for example, differences in time and cultural differences).</i>
MEASUREMENTS ON GROUP PROCESSES	<p>The Communication Process. -</p> <p>Task Process: <i>how much time is spent on different tasks, the structure of how to perform the work (serial or parallel)</i></p> <p>Interpersonal Process, <i>Roles = conflicts, cooperation, affection and participation.</i></p>

Framework constructed by: Lantz (2001) and Olson et al. (1997) and Blessing et al. (2009)

OBSERVATION NOTES

1. Before meeting is initiated
 - 1.1. *Observational notes*
 - 1.2. *Reflective notes*
2. Ongoing meeting
 - 2.1. *Observational notes*
 - 2.2. *Reflective notes*
3. Meeting completed
 - 3.1. *Observational notes*
 - 3.2. *Reflective notes*

C

Interview Questions Template

There are four basic steps in solving a problem:

1. Defining the problem.

2. Generating alternatives.

- a. When it comes to generating ideas, from your perspective/experience, how could such process look like?
 - i. where - time and place?
 - ii. what - if you generate ideas within a meeting context, what type of meeting would that be?
 - iii. when - in the meeting?
 - iv. who - what are the roles and how are they distributed?
 - v. why - what's the purpose of generating ideas, why is this type of process beneficial for your work?

3. Evaluating and selecting alternatives.

Transition between phases

- a. When
 - i. From your experience, do meetings include any decision making activity?
 - ii. Do you separate the idea generation and decision making activities?
- b. How - How the transition from generating ideas to decision making is done?
 - i. Who - who is involved in the transition process?

During decision making

- c. How decisions are made?
 - i. does the video conferencing system facilitate this activity in any way? or/and do you use any other support systems?
- d. How do you document decisions during the meeting?
- e. Do you have a practise of making decisions anonymously?

4. Implementing solutions.

- a. How do distribute and use the results of collaborative efforts
- b. How do you follow up on the decisions made during the meeting?

Interaction with software - from a collaborative aspect

- a. What system do you use for remote collaboration?
- b. What are the most frequently used tools/features?
 - i. What is the reasoning for choosing a specific collaborative tool?
 - ii. What features and functionalities have served their purpose in an effective way, why?
 - iii. Are there any feature you wish you had, why?

Turn-taking and hierarchy

Hierarchy

- 1) In general, do you use roles in the meeting?
 - a) How does this work?
 - b) If not → Why?
- 2) Have you experienced any video conferencing software that support pre-defined roles? (a moderator?)
 - a) how did that work?

Turn-taking

- 3) How is turn-taking experienced across different activities?
 - a) How is this supported by the system?

D

Observation Analysis

MEETING NO#	MEETING TYPE	GROUP SIZE	SOFTWARE	HEAD CATEGORY	SUB CATEGORY	OBSERVATIONAL NOTES	REFLECTIVE NOTES	COMMENTS
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	DECISION MAKING	DM1. Reaching a consensus		DM1. O1. "SP participants asks if any comments or thoughts - very silent response, people nodding but not taking the word. One person finally speaks up SP participants seems a bit uncomfortable and makes a second effort to gain responses"	- Need for a feature that supports "passing on the ball", to facilitate decision making and prothing the occasional silence?
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			DM1. O2. "P1 ask "are we find with that?" P3 is the only one answering, with a silence and nod. "		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom				DM1. O4. "Participant from ottawa: "so that is what you are thinking, right?" - "..."	- such comments could indicate an uncertainty for the active speaker if the other meeting participants has understood what he has talked about ? Function for this?
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom				DM1. O4. "Linköping asking Kista "can you summarize the action points her for me" (after the topic has been discussed and on the move to the next)	- is there a need for something here? communication symbol?*
2	Sprint planning meeting	SE: 4, CH: 4	Polycom		DM2. Note Taking	DM2. O2. "P1 alle discusses something and adds it in the document but didn't tell the remote site.		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom		DM3. Occasional Silence		DM3. O2. "There is a lot of silence when a question has been asked"	- problem with sound, group dynamic?
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			DM3 O4. "when talking about next week, for scheduling another meeting the active speaker says "okay I don't hear any objections" - and then people starts to speak."		- Again, there is a silence where the presenter or active speaker has to make a comment or ask the question again to make people start talking
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			DM3 O4. "you are all soo quite" - woman at Kista		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			DM3 O4. "P2 " Is this ok with everyone?" - only one answer on the same site " I guess its ok"		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	PERSONAL SUPPORT	P1. Tools	P1 O1. "everyone in the meeting has its own personal computer, pen and notepad "		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			P1 O3. "The moderator is the one with a laptop, same as in the remote site."		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			P1 O3. "4 out of 10 people have laptops opened, 2 out 10 have a notepad, 4 don't have any other tools."		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			P1 O4. "60% has their own laptops with them"		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom		P2. When absent	P2 O4. "p2 one person's comes back"		- how long has he been away? Did he miss something?
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom		T1-HS. Roles (human-software)	T1-HS O4. "So the person controlling the screen sharing is not the same person who is the moderator"		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			T1-HS O4. hand gestures indicating when someone is speaking"		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			T1-HS O4. "Screen sharing is used throughout the meeting. One person opens up each participant's presentation or document and then that person presents it."		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	TURN-TAKING	T2. Primary Room Dominance		T2 O1. "Turn Taking starts between participants, moderator does not lead this. At this time the participant from Spain listens to the swedish group's discussion. Not really engaging in the diskussion (more of a listener)	- Need for support to engage in a meeting where there are big differences in group sizes?
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom				T2 O1. "ES participants seems to have problem hearing what the SV groups says. Presses the volume button on her laptop"	- One was under the impression that, since the ES participant was the only participant on that site she was more inclined wanting to following what was discussed on the swedish site. A speculation is that if they had been more, there is an option to rely on each other?
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom				T2 O1. "the discussions is mainly between SV participants, starts facing each other."	
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			T2 O2. "Ask the remote site if they have something to add, and the remote site starts answering and gets interrupted by the other site. They disagree and the P1 site starts discussing by their own."		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom		T3. Pre-defined/ un-defined agenda	T3 O1. "One person introduces the meeting and the agenda, everybody else listens."		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom			T3 O1. "One person responds och the moderator starts taking notes"		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			T3 O3. "Moderator sums up topics which is going to be discussed"		

D. Observation Analysis

1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	TURN-TAKING	T4. Attentive moves and Active Speaker	T4 O1. "Participant from Spain makes an effort to join the conversation by inhaling and starting to talk. Participant from Sweden becomes interrupted and now everyone turns their attention to the video-screen."		- Need for support to engage in a meeting where there are big differences in group sizes?
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			T4 O2. "the remote site starts talking but P1 raises his voice to interrupt."		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			T4 O2. "There are also occurrences of the remote site and SE participants talking simultaneously."		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			T4 O2. "When there's an occurrence of simultaneous talking between SE site and the remote site, Swedish participant stops talking, allowing the other site to continue talking."		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			T4 O3. "Already four times, people on both sides started talking simultaneously and then one person who insisted on talking continued."		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			T4 O3. "some participants felt awkward not very comfortable in the situations where they two people started talking at the time, and then once they realized it they stopped."		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			T4 O4. "P4 "I can ask my question now if it's ok""		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			T4 O4. "they often gave the word, by saying the others name"		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom		T5. Cultural Differences	T5 O2. "The remote participant seems, from time to time, be a bit difficult to understand due to different kind of pronunciation of words"		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			T5 O2. "The audio is of a very low quality and the Chinese accent is strong, but the Swedish site seems to understand what is said. The Chinese participants also talk very slowly, but that doesn't seem to cause troubles in understanding."		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom		T6. Occasional Silence	T6 O2. "Interesting observation is when settling on time for specific tasks, there is a mix of silence both within the Swedish group but also silence between sites. Waiting for someone to make a first suggestion?"		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			T6 O2. "SE site starts having an discussion and sums this up for the remote site. (No questions or no confirmation from the remote site)"		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			T6 O3. "Although there are quite long parts where the participants are silent, awaiting for someone to take the word"	- should this be supported? Is there a connection to the fact that there is no predefined agenda for the meeting?	
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			T6 O4. "There are quite long spans of silence between people talking, and then the active speaker has to pose the question "is there any questions?"	- could these silent pauses be shortened down or diminished with the help of the system?	
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	INTERPLAY	T7. Non-Verbal Cues	T7 O1. "Seems to give a new participant the word by a nod and eye-contact."		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom			T7 O1. Uses a lot of gesturing to emphasize speech		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom			T7 O1. "turn taking flow smoothly (cues: leaning forward, gazing, inhaling, hand gestures)."		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			T7 O2. "Used gestures, hand movements and changed the way he sat when he answered the remote site."		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom		IP1. Temporal Dispersion	IP1 O2. "man kan lämna över rapportering som dom är bra på, och sen lämnar dom tillbaka det när vi vaknat"		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			IP2 O3. "Remote participant signs thumbs up when he likes a comment made"		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom		T9. Non-Verbal Cues	IP2 O3. "The participant on the remote site uses a lot of hand gesturing when explaining"		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom			F1 O1. "The moment meeting has started everybody checked on the sound by saying "Can you hear us?"		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom		F1. Audio Quality	F1 O2. "You can hear the remote site discussing within themselves - impossible to hear what they are saying P1 (SE): "So we can set it to complete."	F1 O1. "Some of the participants contribute to the meeting, but talking very quiet which raises a question if they can be heard on the remote site."	
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			F1 O2. "Bad quality of sound - They leaned forward to be able to hear each other."		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			F1 O4. "The audio quality varies from site to site. For instance, the audio from Ottawa site is poor."		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			F2 O1. "one that displays presentation content."		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	SOFTWARE	F2. Existing Functions/ Features	F2 O2. "They have a new system, the old one had a "recent call list""		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			F2 O2. "Used outlook to show e-mails"		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			F2 O3. "Moderator talks about the shared content displayed in the screen"		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			F2 O3. "we use an external application when voting - survey monkey"		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			F2 O4. "The active speaker is focused by the system by a red frame"		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom					

D. Observation Analysis

4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom	SOFTWARE	F2. Existing Functions/ Features	F2 O4. "As mentioned, the space where the video feeds are displayed is surrounded by a red color frame when there is someone talking. Also, there is a green frame"	- green frame - indicating connectivity?
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			F2 O4. "At a point there where several sites commenting on the same question - although it seemed like not everyone was heard and the software did not help in this case. There was only one red frame, surrounding the site who spoke the loudest"	
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			F2 O4. "the screen only shows the other remote sites and not 'your own video feed (their own choice)'"	<i>That might be problematic because the system gives the speaker no feedback that everyone else knows that you are the active speaker (with a red frame)?</i>
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			F2 O4. "P2 " open ups an agenda and suggests a time form next week, showing the calendar"	
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			F2 O4. "When the person speaks it is impossible to see her face since the picture is so small and the number of participants is high, only to hear her voice and see a red frame which points to where the sound comes from."	
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom		F3. Functions perceived as absent	F3 O3. "want better interaction: draw easily o the board, just easily be able to share information [...] " would like to be able to draw on the whiteboard and load pictures to the remote site."	
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom		F4. Technical Setup	F4 O1. Two screen, one for video feed and one that displays presentation content.	
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom			F4 O1. "the camera positioned above the two screens covers the whole table"	
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			F4 O2. "Sharing content on one screen and video feed on the second Camera positioned above "	
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			F4 O3. "Sharing content on one screen and video feed on the second Camera positioned above "	
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista 4	Polycom			F4 O3. "The came at the site observed was turned towards one angle, so it didn't catch all the participants. When he spoke, he wasn't seen on the screen."	
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			F4 O4. "Two screens - one displays the shared content the other screen is split into four spaces - one space for each site"	
2	Sprint planning meeting	SE: 4, CH: 4	Polycom	F5. Changing Conditions	F5 O2. "Ericsson side is unable to connect to the remote site in China, because they cannot connect via the conference room system. The audio is on, but video is off. Instead, they launched Microsoft Lync and shared a screen with a remote site."	F5 O2. "One person seems in charge in calling the remote site, having difficulties entering the software - "Having trouble to finding the identity of your room" "can't really write any letters, for some reasons" ... " should we do it over the regular lync then"	<i>- Reason: The other remote site switched system. The previous system had a "recent call list", which the new one hasn't, making it difficult to contact the remote site --> Audio-only and no video streams are visible</i>
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			F6 O2. "det blir en glävsägg emellan, det kommer du inte ifrån"	
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom		F7. Connectivity	F7 O4. "when switching between persons for screen sharing, they are experiencing some technical problem (connection)"	
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	F8. Non-Verbal Cues	F8 O1. "SV points (hand) at the screen with shared screen to refer to specific content."		<i>- Need for a function that allows meeting participants that's not the moderator/remoteing (facilitator) to be able to point at the shared content?</i>
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			F8 O2. "P4 adds a comment and points at the screen"	
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			F9 O2. "Existing functions: currently presenting, give control as a drop down menu, stop presenting and a marker - They didn't ever use these functions."	
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	F10. Intuitivity	F10 O1. "another person wants to start screen sharing (from his personal computer) - having troubles, expresses that he doesn't want to display whole desktop, and seems confused how to accomplish that"		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			F10 O4. "When of the participants was speaking, it was hard to understand from what site he or she was speaking "	<i>- Need for feature which displays the location of each remote site?</i>
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom			MP1 O1. "another person states "let's move on to the meeting and you can have another meeting to discuss this" (not the moderator)"	<i>- should be added that when the participant made this comment he was referring to the time (pointed on his watch). Need for a function facilitating the agenda, time management?</i>
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	MEETING PROCESS	MP1. Time Management	MP1 O1. "moderator takes the word and switches to the next subject. Looks at his watch and says: "we have 8 minutes left, it could be tough, we have three areas to go" - ki 09.53 (meeting suppose to end at 10)"	
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom			MP1 O1. "moderator switches to the second subject - time 9.58. Another participant "there is no more time to highjack" people laugh - active speaker talks for 2min, third topic got 15sek "	
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			MP1 O2. "P1 to remote site: "Are you guys staying? "laughter" We are are not getting kicked out from this room as last time"	<i>- indicating issue with time management?</i>
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			MP1 O2. "P1: "Okey guys, so we are finished within the time frame"	<i>- the second time the "time aspect" is brought up in a way which leaves the observer to think that time management not always are easy to handle</i>
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			MP1 O4. "P3 " that's my 25 seconds"	<i>- An ironic statement. Proof of that there usually difficulties conducting the meeting within the given time frame?</i>
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom	MP2. Moving Forward	MP1 O4. "P2 " "you all so quiet!" this is just the beginning, we made it, 2 minutes before deadline."		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			MP2 O4. "should we move forwards? - or did we approve this one" (referring to the topic they just talked about)	<i>- hinting that you not always know if everybody is on the same page,?"</i>

D. Observation Analysis

2	Sprint planning meeting	SE: 4, CH: 4	Polycom	SOCIAL ASPECTS	A1. Acquaintanceship	A1 O2. "Us: "We have noticed that you don't use any video streams, what's the reasons behind that choice?" P1: "No purpose of a video feed. We all know each from before, good for the first times but then not so effective. Everybody just looks into the screen anyway, not adding that such " - ask again"		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	LEVEL OF PARTICIPATION	L1. Multitasking	L1 O1. "other participants reads emails, taking notes other activities on their computer"		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom				L1 O1. "another person starts interacting with the mobile phone"	~ "Difficult to know if this is because of lack of focus or if the person at hand doesn't have a part in the topic which was discussed. Or, it could simply be that he is a good multitasker?"
2	Sprint planning meeting	SE: 4, CH: 4	Polycom				L1 O2. "Starts to answering e-mails on his personal mobile phone, seems that he's not as engaged in the meeting as in the first hour"	
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			L1 O4. "Everyone looks at the videofeed except the 2 persons from Lund that looks at their computer instead."		
1	Status update: Strategic planning and discussion. Focus area - network transformation (once a month)	SE: 10, ES: 1	Polycom	INFORMALITY	INF1. Before Meeting	INF O1. Before meeting: "Participant from the Swedish site is engage in small talk"		
2	Sprint planning meeting	SE: 4, CH: 4	Polycom			INF O2. "Participants are having a small talk, greet each other. One of the participants attempts to initiate a video call."		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			INF O4. "everyone introduces who they are and they profession. - there is one person who facilitates this activity"		
3	sync meeting - not fixed agenda	Lindholmen: 5, Kista: 4	Polycom	DOCUMENTATION	D1. Roles	D1 O3. "Moderator takes notes during the whole meeting (both sites)"		
4	decision-making, information-sharing, planning, status update	Lindholmen: 2 Kista:10 Ottawa: 1 Linköping: 2	Polycom			D1 O4. "One person located at lindholmen is taking notes, and you could see the same happening in the other sites"		

E

Content Analysis

DOCUMENTATION				
D1. Reason for documenting				
D2. When to document				
D3. Ways to document				
D4. Follow-up				
D5. Roles				
P1	P2	P3	P4	P5
D1. Positive	D4. Uncommitted	D1. Uncommitted	D3. Uncommitted	D3. Positive
D1 P1 (P). " in order not to have to document anything after the meeting"	D4 P2 (U). "We decide also in the brainstorming structure, or voting or counting. Okay , we look into it. And then next meeting you have structured suggestions presented him/her. "	D1 P3 (U). " We don't document the decisions. Or it depends on the decision. I mean if it is a suggestion for a API then we have a document running before the meeting like the presentation, and then after the meeting we say "okay now we will finalize this to make decision log or similar". "	D3 P4 (U). " wikisida, som det är lite skript runt.."	D3 P5 (P). " Yeah, for sure documentation is needed. And I must say, I think usually it's done in written words, the decision. Even if you present something visually like a shared screen, decisions are made by text and describing what we saw."
D2. Positive	D4 P2 (U). "So some decisions are made, and then next meeting people will hear about the results of assigned tasks."	D2. Uncommitted	D4. Positive	D3. Uncommitted
D2 P1 (P). " During the course of the meeting that is, in order not to have to document anything after the meeting."		D2 P3 (U). " We don't document the decisions. Or it depends on the decision, I mean if it is a suggestion for a API then we have a document running before the meeting like the presentation, and then after the meeting we say "okay now we will finalize this to make decision log or similar". "	D4 P4 (P). "Det följer man upp på nästkommande möten. Det ska vara lättgängligt "	D3 P5 (U). "You solve things, put it in a PowerPoint or a report"
D3. Uncommitted		D4. Negative		D3 P5 (U). " the small micro decisions maybe, taking notes on a paper."
D3 P1 (U). "if i am responsible for the meeting then i would document it electronically. "		D4 P3 (N). "No we don't follow up , ehm, maybe we should but we haven't got that time to follow up "		D3 P5 (U). " . Sometimes the meetings are, you have one writing in a word document, and you see when he or she writes"
				D3 P5 (U). "But usually document it afterwards in a memo, report pm or whatever. Paper to word or PowerPoint, for many companies PowerPoint is like the documentation form, so they ship around PowerPoint's with the like agenda, picture on what have taken place and the summary and decisions in the PowerPoint. Visual together with text"
				D4.Uncommitted
				D4 P5 (U). " I think it's differs on cultures, but the project leaders and maybe the sub leaders like from smaller teams they have to relate to the decision on the document. So they go into that to look to work with their work and to consider the decisions which could be very technical decisions, like using that platform or that code, whatever. They need to go back to that and read, and yeah. And the, another part of that work is how to handle not only the decisions but the requirements"
				D5.Uncommitted
				D5 P5 (U). " I think it's your laptop, someone has the role of putting notes. Usually the project leader does that, short notes from the meeting – during the meeting"

DISTRIBUTION				
M1. When to distribute				
M2. Type of distribution				
M3. Distribution dependent on type of meeting				
P1	P2	P3	P4	P5
M1. Uncommitted M1 P1 (U). " when the meeting is done and there is no more questions, then I distribute the results."		M2. Uncommitted M2 P3 (U). "decision log or similar [...] since usually the one who wants some change is the one driving"	M2. Uncommitted M2 P4 (U). " M:hur allt distribueras, hur går det till? P4: Mail"	M2. Uncommitted M2 P5 (U). "Maybe you link to a dropbox or some other database where more information is gathered."
M2. Uncommitted M2 P1 (U). "Could be in the form of a powerpoint file or an email"			M2 P4 (U). " och kunna dela på information i form av PowerPoints"	
M3. Uncommitted M3 P1 (U). "But it could be different, if it is a more formal decision then maybe you want to.. if it is a more complex situation, maybe then you would need to follow it up with some sort of communication plan or something like that. "				

E. Content Analysis

TURN-TAKING				
T1-HH. Roles (human-human)		T1-HS. Roles (human-software)		
T2. Informal/ formal meeting				
T3. Pre-defined/ un-defined agenda				
T4. Attentive moves				
T5. Communication Symbols				
T6. Connectivity				
T7. Hierarchy				
T8. Equality				
T9. Non-verbal cues				
P1		P2		P3
T1-HH Uncommitted		T1-HH Uncommitted		T1-HH Positive
T1-HH P1 (U). "Depends on the type of the meeting, if it is an informal session, than usually the meeting caller is the person who also runs and leads the meeting"		T1-HS P1 (U). "M:I see, so have you experienced any video conferencing software that support these roles? P1- Yes, in training!"		T1-HS P3 (P). " But I have come across meeting where this might have been needed, and at the same meeting a moderator would have been needed in order to support that"
T1-HH P1 (U). "If there is a meeting with a pre-defined purpose... maybe a review meeting, or what we call an inspection meeting, and if you use that we have a moderator, a secretary, you may have a presenter (could be the moderator also. But these three roles, un-dependent on how many people you are, these three would be roles... as well as reviewers. Could also be the author, it's also part of it. Extremely well-defined		T1-HS P1 (U). " Yes, in training!" [...] there is a moderator doing certain things... you have a software facilitator who facilitates the communication,"		T1-HS P3 (P). " more likely that the person who organises the meeting takes a more "leading" role. But in these meetings we are so self-going, we don't need that because we know what we want to get. It's a lot easier to communicate if you know each other from before, or if you have met. "
T1-HH. Negative		T1-HH P2 (U). "you receive a new booking confirmation, so you become like moderator, so everybody knows now you called in like a moderator of the meeting. But it's not like that in Lync, unless you started a group chat, but not other visible role distinctions. "		T1-HS. Positive
T1-HH P1 (N). "The problem is that if you have people who is immature, and are not able to... if the author is there for instance some people take it very personally if they get comments on their work. [...], but as a moderator you have to allow for that and make sure [...]. I had to break off a meeting, because the author couldn't accept"		T4. Negative		T1-HH Uncommitted
T1-HH P1 (N). "This is costly, because you have to prepare very well and you are on a time schedule, you have participants... so you have to be very structured if you run those meetings. Otherwise you won't be able to finalize the review within the time frame" (connected to one above)		T4 P2 (N). " usually they would need then to repeat again, because they would jump in in the middle of group's discussion"		T1-HH P3 (U). "No we don't anyone who spoken to be the moderator or secretary or else"
T2. Uncommitted		T7. Negative		T2 P4 (U). " ". Är det till exempel är beslutsmöte så har alla samma roll och kanske håller i olika delar. Om det ska finnas roller beror ju lite på vilken uppgift som ska lösas. "
T2 P1 (U). "Depends on the type of the meeting, if it is an informal session, than usually the meeting caller is the person who also runs and leads the meeting"		T3. Uncommitted		T4 P5 (N). "But you can not do it in the other way, you need to scream out! Anders I'm here, I have a question" You need to wait we are talking about this. "ok don't forget me."
T3. Positive		T7 P5 (U). "Or you by presenting yourself you set the hierarchy. And I think that that's the normally set before, so you come to the table and it's my turn. I'm the project leader for this project everyone's just go back, he will lead. That's the automatically, and especially if you present yourself in the first time in such a meeting when you like tell your title or rank, it's automatically in people heads set up an hierarchy that affects the meeting."		T7 P5 (N). "M: Any ways to encourage them to speak?"
T3 P1 (P). "If you have a defined process such, as a review in my experience it is easier not to miss capture important questions."		T7. Negative		T7 P5 (N). " You don't hear anything from some of them. But they should speak or raise their voice. They will never do it since there is a manager in this room or in their room are presence. "
		T7 P5 (N). "M: To ask them of course, if there is a good moderator or project leader, that know that they are four others, and that they are skilled at this, then they point and ask them and give them the voice, in a good way so you don't offend the manager in that country, sitting in that room. Usually you have to ask a question to a manager, and then he ask the you or ask for their opinion."		T3 P4 (U). "Men är det ett mer diskussionsmöte, då finns det ju ingen riktig tydlig ordförande som driver på samma sätt. Då är det mer klockan eller agendan som styr, någon som håller koll på det såklart."
		T4. Positive		T4 P4 (P). "Nej, men det skulle man ju kunna systematisera att man ska kunnia be om ordet. Men samtidigt vill man ju också ha så som det är i diskussionsmöten när ordet flyger fritt"

T4. Negative

T4 P1 (N). "They just raise their voice, that's usually the way it happens. If the dialogue doesn't stop, and if they have something important to say they continue to push for attention until they get it. [...] maybe I didn't want to break off a discussion but I still want to get attention to what I want to say then I Lync the person who drives the meeting, or if it somebody I know amongst the others then I email, Lync or text that person. "

T5. Positive

T5 P1 (P). "In training [...] if you like something there is "thumbs up sign" and if you want to put up a question to the group you can "raise your hand" and there is a button for it. If you want to talk you can request control... so they have facilitated the most important, or the most common interaction "

T6. Negative

T6 P1 (N). "but where it can be a problem, is when you notice within a meeting that you have a poor phone link in one of the sites.. then that site is very likely to be down-played because nobody could hear what they are saying anyway. So... it's only a waste of time to have them into the dialogue, maybe you mute to only to listen."

T7. Uncommitted

T7 P1 (U). ". But very often also, if you have persons who is from a technical perspective very proficient, they have a different type of authority. They have authority because they know how it works, so everybody tend to listen to them"

T8. Uncommitted

T8 P1 (U). "And usually there are usually some other remote parts present[...], and then it is even more important that everyone gets their hand into it. "

T4. Negative

T4 P4 (N). "det är ju grön markerat kring den som pratar". Så när någon pratar och så börjar någon annan prata så får man sitta där tyst. Det blir "lite såddä (lutar sig framåt)" och sen "nej okej... (lutar sig bakåt igen)". Det är lite så man försöker skapa någon turordning. Vet inte hur man ska göra annars.. "

T9. Positive

T9 P4 (P). "titta på varandra för att se hur folk reagerar och höra på rösterna hur de reagerar"

T7 P5 (N).

"when I'm the little guy it's difficult to going in and it's also sometimes when I'm the meeting leader to keep the voice to someone because you don't know it, that he has want to say something, you don't see it."

T9 P5 (N).

"then you can lean forward or raise a finger or just look at the people who talks, like I need to talk now. That's a subtle thing, social competence in some sense. But if you are in another site you don't see so much of the video you don't see if he leans forward."

SOFTWARE				
		F1. Audio and Video quality		
		F2. Most frequently used features/ functions		
		F3. Features perceived as absent		
		F4. Technical setup		
		F5. Changing conditions		
		F6. Presence		
		F7. Informality		
		F8. Accessibility		
		F9. Integration		
P1	P2	P3	P4	P5
F1. Positive	F2. Positive	F1. Negative	F4. Negative	F2. Positive
<p>F1 P1 (P). " M: Interaction tools.. what do think of them?"</p> <p>P1: They help a little bit, but again, it is the audio quality that is of most importance. If that doesn't work it doesn't matter how fancy the software is. So it still comes back to the basics, and very often the software can't control that "</p>	<p>F2 P2 (P). "The important thing is information is shared"</p> <p>F2 P2 (P). "chat, you discuss, you share information, you can have a video call, phone, share screen, give access to your desktop [...] The features I mentioned earlier we need the most, since they help solve necessary tasks."</p>	<p>F1 P3 (N). "I think there is room for improvement.. especially audio,- and video quality. I heard this time (referring to the last meeting) that our picture froze and I guess some words where lost also"</p>	<p>F4 P4 (N). " M: är det lättare att ha en fysisk whiteboard? [...] ja det tror jag! För att egentligen så skulle man ju vilja ha en lös kamera, en kamera som var separat där man kan visa whiteboarden. För liksom om man går in i ett sådant rum, och så ska man behöva vända kameran på skärmen mot whiteboarden. Men då har man ju zoomat bort den kameran. Egentligen skulle man ju vilja ha flera video feeds till detta, och den behöver kanske inte behöver vara så snabb den skulle ju kunna skicka stillbilder, med</p>	<p>F2 P5 (P). "And as I said later, the most efficient that I like the most is to share the desktop easily, so you can share what I do and then you switch to her"</p>
		F2. Uncommitted	F5. Negative	F2. Uncommitted
		F2 P3 (U). "the tool which allows you to share you desktop is the most used one, and if the only tool used"	<p>F5 P4 (N). " Mm är det långa delays så kan det vara svårt, asså typ när svarstiden är dålig. Men i videokonferensen så ser man ju oftast vilken... det är ju grön markerat kring den som pratar. "</p>	<p>F2 P5 (U). "That you share screen to see what you or others have on their desk"</p>
	F2. Uncommitted	F3. Negative	F8. Negative	F3. Negative
	<p>F2 P2 (U). "Gathering the input, hearing the reaction, filtering out the information. "</p>	<p>F3 P3 (N). "whiteboard would be helpful"</p>	<p>F8 P4 (N). "Sen ska man ringa och det är långa koder man ska slå in. "</p>	<p>F3 P5 (N). "It's not a good "talarlista" Speaking list or it's not supported at all, it's difficult especially if you are like many sites, which is very common 2-3-4-5 places and you don't see the faces at all because they are so many it's going to be that small. People start talking the same time and you don't see that he cannot raise his voice, you need to be dare to do it. "</p>
		F3 P3 (N). " be able to point . Sometimes in meetings you see people pointing in the air, and you have no idea of what they are pointing on. I think that that is kind of strange that it isn't supported, because you do it quite often in a meeting. The one presenting can point with the mouse but for the others it impossible to use the mouse. [...] And usually in our meetings, we are quite few so then people stand up and ask "is it okey if i point" . Sometimes when we have drawn flowcharts and things like that then pointing is quite crucial, people will ask "why can't we move this to hear"."	F9. Negative	F5. Positive
			<p>F9 P4 (N). "Dom är väl inte jättebra någon av dom.. dom är lite krångliga. [...] ibland funkar det inte att koppla ihop datorerna för att visa grejer och i vissa konferensrum så finns det bara en skärm ..och så kan man inte se dom är med när man visar. Det är många små detaljer. Sen om man ska både ha videokonferens och folk som ringer in så måste man dela både på Lync och videokonferensen ..man skulle ju helst vilja se att det är lite mer seamless."</p>	<p>F5 P5 (P). " Sending messages, specially when the system is not working well, then you need to send messages"</p>

F4. Negative

F4 P3 (N). "the camera gives a good view of the ones sitting closest or the ones that are furthest away."

F6. Positive

F6 P5 (P). " in the beginning of the meeting, the most effective is to see each other, so that that work. You don't see an icon of a person, you see the person moving and talking and hearing of course"

F6 P5 (P). "Maybe more presence, more total presence, 3d more whole body. So you can move in a volume more easily, so when you move out you are gone and then you come back. So you can move and they see you, and then you go and point and when you talk to a person in a room they can follow and see that even if is a part of the room. Which I could do now"

F6 P5 (P). "To have the presence I think, so you can see the body posture or the hesitation. And its quite limited today, especially when the video is like that, is he smiling or is he angry?"

F6. Uncommitted

F6 P5 (U). "So it's the window to the others, in the beginning see the faces and then quite rapidly you go into the sharing what you do. "

F7. Positive

F7 P5 (P). "You have the coffee, chat a little bit, see each other eyes, and then you start work, you don't look at people's eyes as much. You just look at the stuff that you have to work with, and the check up sometimes which is missed in this usually software since then the camera is not on in the same way"

F7 P5 (P). "I can see that or maybe overhear something, which is good for the discussion, or the problem-solving. "

F8. Positive

F8 P5 (P). "And of course a more smooth set up, starting so you just open. Like when you entering a room, it should be like that. [...] And then you have to talk to other guys in brazil that needs to be expert on that system to make it work. It's so money and time consuming when these struggles it takes time away from the problem solving, so the meetings are always shorter."

IDEATION				
I1. Processing ideas				
I2. Preparation (before meeting)				
I3. Raising ideas				
I4. Meeting structure				
I5. Roles				
I6. Tools used				
I7. Different starting-points				
I8. Showcasing ideas				
P1	P2	P3	P4	P5
I1. Positive I1 P1 (P). "or at least ideas that leads the discussion in a completely different direction. Usually, maybe not correct but will spark up their ideas. [...] t is still takes the discussion in another direction. "	I3. Uncommitted I3 P2 (U). "Otherwise, it's a free brainstorming in the meeting, like What do you think?"	I2. Uncommitted I2 P3 (U). "Usually we try to think about a problem on beforehand, so that, most of the ideas doesn't come up on the meeting"	I1. Negative I1 P4 (N). " [...] whiteboard. Lite så du vill göra i konferenser, asså tydliggöra, stärka en diskussion då. Man vill gärna att det går snabbt. För det är ju det du gör när man är i samma rum, typ "okej jag ritar en liten bild här" och sen suddar någon annan ut och så bygger vi på den istället. Och då kanske man skulle kunna komma till ett mer ide-genereringsstadie"	I1. Positive I1 P5 (P). "Sometimes in the problem-solving, you put things away, this idea was no good and after half a day work we realized that the idea consists of "combinations" of this, and we end up choosing this path anyway. "
	I5. Uncommitted I5 P2 (U). " So always there's a specific topic. For example, there's a presenter that has more knowledge who presents, does Q and A and leads the discussion. He also always gets an input from the audience or from every side, and then you try to describe a problem, you try to see what future scenarios could be, you can describe those in advance. "	I3. Uncommitted I3 P3 (U). " But, in the cases where you find some ideas then we usually just say it out loud, and then you'll see everyone's reaction. "	I3. Uncommitted I3 P4 (U). "vi har ett problem här, vad finns det för lösningar.?. Det är mer en diskussion, mer på en diskussionsnivå.."	I2. Uncommitted I2 P5 (U). "Or just put things in notes and discuss it and also you sometimes are given the choices from the client this is the path you should work from, then its more limited. "
		I4. Uncommitted I4 P3 (U). "We have some other recurring meetings where the agenda is more strict and where you pretty much only present what you thought and then there is no room for ideas."	I3. Negative I3 P4 (N). ".det är svårt att vara kreativ remote. "	I4. Uncommitted I4 P5 (U). "sometimes as a more structural brainstorming, with a process for it, a brainstorming leader. "
		I5. Uncommitted I5 P3 (U). "the times where we come up with ideas outside the actual meeting then the one who came up with the ideas is the one to present. But then we some other members in our team which are better at creating powerpoints and then maybe they want to it that way."	I5. Uncommitted I5 P4 (U). " är det någon speciell person som tar en ledande position då? P4: Det är nog olika.. det är ju beroende på vilket möte det är."	I5. Positive I5 P5 (P). "I think it's good, mostly good, because then it's un-dramatical. It's not so, then he is the king for two hours or four hours, the managers is not the king as much. He can be the bad guy, because he as the role to be the moderator. When, that's a quite neat way of evolving problem and ideas into like good presentable situation so you can decide on it"

18. Positive

18 P4 (P). "fysisk whiteboard [...] För som jag sa, ofta kan man helt parallella diskussioner, och det är jättejätte vanligt. Och då, detta kan man då förtydliga med en bild, att man ritat lite vad man pratar om, "hur systemet funkar", "vilka gränssnitt det finns", "dom här signalerna går på den här nivån"... "okej, okej nu fattar jag varför du yrar så mycket här borta". Detta är oftast ett problem med möten."

15. Uncommitted

15 P5 (U). "That different departments here or in Stockholm or in Lund they work differently and how much they work with brainstorming. For example how much they let the engineering person's raise their hands or if it's the project manager doing the decision"

15 P5 (U). "Yeah sometimes there can be a moderator, that's typically the brainstorming workshop leader. He has no position, actually, any formal. He has just been taking into the meeting to be the facilitator or override, he don't take the decisions but he can help the summarizing trying to get those views, of the shy ones, "

16. Uncommitted

16 P5 (U). "I don't have the full answer but the feeling is that it takes place on the whiteboard"

17. Uncommitted

17 P5 (U). "So it's difficult for me to say it's like that, because it's so many different types of projects and situations for us as a consultant company working with so many different clients, different cultures – how to do things. "

18. Uncommitted

18 P5 (U). "You need to share something especially if it's problem-solving, just put it on the wall or by using **post-it**, **even shape it with paper** or whatever. **You need to show it.**"

WORKING ANONYMOUSLY				
W1. Authorization W2. Ways to work anonymously W3. Reason for working anonymously?				
P1	P2	P3	P4	P5
<div>W1. Uncommitted</div> <div>W1 P1 (U). "And of course it also depends on the questions, maybe there are certain people who are not authorized .. sometimes you work on something that needs a certain NDA or something like that. You don't know if that person has that NDA then you go with those who does have it. "</div>	<div>W2. Uncommitted</div> <div>W2 P2 (U). "Sometimes we are asked to give input on anonymous base. It's done by e-mail, so you will send it to that person who requested it and so no one will see it. "</div>	<div>W2. Positive</div> <div>W2 P3 (P). "I would call some issue sensitive because we are quite... or our opinions are quite different in some things but we don't handle those things anonymously because everyones know what everyone's think pretty much"</div>		<div>W2. Uncommitted</div> <div>W2 P5 (U). "Yeah I think so, but it's not common, it has happen and in a voting form. You write on a piece of paper and collect and see how many votes the path or the solution. But it's not very common I must say, but it would be good to do it, the you would get away from the pressure and hierarchy aspects."</div>
<div>W2. Uncommitted</div> <div>W2 P1 (U). "hen we set up two different Lync sessions: one chat with those who authorized and the other one with those who are not. that's how you split it. And sometimes when there are a problem related to, when you need a certain authority, then you just leave the others out of it"</div>		<div>W2. Uncommitted</div> <div>W2 P3 (U). "So there is no need to do that. But if we have the need to do something anonymously, I guess we would "hide it behind the team" so to say. So if someone has something to say then we would say that "this comes from our team"."</div>		<div>W3. Positive</div> <div>W3 P5 (U). "Yeah I think so, but it's not common [...] But it's not very common I must say, but it would be good to do it, the you would get away from the pressure and hierarchy aspects."</div>

DECISION MAKING				
DM1. Reaching a consensus				
DM2. Roles				
DM3. Handling decisions				
DM4. Informality				
DM5. Ways to conduct decisions				
P1	P2	P3	P4	P5
	DM2. Uncommitted DM2 P2 (U). "The person makes a decision after the input has been received. "	DM1. Positive DM1 P3 (P). " We try to align everyone, so everyone thinks that it is the best solution. "	DM1. Negative DM1 P4 (N). " Ja ibland tar det ju tre möten innan folk fattar att man pratar om olika saker.. och det går ju inte att ta några beslut då. Det går långsamt då, och ibland får man försöka tvinga fram reaktioner så att man kan se hur folk reagerar och trycka frågorna för att säkerställa att man är på samma nivå."	DM1. Positive DM1 P5 (P). "You need your back free, so that you all agree on what you decided on, so it's no "fluffy". So that's as formal as possible, if you leave open what you have decided on the client can come back and say, you should have done this. You should have it in written quite formal so everyone understand what the border are and where the start and the end is."
	DM5. Uncommitted DM5 P2 (U). "We decide also in the brainstorming structure, or voting or counting."	DM1. Uncommitted DM1 P3 (U). "we pretty much ask the questions out loud, like "do you agree", [...]. It does work quite well, so that's why I think we haven't tried anything else. "	DM5. Uncommitted DM5 P4 (U). "t någon lägger fram något och är det ingen fråga på det, så blir det nedskrivet i protokollet som ett beslut."	DM2. Uncommitted DM2 P5 (U). "the decisions are made by the project leader mainly, sometimes with a manager's where the project leader exist. So it's not all the time that he decides what path and ideas to go for it depends on how big the project are. And sometimes he, the project leader, who should take decisions, of course take input from the table with people involved."
				DM2 P5 (U). "M: How is the transition from generating ideas into decision making, how is it done is a specific person who is involved in this process? [...] think usually it's pointed person , either you work in workshop, brainstorming workshop format then it's the Workshop leader who summarize. Ok then we understand, is it this part we should agree on? If it's more an engineering meeting then it's probably the project leader that is more having a laid back role but still is the leader. "
				DM2. Negative DM2 P5 (N). " if you, eh sitting on different sites it's normally the project leader has started the skype meeting. Then he is more able to take control. Of the existing system available, he can put people away if they are... not.. if they arguing to much or whatever. It's not very supporting I must say. "
				DM3. Uncommitted DM3 P5 (U). "Move a post-it to that side, that's a decision that you don't know, it's not the top priority."
				DM4. Positive DM4 P5 (P). "In the end of the meeting or after the coffee break, when you have all the things done, you try to summarize what to go for"

SOCIAL ASPECTS				
A1. Acquaintanceship				
P1	P2	P3	P4	P5
	A1. Positive	A1. Positive	A1. Negative	
	A1 P2 (P). "when you have newcomers, it's important to get a facial recognition and so on. But later we discussed it's a bit, and I think it's not that important later on, because you are looking at what other person is presenting or you look at your desktop. Or maybe you would look at people out of courtesy, it's not adding too much."	A1 P3 (P). "we don't have a fixed moderator, like a "fixed" moderator. It's more likely that the person who organises the meeting takes a more "leading" role. But in these meetings we are so self-going, we don't need that because we know what we want to get. It's a lot easier to communicate if you know each other from before, or if you have met. "	A1 P4 (N). "Jag tror att man måste ha fysiska möten också, som komplement till remote, så man träffas tillräckligt ofta för att man ska lära känna person man sen pratar med remote och kunna ta bra och mycket beslut. För det känns som att, i team där man har pratat mycket så kan man väldigt bra kommunikation och det funkar jätte bra, och sen jobbar man inte lika mycket med varandra och då blir det uppförssbacke igen. Man måste bevara relationer för att kunna prata på samma nivå, men det är svårt remote."	
SECURITY				
S1. Authorization				
S2. Audio only				
P1	P2	P3	P4	P5
			S1. Uncommitted	
			S1 P4 (U). "I kombination med den wikin [...]. För där kommer ju nästa dimension.. om det skulle finnas med i videokonferens- systemet så måste det ju vara separerat mellan vilka som är inloggade och vem ska få tillgång till vilken information och så. Det är en viktig aspekt.	
			S2. Negative	
			S2 P4 (N). " För det svåra är ju dom där som ringer in som inte är med och som inte ska vara med.. det är ju inte så att man räknar och har en tydlig uppfattning om vilka som har ringt in ju [...]. Det har ju funnits tillfällen där folk har busingt, där folk har spridit dom där konferens-nummrerna"	

F

Observation - Extracting Needs and Creating Requirements

HEAD CATEGORY	SUB CATEGORY	NOTES (D = Observational, R = Reflective)	NEED	FUNCTIONAL REQUIREMENTS
DECISION MAKING	DM1. Meeting a consensus	DM1-D1. "If participants also if any comments or thoughts... very short response, people nodding but not taking the word. One person finally speaks up. If participants seems a bit uncomfortable and makes a second effort to gain response". - (R)	Meeting participants wants to get immediate response when a question has been posed	System should be able to support the active speaker to facilitate communication in by promoting feedback from the other meeting participants
DECISION MAKING	DM1. Meeting a consensus	DM1-D2. "P1 say "we find with that?" P2 is the only one answering, with a silence and nod". - (C)	Meeting participants wants to get immediate response when a question has been posed	System should be able to support the active speaker to facilitate communication in by promoting feedback from the other meeting participants
DECISION MAKING	DM1. Meeting a consensus	DM1-D4. "Participant from Ottawa: "so that is what you are thinking, right?" ...". - (R)	Meeting participants must be able to pose questions when uncertain	System should be able to support the active speaker to facilitate communication in by promoting feedback from the other meeting participants
DECISION MAKING	DM1. Meeting a consensus	DM1-D4. "Linköping asking Kida "can you summarize the action points for us?" (after the topic has been discussed and on the other side of the table)". - (R)	Meeting participants must be able to pose questions when uncertain	System should support meeting participants raising concerns or questions
DECISION MAKING	DM1. Meeting a consensus	DM1-D2. "P1 site discusses something and adds it in the document but doesn't tell the remote site". - (C)	The active speaker wants to be able to document during the meeting	System could support documentation
DECISION MAKING	DM1. Meeting a consensus	DM1-D4. "When talking about next week, for establishing another meeting the active speaker says "they I don't hear any objections", and then people starts to speak". - (C)	The active speaker wants to get immediate response when a question has been posed	System should be able to support the active speaker/ meeting facilitator to ease decision-making by promoting feedback from the other meeting participants
DECISION MAKING	DM1. Meeting a consensus	DM1-D4. "you are all so quiet" - women at Kida". - (C)	Meeting participants must be able to pose questions when uncertain	System should be able to support the active speaker/ meeting facilitator to ease decision-making by promoting feedback from the other meeting participants
DECISION MAKING	DM1. Meeting a consensus	DM1-D4. "P2 "is this ok with everyone?" - only one answer on the same site "I guess its ok" - (C)	The active speaker wants to get immediate response when a question has been posed	System should be able to support the active speaker/ meeting facilitator to ease decision-making by promoting feedback from the other meeting participants
DECISION MAKING	DM1. Meeting a consensus	DM1-D2. "There is a bit of silence when a question has been asked". - (R)	Meeting participants wants to get immediate response when a question has been posed	System should be able to support the active speaker/ meeting facilitator to ease decision-making by promoting feedback from the other meeting participants
PERSONAL SUPPORT	P1. Tools	P1-C1. "Everyone in the meeting has to own personal computer, pen and notepad". - (C)	Meeting participants wants to be able to document during meeting, for personal reasons	System should be able to support the active speaker to facilitate communication in by promoting feedback from the other meeting participants
PERSONAL SUPPORT	P1. Tools	P1-C3. "The moderator is the one with a laptop, same as in the remote site". - (C)	Meeting participants wants someone to be assigned the role of a meeting facilitator	System should support the role of a meeting facilitator
PERSONAL SUPPORT	P1. Tools	P1-C3. "I out of 10 people have laptops opened, 7 out 10 have a notepad, 4 don't have any other tools". - (C)	Meeting participants wants to be able to document during meeting, for personal reasons	
PERSONAL SUPPORT	P1. Tools	P1-C4. "50% has their own laptops with them". - (C)	Meeting participants wants to be able to document during meeting, for personal reasons	
PERSONAL SUPPORT	P2. When absent	P2-D4. "If one person's comes back". - (C)	Meeting participants wants to be able to gain insight to discussion content when been absent	System should support meeting participant to get insight to missed discussions
TURN-TAKING	T1-HS OL. Roles (human-scheduled)	T1-HS OL. "So the person controlling the screen sharing is not the same person who is the moderator". - (C)	Meeting participants must be able to take roles in meeting, if necessary	System should support the role of a presenter
TURN-TAKING	T1-HS. Roles (human-scheduled)	T1-HS OL. "hand gestures indicating when someone is speaking". - (C)	Meeting participants wants receive signs of who is the active speaker through hand gesturing	System could support participants seeking the role as the active speaker by recognizing/identifying non-verbal cues such as hand gesturing/pointing
TURN-TAKING	T1-HS. Roles (human-scheduled)	T1-HS OL. "Screen sharing is used throughout the meeting. One person opens up each participant's presentation or document instead of then that person presents it.". - (C)	Meeting participants must be able to take roles in meetings, if necessary	System must support information sharing
				System should support the role of a meeting facilitator
TURN-TAKING	T2. Primary Room Dominance	T2-C1. "Turn Taking starts between participants, moderator does not lead this. At this time the participant from Spain listens to the session group's discussion. Not really engaging in the discussion (from of a listener)". - (R)	Meeting participants must be able to equally be able to engage in discussions	System should enable meeting participants to disengage when one wants to engage in an ongoing discussion
TURN-TAKING	T2. Primary Room Dominance	T2-C1. "If participants seems to have problem hearing what the SV group says. Presses the volume button on her laptop". - (R)	Meeting participants must be able to receive the same information	System should enable meeting participants to signal when occasionally missing out of meeting content
TURN-TAKING	T2. Primary Room Dominance	T2-C1. "The discussion is mainly between SV participants, starts facing each other". - (C)	Meeting participants must be able to receive the same information	System should enable meeting participants to signal when occasionally missing out of meeting content
TURN-TAKING	T2. Primary Room Dominance	T2-C2. "As the remote site if they have something to add, and the remote site starts answering and gets interrupted by the other site. They disagree and the P1 site starts discussing by their own". - (C)	Meeting participants must be able to have open non-conflicted discussion	
TURN-TAKING	T3. The defined set defined agenda	T3-C1. "One person introduces the meeting and the agenda, everybody else listens". - (C)	Meeting participants wants someone to be assigned the role of a meeting facilitator	System should support the role of a meeting facilitator
TURN-TAKING	T3. The defined set defined agenda	T3-C1. "One person responds and the moderator starts taking notes". - (C)		
TURN-TAKING	T3. The defined set defined agenda	T3-C3. "Moderator sums up topics which is going to be discussed". - (C)	Meeting must be able to have a pre-defined agenda	System should support the role of a meeting facilitator
TURN-TAKING	T4. Alternate rooms and Active Speaker	T4-C1. "Participant from Spain makes an effort to join the conversation by initiating and starting to talk. Participant from Sweden becomes interrupted and how everyone turns their attention to the video-screen". - (C)	Meeting participants must be able to equally be able to engage in discussions	System should support integration of applications holding information as an agenda
TURN-TAKING	T4. Alternate rooms and Active Speaker	T4-C2. "There are also occurrences of the remote site and SE participants talking simultaneously". - (C)	Meeting participants must be able to freely discuss without interrupting the flow of the meeting	System should enable meeting participants to disengage when one wants to engage in an ongoing discussion
TURN-TAKING	T4. Alternate rooms and Active Speaker	T4-C2. "When there is an occurrence of simultaneous talking between SE site and the remote site, Swedish participant stops talking, allowing the other site to continue talking". - (C)	Meeting participants must be able to equally be able to engage in discussions	System should enable meeting participants to indicate when wanting to add content to an ongoing discussion
TURN-TAKING	T4. Alternate rooms and Active Speaker	T4-C3. "Already four times, people on both sides started talking simultaneously and then one person who insisted on talking continued". - (C)	Meeting participants must be able to equally be able to engage in discussions	System should enable meeting participants to indicate when wanting to add content to an ongoing discussion
TURN-TAKING	T4. Alternate rooms and Active Speaker	T4-C3. "Although there are quite long spans of silence between people talking, and then the active speaker has to pose the question "is there any questions?". - (R)	The active speaker wants to get immediate response when a question has been posed	System should be able to support the active speaker to facilitate communication in by promoting feedback from the other meeting participants
TURN-TAKING	T4. Alternate rooms and Active Speaker	T4-C3. "There are quite long spans of silence between people talking, and then the active speaker has to pose the question "is there any questions?". - (R)	The active speaker wants to get immediate response when a question has been posed	System should be able to support the active speaker to facilitate communication in by promoting feedback from the other meeting participants
TURN-TAKING	T7. Non-Verbal Cues	T7-C1. "Seems to give a new participant the word by a nod and eye-contact". - (C)	The active speaker must be able to pass on the word to other meeting participants	System should enable the active speaker to selectively pass on this role
TURN-TAKING	T7. Non-Verbal Cues	T7-C1. "Seems to give a new participant the word by a nod and eye-contact". - (C)	The active speaker must be able to pass on the word to other meeting participants	System should support requests of wanting to become an active speaker inspired by non-verbal cues such as hand gesturing
TURN-TAKING	T7. Non-Verbal Cues	T7-C1. "Turn taking flow smoothly (down, leaning forward, glancing, inhaling, hand gestures)". - (C)	Meeting participants wants to give signs of active speaker by using non-verbal cues	System could support requests of wanting to become an active speaker inspired by non-verbal cues such as hand gesturing
TURN-TAKING	T7. Non-Verbal Cues	T7-C2. "Used gestures, hand movements and changed the way he sat when he answered the remote site". - (C)	Meeting participants wants to give signs of active speaker by using non-verbal cues	System could support requests of wanting to become an active speaker inspired by non-verbal cues such as hand gesturing
INTERPLAY	IP1. Temporal Discussion	IP1-C2. "man han lilla bär rödgrönt som det är bra på, och han ligger dom tillbaka det är i väskan". - (C)		
INTERPLAY	IP2. Non-Verbal Cues	IP2-C3. "Remote participant signs thumbs up when he has a comment made". - (C)	Meeting participants wants to be able to give response	System should support meeting participants indicating appreciative feedback
INTERPLAY	IP2. Non-Verbal Cues	IP2-C3. "The participant on the remote site uses a lot of hand gesturing when explaining". - (C)	Meeting participants wants to give signs of active speaker by using non-verbal cues	System should support meeting participants indicating appreciative feedback
SOFTWARE	F1. Audio Quality	F1-C1. "The moment meeting has started everybody checked on the sound by saying "Can you hear us?". - (C)	Meeting participants must be able to hear each other	System must have good audio quality
SOFTWARE	F1. Audio Quality	F1-C1. "None of the participants contribute to the meeting, but talking very clear". - (R)	Meeting participants must be able to hear each other	System should enable meeting participants to signal when occasionally missing out of meeting content
SOFTWARE	F1. Audio Quality	F1-C2. "You can hear the remote site discussing when themselves... impossible to hear what they are saying (P1 said). So we can't see it completely". - (C)	Meeting participants must be able to share an understanding for the content discussed	System should enable meeting participants to indicate if there is an ongoing but closed discussion within one remote site
SOFTWARE	F1. Audio Quality	F1-C2. "Bad quality of sound - They leaned forward to be able to hear each other". - (C)	Meeting participants must be able to hear each other	System should be able to support the active speaker/ meeting facilitator to ease decision making by promoting feedback from the other meeting participants
SOFTWARE	F1. Audio Quality	F1-C4. "The audio quality varies from site to site. For instance, the audio from Ottawa site is poor". - (C)	Meeting participants must be able to hear each other	System must have good audio quality

F. Observation - Extracting Needs and Creating Requirements

SOFTWARE	F0. Existing functional features	F1 Q1. "one that displays presentation content." - (C)	The presenter must be able to share information	System must support information sharing
SOFTWARE	F0. Existing functional features	F2 Q2. "They have a new system, the old one had a "recent call list" - (C)	It must be easy to call other sites	System must be able to store calling IDs
SOFTWARE	F0. Existing functional features	F2 Q2. "Used outlook to show e-mails" - (C)	Meeting participants wants to share information from other sources	System could be able integrate other applications such as Outlook
SOFTWARE	F0. Existing functional features	F2 Q3. "Moderator talks about the shared content displayed in the screen" - (C)	The meeting facilitator must be able to share information	System must support information sharing
SOFTWARE	F0. Existing functional features	F2 Q3. "we use a external application when voting - survey monkey" - (C)	Meeting participants wants to be able efficiently make decisions	System could support integration any software enabling decision making
SOFTWARE	F0. Existing functional features	F2 Q4. "The active speaker is focused by the system by a red frame" - (C)	Meeting participants wants to see who the active speaker is	System should be able support input which ensures that every participant within each remote site is clearly visualized
SOFTWARE	F0. Existing functional features	F2 Q4. "We mentioned the space where the video feeds are displayed is surrounded by a red color frame when there is someone talking. Also, there is a green frame" - (F)	Meeting participants wants to see who the active speaker is	System should be able support input which ensures that every participant within each remote site is clearly visualized
SOFTWARE	F0. Existing functional features	F2 Q4. "At a point there where several sites commenting on the same question - although it seemed like not everyone was heard and the software did not help in this case. There was only one red frame, surrounding the site who spoke the loudest" - (C)	Meeting participants must be able to equally be able to engage in discussions	System must be able to display level of connectivity
SOFTWARE	F0. Existing functional features	F2 Q4. "The screen only shows the other remote sites and not "your own video feed [their own choice]" - (F)	Meeting participants must be able to share information	System should enable meeting participants to indicate when wanting to add content to an ongoing discussion
SOFTWARE	F0. Existing functional features	F2 Q4. "It" open up an agenda and suggests a time for next week, showing the calendar" - (C)	It must be easy to call other sites	System should support integration of other applications, such as calendar
SOFTWARE	F0. Existing functional features	F2 Q4. "When the person decides it is impossible to see the live screen the picture is so small and the number of participants is high, only to hear her voice and see a red frame which points to where the sound comes from." - (C)	Meeting participants wants to have clear overview of everyone who is engaged in the meeting	System should be able support input which ensures that every participant within each remote site is clearly visualized
SOFTWARE	F3. Features perceived as absent	F3 Q3. "we'd better discussion: share easily e the board, just easily be able to share information" - (C)	Meeting participants wants to ideate and share the outcome	System could be able to continuously, within set time intervals, take self pictures to later be used as an information source
SOFTWARE	F4. Technical Setup	F4 Q1. "Two screens, one for video feed and one that displays presentation content" - (C)	Meeting participants must be able to share information	System should be able to sharing
SOFTWARE	F4. Technical Setup	F4 Q1. "The camera positioned above the two screens covers the whole table" - (C)	Meeting participants must be able to share information	
SOFTWARE	F4. Technical Setup	F4 Q2. "Sharing content on one screen and video feed on the second	Meeting participants must be able to share information	
SOFTWARE	F4. Technical Setup	F4 Q2. "Sharing content on one screen and video feed on the second	Meeting participants must be able to share information	
SOFTWARE	F4. Technical Setup	F4 Q3. "The came at the site observed was turned towards one angle, so it didn't catch all the participants. When he spoke, he wasn't seen on the screen" - (C)	Meeting participants must be able to share information	
SOFTWARE	F4. Technical Setup	F4 Q4. "Five screens - one displays the shared content	Meeting participants must be able to share information	
SOFTWARE	F5. Changing conditions	F5 Q2. "One person presents in charge in calling the remote site, having difficulties joining the software. "Having trouble to connect the screen of your room, it really took me any effort, for some reason" - (C)	Meeting participants must be able to share information	System should be able support input which ensures that every participant within each remote site is clearly visualized
SOFTWARE	F5. Changing conditions	F5 Q2. "One person presents in charge in calling the remote site, having difficulties joining the software. "Having trouble to connect the screen of your room, it really took me any effort, for some reason" - (C)	It must be easy to call other sites	System must be able to store calling IDs
SOFTWARE	F6. Presence	F6 Q1. "The audio is on, but video is off. Instead, they launched Microsoft Lync and shared a screen with a remote site." - (C)	Meeting participants must be able to get a feeling for each other	System should be designed to project presence
SOFTWARE	F7. Connectivity	F7 Q4. "when switching between persons for screen sharing, they are experiencing some technical problem (connectivity)" - (C)	Meeting participants must be able to watching a high performance independent on connectivity level	System must be able to display level of connectivity
SOFTWARE	F8. Non-Verbal Cues	F8 Q1. "It points [hand] at the screen with shared screen to refer to specific content" - (F)	Meeting participants wants to be able to refer to information by gesturing	System performance should not be negatively affected of a low connectivity level
SOFTWARE	F8. Non-Verbal Cues	F8 Q2. "It adds a comment and points at the screen" - (C)	Meeting participants wants to be able to refer to information by gesturing	System could enable meeting participants who is not the facilitator to point at shared content without using a cursor
SOFTWARE	F9. Roles	F9 Q2. "Existing functions: currently presenting, give control as a drop down menu, stop presenting and a marker - They didn't use our three functions" - (C)	Meeting participants must be able to refer to information by gesturing	System could enable meeting participants who is not the facilitator to point at shared content without using a cursor
SOFTWARE	F10. Interactivity	F10 Q1. "another person wants to start screen sharing from his personal computer - having troubles, expresses that he doesn't want to display while desktop, and seems confused how to accomplish that" - (C)	Meeting participants must be able to share information	System must enable the presenter to share the desktop
SOFTWARE	F10. Interactivity	F10 Q4. "When of the participants was speaking, it was hard to understand from what site he or she was speaking" - (C)	Meeting participants must be able to see who the active speaker is	System must be able to selectively choose whosn application to share
MEETING PROCESS	MP1. Time Management	MP1 Q1. "another person delays "let's move on to the meeting and you can have another meeting to discuss that "and the moderator" - (F)	Meeting participants must be able to have a pre-defined agenda	System should be able support input which ensures that every participant within each remote site is clearly visualized
MEETING PROCESS	MP1. Time Management	MP1 Q1. "moderator takes the word and switches to the next subject. Looks at his watch and says "we have 8 minutes left, it could be tough, we have three areas to go" - 4:04:30 (meeting suppose to end at 10)" - (C)	Meeting participants must be able to have a pre-defined agenda	System could support integration of applications holding information as an agenda
MEETING PROCESS	MP1. Time Management	MP1 Q1. "moderator switches to the second subject - time 9:58. Another participant "there is no more time to highlight"	Meeting must be able to have a pre-defined agenda	System should enable the meeting facilitator to manage time in an effective manner by being provided a clear overview of which topics have been brought up, topics which still are to be discussed, remaining time and total meeting time
MEETING PROCESS	MP1. Time Management	MP1 Q2. "It" into remote site "Are you guys playing" laughter. We are not getting kicked out from this room as last time" - (F)	Meeting must be able to have a pre-defined agenda	System should enable the meeting facilitator to manage time in an effective manner by being provided a clear overview of which topics have been brought up, topics which still are to be discussed, remaining time and total meeting time
MEETING PROCESS	MP1. Time Management	MP1 Q2. "It" into remote site "Are you guys playing" laughter. We are not getting kicked out from this room as last time" - (F)	Meeting must be able to have a pre-defined agenda	System should enable the meeting facilitator to manage time in an effective manner by being provided a clear overview of which topics have been brought up, topics which still are to be discussed, remaining time and total meeting time
MEETING PROCESS	MP1. Time Management	MP1 Q2. "It" into remote site "Are you guys playing" laughter. We are not getting kicked out from this room as last time" - (F)	Meeting must be able to have a pre-defined agenda	System should enable the meeting facilitator to manage time in an effective manner by being provided a clear overview of which topics have been brought up, topics which still are to be discussed, remaining time and total meeting time
MEETING PROCESS	MP1. Time Management	MP1 Q4. "It" into "you all so quiet" This is just the beginning, we made it, 2 minutes before deadline" - (C)	Meeting participants must be able to have a pre-defined agenda	System should enable the meeting facilitator to manage time in an effective manner by being provided a clear overview of which topics have been brought up, topics which still are to be discussed, remaining time and total meeting time
MEETING PROCESS	MP2. Moving Forward	MP2 Q4. "should we move forward? .. or did we approve this one" referring to the topic they just talked about" - (C)	Meeting participants must be able to have a pre-defined agenda	System should be able to support the active speaker/ meeting facilitator to ease decision making by promoting feedback from the other meeting participants
SOCIAL ASPECTS	A1. Asynchronous	A1 Q2. "I'm "Um, "We have noticed that you don't use any video streams, what's the reasons behind that choice?" - (F)	The facilitator wants to get immediate response when a question has been posed	
LEVEL OF PARTICIPATION	L1. Multitasking	L1 Q1. "another person starts interacting with the mobile phone" - (F)		
LEVEL OF PARTICIPATION	L1. Multitasking	L1 Q2. "Starts to answering e-mails on his personal mobile phone, seems that he's not as engaged in the meeting as in the first hour" - (F)		
LEVEL OF PARTICIPATION	L1. Multitasking	L1 Q4. "Everyone looks at the videofed except the 2 persons from Lund that looks at their computer instead" - (C)	Meeting participants must be able to have a pre-defined agenda	System should be able to support the active speaker/ meeting facilitator to ease decision making by promoting feedback from the other meeting participants
INFORMALITY	INF. Before Meeting	INF Q1. Before meeting: "Participant from the Swedish site is engage in email later" - (C)	Meeting participants must be able to have a pre-defined agenda	System should provide communicative options intended to be used before the meeting has been initiated
INFORMALITY	INF. Before Meeting	INF Q2. "Participants are having a small talk, greet each other. One of the participants attempts to initiate a a video call." - (C)	Meeting participants must be able to have a pre-defined agenda	System should provide communicative options intended to be used before the meeting has been initiated
INFORMALITY	INF. Before Meeting	INF Q4. "everyone introduces who they are and their profession - there is one person who facilitates this activity" - (C)	Meeting participants must be able to have a pre-defined agenda	System could support apps for participants to introduce themselves to one another
DOCUMENTATION	D0. Notes	D1 Q3. "Moderator takes notes during the whole meeting both virtual" - (C)	Meeting participants must be able to have a pre-defined agenda	System could support documentation
DOCUMENTATION	D0. Notes	D1 Q4. "One person located at Lindholm is taking notes, and you could see the same happening in the other sites" - (C)	Meeting participants must be able to have a pre-defined agenda	System could support documentation

Interview - Extracting Needs and Creating Requirements

[illegible]

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H

Mapped Results of Observation and Interview

OBSERVATION				INTERVIEW				
Description (i.e. identified needs)	Number of Unique Requirements	Number of comments	Sub Category	Theme	Sub Category	Number of comments	Number of Unique Requirements	Description (i.e. identified needs)
Meeting participants wants to get immediate response when a question has been posed, and must also be able to put up a question when feeling uncertain about something	2	4	DM1. Reaching a consensus	DECISION MAKING	DM1. Reaching a consensus	4	7	Meeting participants wants to reach a common understanding and wants to get immediate response when a question has been posed. Meeting participants also wants to be able to document to be able to follow-up on decisions
Meeting participants wants be able to document during the meeting	1	1	DM2. Note Taking		DM2. Roles	4	13	Meeting participants wants to be able to document. The participants wants to have a meeting facilitator, managing communication and they also wants to have a person which brings the meeting forward in addition to one which is in charge of decision making. A meeting facilitator must be able to control the communication within the meeting group and the participants must be able to get their voices heard
The active speaker and meeting participants wants to get immediate response when a question has been posed.	2	4	DM3. Occasional Silence		DM3. Handling decisions	1	2	Meeting participants wants to be able to process
					DM4. Informality	1	1	Meetings participants must be able to reach a common understanding when making decisions
					DM5. Ways to conduct decisions	3	5	Meetings participants must be able to reach a common understanding when making decisions, and must be able to go back to the decisions. Proposals and decisions must be able to be documented
				IDEATION	I1. Processing ideas	3	3	Meeting participant wants to work and process ideas when ideating, in addition they want to be able to clarify / strengthen a discussion by creative methods.
					I2. Preparation	2	3	Meeting participant wants to prepare ideas before the meeting
					I3. Raising ideas	4	2	The participants must be able to freely discuss without interrupting the flow of the meeting. The active speaker wants to receive feedback in the form of facial expressions
					I4. Meeting structure	2	3	Meeting must be able to have a pre-defined agenda and they also want to know who what role and which remote site they belong
					I5. Roles	6	6	The presenter wants feedback from the remaining participants. Meeting participants wants to be able to add/share other documents and wants to get immediate response when a question has been posed. The active speaker must be able to pass on the word to other meeting participants.
					I6. Tools used	1	1	Meeting participants wants to be able to share t
					I7. Different starting-points	1	1	Meeting participant must be able to adapt the meeting to clients need
					I8. Showcasing ideas	2	2	Meeting participants wants to be able to clarify/ strengthen a discussion, and wants to be able to physically show tangible ideas
Meeting participants wants to be able to, for personal reasons, document during meeting. They also wants someone to be assigned the role of a meeting facilitator.	1	4	P1. Tools	PERSONAL SUPPORT				
People wants to be able to gain insight of discussion content when been absent from a meeting	1	1	P2. When absent					
Meeting participants must be able to take roles in a meeting, if necessary. Meeting participants wants receive signs of who is the active speaker through hand gesturing.	4	3	T1-HS. Roles (human-software)	TURN-TAKING	T1-HH. Roles (human-human)	10	1	Meeting facilitator must be able to control the communication within the meeting group
Meeting participants must be able to equally be able to engage in discussions, and they must be able to receive the same information. They also must be able to have open/ non-controlled discussion	2	4	T2. Primary Room Dominance		T1-HS. Roles (human-software)	4	2	Meeting must be able to have a pre-defined ag
Meeting participants wants someone to be assigned the role of a meeting facilitator. Their meeting must be able to have a pre-defined agenda	2	3	T3. Pre-defined/ un-defined agen		T2. Informal/ formal meeting	3	1	Meeting participants wants decision making to be executed efficiently.
Meeting participants must be able to equally be able to engage in discussions. Meeting participants must be able to freely discuss without interrupting the flow of the meeting. The active speaker must be able to pass on the word to other meeting participants	5	8	T4. Attentive moves and Active S		T3. Pre-defined/ un-defined agenda	3	5	Meeting must be able to have a pre-defined agenda. Meeting participants wants someone to be assigned the role of a meeting facilitator.
Meeting participant must be able to reach a shared understanding for the content discussed	1	2	T5. Cultural Differences		T4. Attentive moves - "get the word"	6	6	Meetings participants must be able to pose questions and wants to receive signs of who the active speaker is
The active speaker wants to get immediate response when a question has been posed. Meeting participants must be able to equally engage in discussions.	1	4	T6. Occasional Silence		T5. Communication Symbols	1	2	Meeting participants wants to be able to give re
The active speaker must be able to pass on the word to other meeting participants, and also wants to be able to give signs of active speaker by using hand gesturing and similar non-verbal cues	3	4	T7. Non-Verbal Cues		T6. Connectivity	1	1	Meeting participants must be able to sustain a high performance independent on connectivity level
					T7. Hierarchy	6	5	Meeting participants wants to get a feeling of familiarity when engaging in a meeting. The active speaker wants to get immediate response when a question has been posed, and must be able to pass on the word to other meeting participants. Meeting participants must also be able to equally be able to engage in discussions.
					T8. Equality	1	3	Meeting participants wants to reach a shared understanding
				SAFETY	T9. Non-verbal cues	2	2	The active speaker wants to receive feedback in the form of facial expressions. Meeting participants must be able to equally engage in discussions
					S1. Authorization	1	1	Meeting participants must be able to distribute information separately
				INTERPLAY	S2. Audio only	1	2	The participants wants to be able to see the number of remote sites participating in the meeting
---	---	1	IP1. Temporal Dispersion					
Meeting participants wants to be able to give response. Meeting participants wants to give signs of active speaker by using non-verbal cues	1	2	IP2. Non-Verbal Cues					

H. Mapped Results of Observation and Interview

				WORKING ANONYMOUSLY	W1. Authorization	1	1	Meeting participants must be able to distribute information separately.
					W2. Ways to work anonymously	5	3	Meeting participants want to share information depending on authority and they want to be able to give input anonymously. Meeting participants want to make decisions separately within each remote site.
					W3. Reason for working anonymously	1	---	Meeting participants want to give input anonym
Meeting participants must be able to hear each other. Meeting participants must be able to freely discuss without interrupting the flow of the meeting, as well as be able to reach a shared understanding for the content being discussed.	4	5	F1. Audio Quality		F1. Audio and Video quality	2	3	Meeting participants must be able to hear each other. They also want to know when the connection is low, and they must be able to sustain a high performance independent on connectivity level.
The presenter and meeting facilitator must be able to share information. It must be easy to call other sites. Meeting participants want to share information from other sources, and want decision making to go smoothly and efficiently. They also want to see who the active speaker is and have clear overview of everyone who is participating in the meeting. Additionally, they must be able to equally be able to engage in discussions. Lastly it must be simple to book a new meeting.	8	11	F2. Existing functions/ features		F2. Most frequently used features/ functi	6	3	Meeting participants want to reach a common understanding, and want to be able to share information in various ways. For example, they must be able to show information through sharing their desktop.
Meeting participants want to ideate and be able to share the outcome	2	1	F3. Features perceived as absent		F3. Features perceived as absent	3	6	Meeting participant wants to reach a shared understanding, and must be able to get their voice's heard. They also want to be able to refer to information by gesturing.
Meeting participants must be able to share information. Meeting participants want to have clear overview of everyone who is engaged in the meeting	1	6	F4. Technical Setup	SOFTWARE	F4. Technical setup	2	2	Meeting participants want to ideate and share the outcome.
It must be easy to call other sites	1	2	F5. Changing conditions		F5. Changing conditions	2	2	Meeting participants must be able to sustain a high performance independent on connectivity level.
Meeting participant wants to be able to get a feeling for who the other participants are	1	1	F6. Presence		F6. Presence	4	3	Meeting participant wants to be able to get a feeling for each other, an immersive environment. In addition they want to get an understanding for non-verbal information.
Meeting participants must be able to sustain a high performance independent on connectivity level	2	1	F7. Connectivity		F7. Informality	2	---	The active speaker wants to receive feedback in the form of facial expressions.
Meeting participants want to be able to refer to information by gesturing	1	2	F8. Non-Verbal Cues		F8. Accessibility	2	1	It must be easy to call other sites.
---	---	1	F9. Roles		F9. Integration	1	1	It must be easy to call other sites.
Meeting participants must be able to share information, and also see who the active speaker is	4	2	F10. Intuitivity					
				DISTRIBUTION	M1. When to distribute	1	---	---
					M2. Type of distribution	5	3	Meeting participant wants to be able to distribute the noted outcome from the meeting.
					M3. Distribution dependent on type of meeting	1	---	---
Meeting must be able to have a pre-defined agenda. Meeting participants want to get immediate response when a question has been posed	3	7	MP1. Time Management	MEETING PROCESS				
The facilitator wants to get immediate response when a question has been posed	1	1	MP2. Moving Forward					
---	---	1	A1. Acquaintanceship	SOCIAL ASPECTS	A1. Acquaintanceship	3	3	Meeting participants want to get a feeling of familiarity, as well as being able to resume former connections with other remote sites.
---	---	4	L1. Multitasking	LEVEL OF PARTICIPATION				
---	---	3	INF1. Before Meeting	INFORMALITY				
				DOCUMENTATION	D1. Reason for documenting	2	---	---
					D2. When to document	2	2	Meeting participants want to be able to distribute the noted outcome from the meeting
					D3. Ways to document	7	4	Meeting participants want to be able to process ideas in addition to sharing and to collect data from the meeting afterwards
					D4. Follow-up	5	1	Meeting participants want to be able to access previous documentation
Meeting facilitator wants to be able to take notes during a meeting	1	2	D1. Roles		D5. Roles	1	2	Meeting participants want to be able to, in retrospect, collect data from a meeting
	n = 55	n = 95				n = 131	n = 117	

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Requirements Specification

FUNCTIONAL REQUIREMENTS			
1. Control Management Requirements			
1.1 Host/ Meeting Facilitator/ Active Speaker			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
P1 O3/ T1-HS O4/ T3 O1, O3		System should support the role of a meeting facilitator	
T1-HS O4.		System should support the role of a presenter	
	DM2 P5 (U) / F3 P5 (N) / F5 P4 (N)	System must support the role of an active speaker	
	DM2 P5 (U) (N)/ I4 P5 (U)/ D5 P5 (U)/ T4 P4 (N)	System should enable meeting participants to see who the meeting facilitator/active speaker/presenter is	
DM1 O1, O2, O4/ DM3 O2, O4/ T6 O2, O3, O4/ MP1 O4/	DM1 P3 (P), P4 (N)/ I5 P2 (U), P5 (U)/ T7 P5 (N)	System should be able to support the active speaker to facilitate communication in by promoting feedback from the other meeting participants	
DM3 O4/ F1 O2/ MP2 O4	DM1 P3 (U) / DM2 P5 (U)(P)/ T2 P4 (U)	System should be able to support the active speaker/ meeting facilitator to ease decision making by promoting feedback from the other meeting participants	
T4 O4/ T7 O1	I5 P5 (U) / T7 P5 (N)/ DM2 P5 (N)/ I4 P3 (U)	System should enable the active speaker to selectively pass on this role	
MP1 O1, O2, O4.	I4 P3 (U)/ T3 P4 (U)	System should enable the meeting facilitator to manage time in an effective manner by being provided a clear overview of which topics have been brought up, topics which still are to discussed, remaining time and total meeting time	
	DM2 P5 (N)	System should enable the meeting facilitator/host/ current active speaker to grant requests as the role as the active speaker	
	DM2 P5 (N)	System must enable meeting facilitator/host/active speaker to see the order of the incoming requests of the active speaker	
	DM2 P5 (N) / F3 P5 (N)	System must enable the meeting facilitator to rank/ prioritize incoming active speaker requests	
	T1- HH P1 (N)	System could enable the meeting facilitator to exclude a participant or remote site if necessary	
	DM2 P5 (N)	System should be enable the meeting facilitator to mute other meeting participants	
	DM2 P5 (N)	System should enable the meeting facilitator to take over the role as the active speaker	
	W2 P1 (U)	System could the meeting facilitator to create sub-groups (within an on-going meeting)	
1.2 Meeting Participant Control			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
DM1. O4.	DM1 P3 (P) (U) / T3 P1 (P) / T4 P1 (N), P5 (N) / T5 P1 (P) / F3 P5 (N)	System should support meeting participant raising concerns or questions	
T2 O1/ T4 O3, O4	T4 P1 (N) / T4 P2 (N), T4 P4 (P), P5 (N)	System should enable meeting participants to visualize when one wants to engage in an ongoing discussion	
T4 O1, O2/ F2 O4.	T4 P1 (N), P2 (N), P4 (P), P5 (N) / T7 P5 (N) / T8 P1 (U) / T9 P5 (N)	System should enable meeting participants to indicate when wanting to add content to an ongoing discussion	
	DM2 P5 (N) / I5 P5 (U) / F3 P5 (N)/ T8 P1 (U)	System should enable the participants who requested the role as the active speaker to indicate topic of thought/discussion	
T4 O3.	T4 P1 (N), P4 (P), P5 (N)/ P2 (N) / T8 P1 (U)	System should enable the meeting participants to indicate "emergency status" of the topics they want to raise	
T2 O1/ F1 O1		System should enable meeting participants to signal when occasionally missing out of meeting content	
T4 O2/ F1 O2	I3 P2 (U)/ W2 P3 (U)	System could enable participants to indicate if there is an ongoing but closed discussion within one remote site	
	DM2 P5 (N) / I5 P5 (U)	System must enable meeting participants to request the role as the active speaker	
T7 O1, O2/ T1-HS O4		System could support participants seeking the role as the active speaker by recognizing/identifying non-verbal cues such as hand gesturing/waving	

2. Communicative Input Requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
IP2 O3.	T5 P1 (P)	System should support meeting participants indicating appreciative feedback	
F8 O1, O2.	F3 P3 (N)	System could enable meeting participants (who is not the facilitator) to point at shared content without using a cursor	
T7 O1, O2.		System could support requests of wanting to become an active speaker inspired by non-verbal cues such as hand geasturing	
INF O4.	T7 P5 (U) / A1 P2 (P), P4 (N)	System could support ways for participants to introduce themselves to one another	
3. Communicative Output Requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
	A1 P4 (N)	System could support features which resumes former acquaintancies	
INF O1, O2		System should provide communicative options intended to be used before the meeting has been initiated	
4. Contextual Information Requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
F2 O4/ F10 O4		System must be able to indicate which remote site speaker is located at	
F6 O2.	F6 P5 (P)	System should project presence in order to enhance the feeling of closeness	
	T7 P5 (U)	System should support the meeting participants with contextual and spatial information	
5. Knowledge Management Requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
DM2 O2 / D1 O3, O4	DM5 P4 (U)	System could support documentation	
	DM1 P5 (P) / DM2 P2 (U) / DM5 P2 (U) / T3 P4 (U)	System should enable meeting participant to document decisions	
	M2 P1 (U) / D2 P1 (P)	System could be able to locally store notes taken during the meeting	
	D3 P5 (U)	System should enable meeting participant to see the documentation process (in real-time) during the meeting	
	T3 P4 (U) / I2 P3 (U) / T1-HS P4 (U)	System could enable meeting participant to create an agenda	
	D5 P5 (U)	System should enable the participants to share informaion from the meeting to all participants	
	M2 P5 (U)	System should enable meeting facilitator to selective filter data aimed to be distrubuted	
5.1 Decision documentaion			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
	DM1 P5 (P)/ D3 P5 (U)	System should enable meeting participants to distrubute decisions	
	DM1 P5 (P)/ I1 P5 (P) / D3 P5 (P)	System could enable meeting participant to edit decisions	
	DM3 P5 (U)	System should support prioritizing of decisions	
	DM4 P5 (P)	System should enable participants to compare decisions	
	DM2 P5 (U) / DM3 P5 (U)	System must support vizualisation of decisions in different forms	
	DM5 P2 (u)	System should support participant to follow up on earlier decisions	

I. Requirements Specification

5.2 Ideas documentaion			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
	I1 P4 (N) / I6 P5 (U) / I8 P4 (P) / F3 P3 (N) / I1 P1 (P)	System should be able to facilitate discussons by enabling meeting participant to visualize their ideas	
	I1 P4 (N) / F4 P3 (N)	System should enable meeting participants to add on to each others ideas	
	I1 P4 (N)	System should enable meeting participants to show different alteratives on of idea	
6. Output Requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
T5 O2.		System could be able to translate and/or clarify spoken sentences	
F3 O3.	F4 P4 (N)	System could be able to continuosly, within set time intervals, take still pictures to later be used as an information source	
	DM5 P2 (U) / W2 P5 (U)	System should support decision making producing a anonymous quantitative outcome	
	I3 P3 (U) / F6 P5 (P) / T9 P4 (P) / A1 P2 (P) / F6 P5 (P)	System could read and visualize facial recognition	
	S2 P4 (N) / S2 P4 (N)	System should enable participants to se how many sites (video and audio included) that are in the meeting	
	F6 P5 (P)	System could support implementation of augumented and/or virtual reality	
7. Data Storage Requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
P2 O4.		System should support meeting participant to get insight to missed discussions	
	DM5 P2 (u) / I1 P5 (P) / D3 P5 (P) / D4 P5 (U)	System should support paricipants to follow up on earlier decisions	
8. Software Integration Requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
T3 O3/ MP1 O1	I2 P3 (U) / L4 P3 (U) / T1-HS P4 (U) / T3 P4 (U) / I5 P3 (U)	System could support integration of applications holding information as an agenda	
	I2 P3 (U)	System could enable meeting host to send out invitations presenting the topics of the meeting	
F2 O2.	M2 P1 (U), P3 (U), P4 (U) / D2 P1 (P)	System could be able integrate other applications such as Outlook	
F2 O4.		System should support integration of other applications, such as calendars	
F2 O3.		System could support integration any software enabling decision making	
9. Software Functionality Requirements			
9.1 Audio			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
F1 O1, O2, O4	F1 P1 (P) / P3 (N)	System must have good audio quality	

9.2 Video			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
F4 O4/ F10 O4.		System should be able support input which ensures that every participant within each remote site is clearly visualized	
	I8 P5 (U)	System could enable the meeting facilitator to steer the camera and its zooming function	
9.3 Information Sharing			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirement	
T1-HS O4/ F2 O1, O3	F2 P2 (P), P3 (U), P5 (P) (U)	System must support information sharing	
F3 O3.		System must enable file sharing	
F10 O1.	F2 P2 (P)	System must enable the presenter to share the desktop	
	I5 P3 (U)	System should enable participants to share their desktop	
F10 O1		System must enable the presenter to selectively choose which application to share	
	T4 P1 (N), P2 (N), P4 (N), P2 (U)	System must support private messaging	
	F2 P2 (P)	System must support instant messaging	
	I7 P5 (U)	System could hold different modes options dependent on type of meeting	
9.4 Initiating meeting			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirements Text	
F2 O2 / F5 O2	F8 P4 (N) / F8 P5 (P) / F9 P4 (N)	System must be able to store calling ID's	
10. Authorization Requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirements Text	
	S1 P4 (U) / W1 P1 (U)	System must enable for selectively choose who gets access to certain information	
NON-FUNCTIONAL REQUIREMENTS			
1. Performance requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirements Text	
F2 O4/ F7 O4	F1 P3 (N)	System must be able to display level of connectivity	
F7 O4	T6 P1 (N) / F1 P3 (N) / F5 P4 (N)	System performance should not be negatively affected of a low connectivity level	
2. Security requirements			
Encoded Identifier (observation)	Encoded Identifier (interview)	Requirements Text	
	S2 P4 (N)	System must ensure that the platform is secure	