Distance meetings in formal groups

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Abstract

Researchers must work from a common idea about how to describe their studies in order to build a theory in mediated communication. We should not always start in the technology side of the problem but in the activity. Two studies of real groups performing meetings on distance via a desktop videoconference system were observed. New variables to include in studies of mediated meetings are "group norms" and "artefacts". In the interface spatial ability is not included. Echo effects and the lagged audio/video is a disturbance for one of the observed groups.

Keywords: Formal and mediated meeting, desktop videoconference

INTRODUCTION

In previous research the main part of the presented studies are based on experiments, fictive tasks and groups composed for the specific test. The focus is very much on the technology itself and not on "the human side" of the interaction. Naturalistic studies, even longitudinal studies have been performed (Tang and Isaacs, 1992) but still the focus on the group and on the activitiy performed is a minor element. This results in that one media is reckommended to support distributed group meetings but without considering the group, the task i.e. the meeting as a complex situation.

"All communication media combine advantages and disadvantages....... It is therfore very important for researchers and practitioners alike to regard research in this domain not as an effort to find the best communication medium for collaborative work, but rather as an effort to understand the conditions under which groups using different communication media (and combinations of media) will be most effective." Arrow, Berdahl, Bouas, Craig, Cummings, Lebie, McGrath, O'Connor, Rhoades, & Schlosser (1996, p.237).

We should according to Arrow et al (1996) not try to find out which medium is the best but rather adopt the following two complex purposes:
*   Determine the strengths and limitations of each kind of communication system, used alone and in various combinations. This information can be used to make sensible choices among communication systems based on the requirements of the task and user.
*   Improve our understanding of how the mix of communication technology used by a group influences the way in which groups interact, develop, and perform a variety of kinds of tasks.

Befor we take these two purposes into cosideration a background in face-to-face meetings is given in order to facilitate comparements of results from studies of mediated meetings.

Not just one type of meetings

In the litterature describing videomediated communication (VMC) the meetings are often mentioned as the activity performed but without describing it in detaile and without nueanses, just as if all meetings are alike. Of course they are not!

Olson and Olson (1997) have described this problem and say that researchers have to get a shared vocabulary in order to construct a theory in VMC. They suggests that the following variables should be described properly in research reports in order to enable comparisons among empirical studies performed in the area:
*   Characteristics of the group (include individual characteristics, group composition, organizational factors and particulars of the moment).
*   Characteristics of the technology.
*   Characteristics of the task.

According to Olson and Olson (1997) the descriptions used often are at the wrong granularity. To for instance talk about a decision making task do not include the fact that a task is a process, a process that is composed of several phases and that these can be mixed in complex ways. Three processes are considered by Olson and Olson; task, communication and interpersonal process. Measures of outcome i.e. which were the results: task outcomes, group outcomes and organizational outcome (for detailed description of the suggested framework see Olson and Olson, 1997). The suggested framework is based on work described in Kramer and Pinsonneault (1990) where a litterature review of research on group decision support systems (GDSS) and group communication support systems (GCSS) based on the variables; contextual variables, group process, task related outcome, and, group related outcomes, are used. Similar critique is also presented by McGrath (1992) who appart from discussing the lack of description also point at the fact that the technology studied often also is developed in the same environment as the evaluators work.

Type of meeting depend according to Jay (1993) on frequency, composition, motivation and decision.
*   Frequenzy, daily, weekly, monthly, irregular, occasional or special project meeting composed of people normally not working together. This determines the degree of unity of the group.

- Composition, working on the same projects, working on different but parallel tasks, a diverse group i.e. strangers to each other.
- Motivation, common objective, competitive or desire for success.
- Decision process, how is a descision met? By consensus, majority vote or left to the chairman.

Type of meeting can also be divided into formal and informal. A formal meeting is planned in advance and with a specific goal while an informal meeting is spontaneous i.e. just happen when two or more people occasionally meet without having planned to do so.

Below we will briefly go through several different kinds of meetings and then the process of a meeting is described.

Committee meeting

Committee meetings have a well defined structure with an agenda identifying the topic to be discussed during the meeting. After each meeting minutes or report summarizing the discussion is made. Prior a meeting an agenda is prepared (Brown, Davies and Gray, 1985).

Information meeting

According to Lenman, Sallnäs, Serenius, Sundblad, Uhlin, Wadman & Winroth (1999) the purpose of an information meeting is to mediate information from one or several participants to the rest of the group. The information is often presented verbally complemented with text, pictures, films or artefacts. An information meeting is often very formal with an agenda and a planned order of speakers to present their material. The communication during the meeting is mainly from one presenter to the group with less interaction from the group to the speaker (although questions and comments might occur).

Coordination meeting

In this type of meetings the aim is to plan, to allocate activities and resources among a group of people and to share information that help actors achieve the overall goals (Malone and Crawston, 1990).
An agreement among the group members have to be the result of the meeting and conflicts can arise. The agreement met during the meeting needs to be documented in order to follow up that everything has been acomplished as planned. Activities during the actual work needs to be done in order to coordinate the work and the participants of the group need shared information resources and shared documents.

Brainstorm meeting

The purpose is to make a group within a short period of time come up with creative and new solutions or aspects of a topic. Everybody are contributing and the meeting is characterised by a democratic athmosphere.

Work group meeting

This kind of meeting is one important activity for the work group when planning and producing something collaboratively. The purpose of the meeting is that all participants shall produce something together. The task is often complex and demands several meetings in order to let the group accomplish the task. The work is often split into subtask and the members of the group work in smaller groups between the work group meetings to solve the different subtasks. The meeting can have the function of solving problems, handle conflicts and to produce. The work is often structured by one person in the group who also often is the chair of the meeting and the project leader. This person also construct the agenda to use during the meeting.

Study circle

The study circle aims, according to Lenman et al (1999), at supporting a group of people with interest in learning someting about a topic together. The group normally include a leader and 5-10 participants. The activities are often to prepare to a meeting by reading a pice of text, and, during the meeting one or several participants present the text, and, have a common discussion. The role of the leader is often administrative and supporting to see to that all participants are at the same level and that everybody speak and discuss.

Spontaneous meetings

People occasionally meet without planned to do so in advance. Meeting collegues in the corridor talking about ordinary topics such as the wether or informally discussing work rellated matters are examples of spontaneous meetings.

A number of meetings have been described and for all of them exept for the spontaneous meetings there is a procedure worked out in advance. Olson and Olson (1997) mean that describing activities by just

mentioning the type of meeting e.g. information meeting, is at a wrong level of granularity. All these activities also have a process and we have to look into it in detal.

The procedure of a meeting

A meeting is not static but includes a set of different phases. Sometimes performed in a given order but sometimes mixed during a meeting. Jay (1993) describe three phases of a meeting: before, conduction and following the meeting.

Before the meeting

A formal meeting needs to be planned in order to reach the goal with the meeting. According to Jay (1993) the following questions have to be addressed befor the meeting takes place.

What is the meeting intended to achieve? What would be the likely consequences of holding it? and, When it is over, was it a success or a failure? Is there information to be delivered before the meeting? What and how shall we do it? How to do it depend on a set of rules from the department, the organisation or the society.

An agenda should be constructed and circulated to all participants (not too far in advande - people forget it). The order of items on the agenda is important. The early part of the meeting tends to be more lively and creative than the end of it. An item that needs a clear head sould be put high up on the list. An attention lag sets in after 15-20 minutes. Some items unite the participants while others divide. A good idea is to find a unifying item at the end of the meeting. It is enough to allocate 1-1.5 h for most purposes and the finishing time, and the start ime can be put on the agenda.

Conducting the meeting

During the meeting both the subject to discuss and the people need attention. MacGrath (1993,b) describe four general processes during a meeting. To generate alternatives, to choose alterantives, to negotiate and to execute.

Following the meeting

Jay (1993) reccomends the following activities to follow the meeting. Minutes should include information about date and place, name of the chairman, list of participants indicating if they came late or left early, appologies for absence. All agenda items, and other items discussed, decisions reached should be included. Record and underline the person responsible for the assignment if any are made. Time when the meeting ended, and, the date, time and place of the next meeting.

Different types of meetings have been described and a process for meetings have been described. But meetings include people – participants.

The participants of the meeting

From the viewpoint of participants Jay (1993) describe six main functions of a meeting;
A meeting defines the team, the group the unit.
A meeting is the place where the group revises, updates and adds to what it knows as a group.
The meeting helps the individual to understand both the collective aim of the group and the way in which his own and everyone else's work can contribute to the groups success.
A meeting creates in all present a commitment to the decisions it makes and the objectives it pursues.
A meeting is very often the only occasion the group exists and work as a group.
A meeting is a status arena.

There are different sizes of the group participating in a meeting and also different types of meetings. According to Jay (1993) size can be divided into three groups: Assembly (>100 participants), all listen to the main speaker. Counsil (40-50 participants), some gives questions and come with suggestions but the mainpart listen to the main speaker. Committee (<=10), all speaks more or less on an equal footing under guidance and control of a chairman. Between 4-7 participants is ideal, 10 is tolerable and 12 is the outside limit for a committee group.

Spatial relationship such as seating positions influence both our way to act in the group as well as indirect or direct influence the outcome of the meeting in terms of influencing people with power to make descisions (Jay, 1993). Sitting face-to-face across a table facilitates opposition, conflict and disagreement.

Sitting side by side makes disagrement and conflicts harder. The chairman can exploit friendship of the seats next to him. Dead mans corner, is to the right of the chairman, but does not apply if s/he sits alone at the head of the table. Proximity to the chairman is a sign of honor and favor. The greater the distance from the chairman the lower the rank of the member.

Individuals who are in ones direct line of view are judged to play a moore central role in the discussion, to contribute more often, and to make better points than others who talk equally often and make equally contributions (Fusell and Benimoff, 1995).

Draw out the silence, can be a sign of someone having something important to say but being to nervous to do it, or a sign that there is a hostility toward the chairman, the meeting or the topic as such. The chairman should also protect the weak and give them credit for commenting and participating.

In order to study mediated meetings we need to understand not only different types of meetings, their process and participants but also how people communicate in face-to-face situations.

Communication among people in a face-to-face situation

Communication is according to Short, Williams and Christi (1993) the pysical signals whereby one individual can influence the behaviour of another.

According to Fusell and Benimoff (1995) we should keep the distinction between signals (counsious transmision of information) and signs (uncounsious reaction not meant to be communicated e.g. to blush).
Chanels for communication is often characterized as: linguistic (the verbal channel), paralinguistic (intonations and pauses) and nonlinguistic (eye gaze, posture, many gestures).

Appart from what is verbally said i.e. linguistic and paralinguistic chanels, we also use and get feedback from the non linguistic chanel. In this chanel we get information from the trunk and arms, facial signals, gaze and eye contact, guestures, turn taking and other non-verbal ques.

Trunk and arms
Posture as such is a source of information. It can tell about, for example, mood, cofident or relaxed, respectful or aggressive. Position of head and trunk with hand and arm position allowe for discrimination within the categories. Forward lean of the trunk is found to convey a positive attitude toward the other, higher rates of gesticulation, smaller reclining angles, more head nodding and lower rate of self-manipulation where associated with greater percieved and intended persuasiveness. These signals are important as background information and do not change often during a conversation. The body is more informative of the intensity of the emotion.

Facial signals
The head is more informative about the nature of emotions (angry, sad, surprised, interested, happy). An important limitation according to Short, Williams and Christi (1993) in most studies of facial expression is that they have ignored the context effects.

Gaze and eye contact
According to Short et al (1993) there are three functions of gaze:
• Monitoring (look at the other can serve as feedback).
• Regulatory function (related to floor apportionment).
• Expressive function (subjects tend to look away at points of high motions).

Eye contact is also a way to say that we have or will have closer contact. Too much eye contact or too long will be discomfortable. The eye contact seems too follow the verbal content. If negative, the eye contact is evluated more negative and vise versa. When people dissagreed there where less eye contact than experienced by chanse and when they agreed there where more eye contact than by chanse (Short et al, 1993).

Fusell and Benimoff (1995) make the following description of the important factors of eye gaze in face-to-face communication. While formulating the message speakers tend to look away from the listener, except for short glances. As they move toward completion of the utterance, their gaze returns to the addressee. One function of this shifting of gaze is to help coordinate speaking turns. In addition, shift away from the listener are thought to help speakers formulate their messages by reducing cognitive load. Addressees tend

to focus on the speaker during the entire message. Speakers periodically glance at their addressees to ensure that they are receiving eye glanzes. Lack of glanzes are taken as a sign of boredom, disinterest or more generally as lack of engagement.

Gesture
Some guestures function as signals (i.e. movements that carry meaning), and others act as signs (e.g. indicators of uncertainty, nervousness an so on). Guestures also have a smooth transition of speaking turns.

Turntaking
There is little or no perceptible delay between the end of one persons turn and the start of the next one. When longer dealys occure they are often experienced as awkward silences.
Communicators use number of ques to project the end of speaking turns. Some are linguistic others paralinguistics, fallen intonation.

Non-verbal cues
According to Short et al (1993) the non-verbal cues have six main functions:
- Mutual attention and responsiveness (continous evidence that the others are attending, eye-gaze, head nods, guestures).
- Chanell control (who shall speak and for how long? More pauses and interruptions where detected in an experiment when the visual cues where reduced. In experiments comparing face-to-face, microphone loudspeaker system fewer interruptions, utterances differed in lengths and more requests for repeats in the no-vision condition).
- Feedback (the speaker needs to know reactions on what have been said. It can go on simultaneously with verbal communication without disturbing it).
- Illustrations (guestures, point to objects or directions or for emphasis).
- Emblems (guestures being used instead of a word, not common but exists).
- Interpersonal attitudes (may be used by the listener as information about the speakers attitude to him. Changes in relation fore example from relaxed to formal, in posture).

All these aspects are of importance in order to enable a smoth communication among a group of people. When we mediate meetings the interaction among people will be changed depending on which medium and tools we chose for our interaction.

Mediated meetings

Short et al (1993) make definitions on communication and media:
Communication is the pysical signals whereby one individual can influence the behaviour of another.
Medium of communication is a system of constraints on the physical signals available in any particular situation.

A broad definition of multimedia conferencing is presented by Fusell and Benimoff (1995). Two or more remotely located people electronically sharing audio, video and data via either desktop PC or a group room system. Speak, see and share documents on screen white boards, video clips and the like.

Some important differences between video and face-to-face meetings are listed by Sellen (1992) who say that unlike eyes, cameras have a fixed field of view and can usually not be controlled by the viewer. There is a failure to make eye contact because of separation of camera and monitor.
The principle of reciprocity does not always hold (i.e. if I can see you, you can see me) and there is no concept of a negotiated mutual distance between speakers. Speakers have no sense of how their voices are perceived by listeners. Other differences are more subtle and harder to define, such as the relative importance of gestures and gaze in securing another's attention through video, and the feeling of being "distanced" from others.

Technology to support meetings

What technology is used to facilitate the distributed meeting? In this report we focus on video mediated communication e.g. e-meetings so called desktop video conferencing (DVC), video conference system (VCS), video café (open link video). Within a technology several tools can be included e.g. audio, video, chat, and, whiteboard. The place for the meeting can vary e.g. a conference room, an office, at home, from two or several sites.

Video-mediated communication

Video conferencing has not met the widespread success except in limited niche markets according to Egidio (1990). It is concluded that the shift toward DVC, office room, lowers the cost and makes the technology more accessible for more spontaneous and informal communication to be regarded as a complement to face-to-face meetings.

Tang and Isaacs (1993) applied interaction analysis and determined at what points in the collaborative design process team members were using each of the media available. They studied the pattern of interactions chosen by team members, measuring frequency, duration, and distributions of the different interaction modes available. Participants had a choice of using e-mail, phone conferencing, video room conferencing, desktop video conferencing, or face-to-face meetings.

Tang and Isaacs found that video conferencing provides team members with several benefits over phone conversations. Compared with face-to-face DVC do not measure up in terms of users ability to manage turn-taking, to acquire or retain floor control, notice expressions or gestures, or have side conversations. Advantages were staying in their own office, and, more efficient meetings.

An overview of the literature of video-mediated communication is presented in Finn (1997). The results are contra dictionary according to Finn. Some studies compared VMC with face-to-face whereas others compare VMC with a condition in which there was no video channel or other visual component. Aspects measured were task performance, user satisfaction, task completion, communication times, behaviour, quality of output, and, time taken to complete tasks. Sixty one percent felt it poor while working because they have to read material both on screen and off screen, requiring them to divert their eyes away from video monitors and toward what they are working on. It was concluded that high-quality audio is more important than high-quality video.

According to Finn (1997) few longitudinal studies have been performed. In lab studies subjects were recruited solely for purposes of brief studies and usually where not familiar with each other, the equipment or the assigned task.
More current naturalistic work involving workplace studies tends to use participants who know each other, have a previously existing working relationship and are familiar with the technology. Most of the previous research is based on dyads whereas later work ranging from 2-9 participants with more than two participants the possibilities for richer more complex and more realistic conversation styles.

Tang and Isaacs (1992) made a study of desktop video conferencing. Their analysis of the use of desktop conferencing revealed that desktop conferencing did not increase overall interactive communication usage, was used more heavily when video was available, substituted for email messages, may have substituted for shorter face-to-face meetings, change the usage pattern of telephone calls, was a novel collaboration setting, and, afforded being aware of where people were looking (gaze awareness).
Their result indicated that the video capability was the determining factor in whether the team used the desktop conferencing prototype. The interviewed users of the prototype system said that they strongly liked the video because they could see each other's reactions, if they were being understood, and engage more in social, personal contacts through video. It was also reported that the prototype was used for more informal chats among the participants. Via the video recorded material Isaacs and Tang could draw the conclusion that the video helped the teams to interpret long audio pauses. The observed pauses lasted up to 15 seconds but the participants did mark them as problematic. The video channel allowed participants to inspect the activity of other participants e.g. reading email or looking for information in the office.

Isaacs and Tang (1993) say that that eye contact is an expected form for interacting face-to-face but a confident sence of gaze awareness may be sufficient to enable effective and comfortable interaction. They found that the video channel had effects on the process of interaction i.e. supporting turn taking mechanisms, demonstrating understanding and attitudes.

Cooperation

The ability to communicate has shown positive effect on cooperation and trust (Jensen, Farnham, Drucker & Kollock, 2000). When individuals are able to communicate, cooperation increases significantly. A study comparing four forms of communication (no communication, text-chat, text-to-speech, and, voice) voice condition resulting in the highest levels of cooperation. The result even highlight the importance of more immediate forms of communication in online environments.

Problem solving

Experiments comparing different combinations of media indicated that speech was the critical medium for communication in problem solving tasks (where it is important to track the understanding and attention of

remote participants). If participants could use the speech channel, then the addition or removal of high quality video, text or writing media had little effect on task outcome or quality of solution (Whittaker, 1995). Neither face-to-face communication nor high quality video/audio systems show objective benefits over audio only communication for problem solving tasks (Chapanis, Ochsman, Parrish & Weeks, 1972).

Communication among people in a video mediated situation

Gaze and eye-contact
Video systems which fail to support gaze and mutual gaze may have an effect on how to regulate the flow of conversation, to provide feedback, to communicate emotions, to communicate the nature of the interpersonal relationship, to avoid excess information input.

Guestures
Discrepancies in transmission rates for audio and video information can lead to confusion when a speaker is simultaneously speaking and gesturing.

Turn-taking
Lagged audio is highly disruptive of turn-taking, producing many fewer, longer turns (Tang and Isaacs, 1993).
A study comparing face-to-face interaction with a low quality wide-area ISDN video conferencing system showed that interactive aspects of conversation that required precise timing (giving feedback, switching speakers, asking clarifying questions) were much reduced in the ISDN system. Speakers were unable to time their conversational contributions, with the result that backchannels or interruptions arrived too late or at inappropriate points in the conversation (O'Conaill, Whittaker & Wilbur, 1993). The result of both decreased interactivity and increased formality led to a "lecture-like" style of interaction.

These results have been replicated and the main findings (when comparing video communication with face-to-face communication) seem to be:
• More formal turn-taking techniques (using devices such as naming a possible next speaker or using "tag" questions -isn't it?, couldn't you? (Whittaker, 1995; Sellen, 1992).
• Conversational turns in videoconference being three times as long as for face-to-face ones (O'Conaill et al, 1993).
• Hard to switch speakers (twice as many speaker switches in face-to-face communication, Cohen, 1982)
• Hard to ask clarifying questions. (Cohen, 1982)
• Reduced spontaneity by the listeners, measured by number of interruptions (Sellen, 1992; Cohen, 1982).

For conversation management and turn-taking high quality videoconferencing is not percived as equivalent to face-to-face interaction (Sellen, 1992; Tang and Isaacs, 1993). In Sellens study comparing high quality video/audio systems, face-to-face and speech only communication there was little evidence to support the claim that high quality video information improves conversation management and turn-taking when compared with audio-only conversations (Sellen, 1992). For objective conversation process measures such as pausing, overlapping speech and interruption management, there was no process differences between the video/audio system and speech only communication. However, video/audio is perceived to be better than speech in support interruptions; lead to more natural conversations that are more interactive, increase the ability to listen selectively to particular speakers, allow one to determine whether one is being attended to, generally keep track of the conversation. People also believe that they are better able to track the attention of others when they have video (Sellen, 1992).

In another study video seemed to allow participants to manage pauses better than in speech only communication. (Isaacs and Tang, 1992)

Compared to face-to-face conversation, video was not experienced as being as effective in supporting interactivity, selective attention and the ability to take initiative in the conversation (Tang and Isaacs, 1993).

In the turn-taking process even high quality video/audio is no different from speech only interaction, but there are differences between face-to-face and speech only. This suggests that visual information can potentially have an impact on conversation processes but that current video systems do not support this (Whittaker, 1995).

Visual information is important in other areas than supplying non-verbal information during communication.
Creating a shared physical context or shared workspace where the video image transmit information about the work objects themselves rather than information about participants (using visual information to initiate communication or depict shared work objects).

Olson, Olson and Meader (1997) conlcude from a series of studies of grops working with design tasks in face-to-face meetings, remote with audio, remote with video and face-to-face with some tools of support for shared editor that with high quality communication (both audio and video) and a shared work space tool, distributed groups can produce work that is indistinguishable in quality from face-to-face groups using the same work space tools. Taking away the video from the remote groups leads to poorer quality designs when compared to face-to-face groups. The audio only were mariginally different from the video groups. The high quality group intellectual work is possible under distributed conditions, and video appears to add som value.

Synthesis

Based on the litterature review the following synthesis can be described. Here presented as a table.

Table 1. A matrix over important variables to consider within the research area of mediated meetings.

Human and Technological aspects	Varfiables t oconsider in empirical studies of mediated meetings in small group.
Size of group	2 (2 = dyad), 3-5, 6-10 (comittee), 11-50 , (40-50 = council) 51-100, >100 (assembly).
Type of meeting	Information, Committee, Coordination, Brainstorm, Work group, Study circle, Spontanous.
Type of task	Cooperation, Problem solving, Planning, Learning.
Procedure of a meeting	Preparation, Conduct, Introduct, Present Decide, Notes, Follow up.
Communication	Signals, Signs, Linguistic, Paralinguistic, Nonlinguistic, Pysical apperance, Trunk and Arms, Face, Head nods, Guesture, Turntaking, Spatial relationship, Gaze, Eye contact, Non-verbal ques.
Type of technology	Desktop video conference system.
Type of tool	Audio, Video, Chat, White board.

THE AIM OF THE STUDIES

The aim with the studies are to explore mediated, synchronous meetings for small groups of 3-5 persons. A normal committee meeting or workgroup meeting will fall under this description. The common ground (Clark, 1996) among the team members is already stablished.

The analysis will include actual activities to be performed in a context including different tools supporting the activity. Results from the initial analysis will influence the development of the technology and point at existing problems and demands from its users.

All meetings are not performed in the same way with the same need of support. Therefor two groups are studied, a group of technical experts on video conference systems, and, one group with non or little experience of using video mediated technology but experts in an academic area. The group of technical experts should be viewed as a reference group. The main focus is on the group that uses the DVC system for the first time together. The studies will initially aim at understanding the introduction of the technology to the group and to understand the life cycle of the task it self (having a meeting) this will be followed by an analysis of the environments where the activity is performed as well as the use of the existing target tool.

Examples of questions related to the overall area of interest (inspired by the checklist developed within activity theory by Kaptelinin and Nardi (1997):

- Are all target actions actually supported?
- Is there any functionality of the system which is not actually used?
- Are the concepts and vocabulary of the system consistent with the concepts and vocabulary of the domain?
- Is target technology integrated with other tools and materials?
- Is the whole task life cycle from goal to final out come taken into account and/or supported?
- Did the users have enough experience with the system at the time of evaluation?
- How are the users' attitudes towards the system?

Other rellated questions are:
- How can we support human communication i.e. which functionality is needed?
- Do we need to see and/or hear the other participants at every occasion?
- What materials need to be shared and reachable during a distributed meeting?
- How enjoyable are the different media to use in the meeting situation?
- How efficient is it to have distributed meetings in different media?

Studies of two distributed work groups

The technical project group
A group of 8 persons have during the last 1-2 years worked on technology to support committee meetings and distans courses via video mediated technology. As a way to evaluate solutions and tools this group use the tools themselves during their project meetings. Participants in the project work at Universities at six different sites in Sweden.

The domain group
A group of 7 participants meet regularly at two differnt sites in Sweden or via tehelphone conferences. They have worked together with planning, administrating and managing a school during the last 3-5 years.

Type of meetings and tasks to perform
Work group meetings and information meetings are the most frequent meetings for the group of technichal experts. For the domain group the meetings can be classified as committee meetings.

The technical tool
The technical tool used by the two groups is Marratech Pro e-meeting software (http://www.maratech.se). It supports real-time video, audio, shared application windows, whiteboard, chat and web-based presentations.

E-meetings are possible over various network configurations, including multicast, unicast or hybrid networks and NAT (Network Address Translation) environments. Administrative tasks such as session management, user access and logging are kept through an intuitive web-based user interface. The portal

administrator can therefore remotely manage and configure the portal through a simple web page. In order to access e-meetings provided by the portal, the user will need to install a freely available client, Marratech Pro Portal Edition.

The Marratech Media Server software can record and playback any meeting. The Marratech Media Server records video, audio, chat, whiteboard, application window sharing and web-based presentation activity from the session. The version of the software used during the here presented studies worked with, a small but still noticable, audio and video lagg.

Procedure used

The procedure used during the two studies is presented below in chronological order.
Participating observations of technological work group during three DVM.
Contact with domain group.
Information about the technology to the domain group and investigating the groups need of hardware and software.
Help to install the software.
Pre-test of the software from the participant's different sites and offices.
Domain groups meeting (observer and a technical facilitator attending).
Observations of the meeting, questionnaire to the participants after the meeting, record of the meeting.
Feedback to technicians based on the responses from the participants.

Observation of distributed meetings in the technical project group

The group met frequently over a desktop video conference system from Maratech (see http://www.maratech.se). Three of their regular project meetings were observed. The meetings took between one and two hours and the observer where acting as a participant observer introduced to the project. The number of participants varied between four and nine persons (connected from their own or colleagues office, or conference room). The participants were situated at 6 different sites in Sweden with a maximum distance of about 2000 km.
Every participant was represented by a video picture with the size of approximately 5x5 centimeters showing head and the upper part of the trunk (se Figure 1 below).

In connection to every representation the participants name was written in blue and turned into red when the person talked. In addition to the name there were also four small squares at the bottom of the representation, IVAP (I=Member information, V= video, A=audio, P=private. Appart from audio and video there were also a chat (for all or for private conversations) and a white board (to present an agenda, a document or a protocol).

The topic for the discussions during the meeting were video mediated technologies on the market,, the agenda for a future planning meeting and groups to observ during use of the technology. The project leader had in advance sent the agenda to the participants via email. The same agenda was also shown on the whiteboard. During the meeting the project leader took notes that were presented on the white board, visible to all participants in the meeting.

The discussion went on and was disturbed now and then since participants tended to ask if everybody could hear, why one of the participants suddenly disapeared and the possible reasons.
Discussions among more than two persons at a time were uncomon. Either everybody said their meaning one by one or, more common, two persons discussed a matter.

This meeting can be classifyed as an information meeting. The task to perform is to inform the project members about ongoing activities, mainly groups to observ and, new technology to test within the project group.

Audio

There is a delay in the transmission of the audio. This is mostly notisable at change of talker, discussions, objections, feedback. They arrives too late and confusion arise. The participants are used to the limits in the technology and do not seem to bother much about it. When one speaker talks at a time the delay of the audio is not a problem.
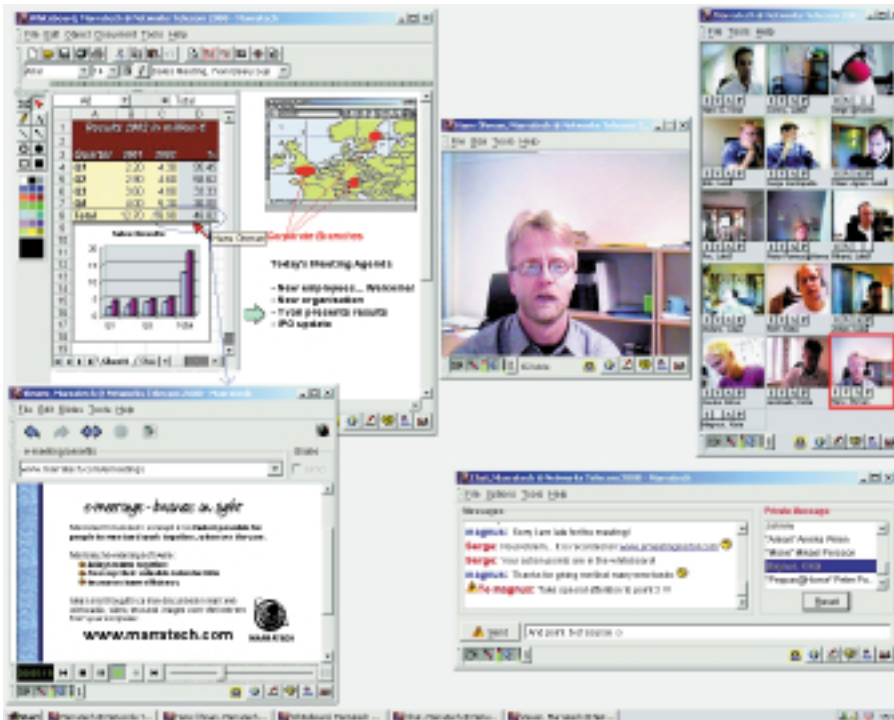
Figure 1. A screen shot showing a typical usage scenario using Marratech Pro.

Video

Video is transmitted with a delay. The camera is constant and do not zoom. The participants lack controll over how they and their colleagues are represented. Most of the cameras are placed beside or on top of the screen which do not lead to eye contact but a feeling of the colleagues looking upwards or downwards. All participants are represented via a small picture in the left upper corner on the screen. If the camera is placed above these, eye contact is nearly experienced.

The delay of the video transmission hinder the view and interpretation of the facial expresion of the participants. Small spontanous gestures as nod, smile and look intensively into the screen is not visible for the others. Large smiles and movements of the head e.g. leaning the head at one side, is viewable. The images are somewhat jerky and lack a natural flow. A hand that is touching up a par of glasses frozes and are held in a position remarkable long time.
Non of the participants comment their colleagues camera position, or the colleagues behaviour.

Conclusions

One example from the group of technical experts and their DVC meeting is presented. It took them 23 to start the meeting! One explanation could be that the project leader sat at a location that had not been used for DVC befor. Unfortunately the same occurred during other DVC meetings in this group. It could be due to that technology, trying to find the optimal transpher of audio and video but it cuold also be due to the interest of the group i.e. working out things arround the technical tool rather than attending a meeting.

To communicate via the DVC system worked quite well and no one in the group complained on lagged audio and video. Nor did any in the group comment on colleauges behaviour e.g. answering a cellular phone call, ordering a table at a restaurant or even leaving the room.

The domain experts

A work group of six persons was contacted. They have collaborated and frequently met in face-to-face meetings and in telephone conferences during the last 3-5 years. This group normally sends an agenda before the meeting. A protocol is written and circulated after each meeting. The meeting observed follow this procedure and can be classified as a committee meeting. The task was to discuss an important report the group worked on together. It included discussions important decisions to be made, problem solving and coordination. Of the initial six persons four participated during the first distributed meeting.

The procedure during the first test
The following procedure was used to introdue the technology:
Technical support personell installed the technology. Description of the technology and description of where the participants were located and how. A pre-test to start the equipment and check audio and video.

One technical facilitator and one observer took part in the meeting together with the four participants from the domain group.

Data collection and analysis
One person observed the meeting and took notes. The video mediated meeting was taped both via a video camera in one of the participants room, direclty in the meeting session.

A questionnaire was distributed, via email, to the participants directly after the meeting. It consisted of 40 questions. A summary of the three subjects answers are presented below.

The notes from the observations was transcribed and function as a complement to the video recorded material.
The video record from one of the participants room, together with the video recorded material from the meeting was transcribed and analysed together. The analysis focus on type of activity in the meeting process, disturbansies (both thecnincal and from the other participants), silence (moore than ten seconds silence was analysed as silence, and paralelle activities. The questionnaires were analysed by calculating mean values and summarizing the participants free text comments.

Results

Video observations

Below the process of the meeting is presented showing start, conduction, closing, disturbances, silence, and, parallel activities.

The total time for the meeting was 1:28:53
The time for conducting the meeting was: 1:04:48 (divided into 18 sequences ranging from 16 seconds to 11 minutes.
The total time for disturbances was: 3:39
The total time for silence (more than 10 seconds at one time) was: 4:18
Parallel activities were: Private conversation in the chat among two (aiming at testing the tool). Visitor in the room (help to solve technical problems).
Chat among two (help to solve technical problems).

The activities performed during the meeting and there order of performance is described below.
Activities presented as Starting (S), Conducting (Co), Closing (C), Silence (Si), Disturbances (D).

S-D-S-Si-S-D-S-Si-S-Si-S-Si-S-Si-S-D-S-Si-S-P-D-Si-Co-Si-Co-D-S-Co-Si-D-Co-D-Co-D-Co-Si-Co-D-Co-D-Co-Si-D-Co-Si-Co-Si-Co-Si-D-Co-D-Co-D-Co-C-S-Co-D-Co-C
Figure 2. Presentation of the different phases during the observed meeting with the domain group.

In figure 2 above we see that the meeting was following the procedure: starting, conducting and closing. The meeting also consist of a number of phases of silence and disturbances.

Questionnaire

Background
All participants were very experienced users of telephone conferences. Three had also used DVC or VCS. The tools used during the meeting were audio, video, whiteboard and chat. During the meeting also telephone, cellular phone and email was used.

The four persons participating where situated as follows; at location 1, in the participants own office, in a colleagues office since the technology did not work in the participants own office. Location 2, in the participants own office, in the colleagues office i.e. the two participants shared the same equipment.

Type of meeting

The studied meeting was not regarded as typical meeting for the group. It was not rated as taking to much time and were not experienced as a successful meeting. One of the participants enjoyed the meeting while the rest of the group were more neutral. Despite this all participants were positive to take part in more e-meetings (except for one saying *"yes, maybe"*).

The participants could focus on the meeting ranked as a 4 out of 5 possible where 1 is to a low extent and 5 complete. The distractions were according to the participant's problem with the technology that led to local problem solving. Documents were read and it was experienced as;

"Disturbing to shut off and turn on the microphone all the time in order to avoid echo effects".

A comment from one of the domain experts was that the meeting was not as efficient as expected but that it could be due to that some of the participants did not prepare properly.

Communication via audio and video

To hear the other participants were ranked as 3 on a five graded scale (were 1 is very bad and 5 is very good). To communicate verbally were ranked as 3 and the particpants commented on the problem with the microphone and the echo effect and said that sometimes it was not possible to hear the participants at all. The lagg of audio was experienced different by the participants. Some were very disturbed by the lagg while other where not.

The quality of the video was experienced differently by the participants, from very good to quite poor and commented by one of the participants as;

"3, but good enough".

There is a lagg in video and one the participants commented;

"Yes, there was a delay in the transmision of the video but this is not the most important, especially as we know each other pritty well".

The participants explained that the video helped in a way so;

"I fast got a apprehension of the other participants. We also received a better understanding of that some of the participants had problems, that to a large extent were possible to solve later on".

To communicate non-linguistic worked bad but was not regarded as a great loss. To understand in which order to take the floor was hard and among other things due to the time delay of transmitting the video.

The meeting was not at all rated as social by the participants;

"All who wanted to talk could do so but the technology did not support to pose short questions while someone else were talking".

Task

The group did not rate themselves as working efficiently during the meeting and comments about the problem to get started were mentioned. During the meeting a simple agenda was used and all topics were discussed during the meeting but not fully completed since not all members of the group participated. The group worked quite task oriented and one toppic was discussed at a time.

Technology and disturbancies

The technology did not work without problems and the disturbansies during the meeting were due to the technology according to the participants.

The participants summary of how they experienced the e-meeting
"The technology corsed more problems than expected. It was unsuitable to, for the first time, test the technology when we had such an important meeting. The result were quite chaotic. Afterwards I was very tired".

"If you fix so that no one need to share microphone without echo it will surely be good".

"Somewhat fumbling. Good with video. The meeting was badly prepared by me and maybe also by others by whom I had expected more input from before the meeting".

The participants summary of what to improve
"Test with an occasion when no big decision have to be taken. Test locally several times".

"The interface, better loudspeaker/microphone. Better conversation discipline. Better adjustments of broad band, volume and so on. Better utilization of the whiteboard".

The participants summary of what to keep as it is
"The idea with the technology is good and interesting. Especially positive is to share documents and to use chat when the audio broke down".

"One advantage with technically complicated meetings is that it includes less ordinary talk that tend to make the meetings inefficient".

"We ought to develop both the meeting technique and the technology as such, which I think we should implement also to our doctoral students to give courses at a distance".

"Video communication is sometimes of a great interest. The whiteboard and chat-facilities can also be valuable as complement to audio only communication. I think the technology is suited for spontaneous meetings, as also to an extent can be documented, which is of special interest when different topics are discuss forward and back and to quickly go into other topics, in order to go back to the first and so on".

Conclusions

To introduce new technology and to have meetings on distance is full of difficulties. We tried to work in several steps, with technical expertice both befor and during the first meeting, but still there were a lot of problems.

The disturbansies and silence during the meeting made it very difficult to study the meeting process as such. The idea of studying a distributed meeting and artefacts to use during the meeting did not fully succseed since several of the participans had to sit in another room than their own office. A comment from one of the domain experts was that the meeting was not as efficient as expected but that it could be due to that some of the participants did not prepare properly.

The participants was althoug quite positive to the software used and they appreciated the chat and whiteboard facilities.

GENERAL DISCUSSION

Variables to be included in "the matrix" i.e. what to describe in studies of mediated meetings are "group norm" and "artefacts". Groups work different and have their own norms for how a meeting should be performed. If an observer is not familiar with the observed group norms, the explanation of why a phenomenon occurred can be misleading.

The situation, including artefacts used or needed during the time of the meeting also need to be clarified in order to draw correct conclusions. The classification of type of meeting and task must be discussed since it can be hard when they often are a mix of several kinds.

Studies of mediated meetings present results from ongoing meetings but if the technology aims at being a tool "for all" then the participants in the meeting also should be able to start up the software individually without any greater problems or disturbances. In one of the here reported studies we worked with facilitators both at one site and at the meeting point in the software – still the conclusion is that the group would not have managed to start up and conduct their meeting without the help! We need to influence the development of these tools in order to reach this goal.

From the study of the technology group we see that DVC systems demand training (both training in the technology and it's different tools).

The audio is very important and some of the here found problems could be minimized or solved by avoiding the echo effects. It the audio and video lag can be made smaller the mediated communication can be much improved.

From the studies we also found that the spatial relationship in face-to-face meetings are not at all applied in DVC. In studies of mediated meetings in collaborative virtual environments it has been shown that the spatial relations can be a support for e.g. turn taking (Lantz, 2001). The pre-test was individually but when a group is observed the pre-test should be as close to the coming real situation as possible i.e. perform the pre-test as the planned meeting is going to be performed, by the whole group. We also have to take into consideration the importance of the meeting for the participants. They might not have a second chance to meet and we can take for granted that there will be technical problems and disturbances.

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