

# Designing Computer Supported Collaborative Learning Activities for Specific Contexts

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## Abstract

This paper explores the design of computer supported collaborative learning activities. There is a need for methods to develop learning activities suitable for various domains. The context in focus here is workplace learning, specifically collaborative learning among mobile and distributed colleagues. The design method proposed builds on input from qualitative studies, organized learning activities and the possibilities of new technology. Scenarios are used to be able to evaluate and innovate learning activities. In this paper the use of learning activities (generally accumulated from research in a non-work context) is combined with qualitative studies to inform design of IT-supported workplace learning. When applying the method to a case of introducing a specific collaborative learning activity (multimedia scenarios) to a context of mobile and distributed workers, it proves useful.

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**Keywords:** *CSCL; Workplace learning; Design Methods*

Received 21/11/2003; received in revised form 9/02/2004; accepted 20/02/2004

## 1. Introduction

This paper explores the design of computer supported collaborative learning (CSCL) activities. We present a method that addresses the problem of making learning activities suitable for specific contexts using qualitative studies and scenarios. The method is presented as applied to a case of introducing new learning activities in the context of mobile and distributed work.

During the past decades the development of information technology (IT) has been accompanied by a trend towards incorporating these technologies in collaborative learning activities (Koshmann, 1996). The effects and possibilities of this have been studied. The field of research on CSCL has generally explored this within an educational setting, in classrooms and has generally ignored the workplace as a context for intentional and organized CSCL activities.

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Organizations are dependent on learning and knowledge (Prahalad & Hamel, 1990) and managing and developing these is a crucial matter. The importance for professionals to continuously learn is given major attention in both research and practice (Fischer, 2000). This is often put forward as the main source of personal as well as corporate competitive advantage (Senge, 1990). By providing designed learning activities, everyday learning among workers can be supported and guided. In this paper the specific type of learning activities discussed is organized activities where learning is intentional (i.e. learning is the aim of the activity). The activities that are in focus here can be more or less formal, and they are always intended to be collaborative.

Mobility can be considered as a circumstance shaping and framing the engagement in collaborative activities, in the use of technology, as well as in other activities. Mobility is, in this paper, used to describe the spatial mobility of people (Ljungberg & Kristoffersen, 2000). The idea of designing CSCL activities using wireless technology and incorporating the aspects of mobility has been explored within the context of the classroom (Roschelle & Pea, 2002). The concept of mobility has been extensively discussed in research (Kakihara & Sørensen, 2001; Lyytinen & Yoo, 2002; Weilenmann, 2003), and will not be further explored here.

This paper aims to formulate a method for designing CSCL activities for specific groups of learners, and to bring in experience from learning activities designed for other contexts. We argue that there is a need for methods that help us in tailoring CSCL activities for new contexts, inspired by the successful results from other domains. In this paper a case of mobile and distributed learners is used in order to exemplify and develop this method. The focus of the study is:

***How can the learning needs and contextual frames for specific groups be incorporated in the design of CSCL activities?***

The remainder of the paper is organized in the following sections: The next section is a discussion of related work on the design of learning activities, it presents the basic starting-points concerning learning that the method is based on. We then continue with a description of the suggested design method. After this, a group of mobile workers are taken as an example case of how new contexts shape and frame learning activities. Section five describes the research approach applied. The following sections describe a case of designing a CSCL activity for mobile and distributed workers. The paper ends with the results from an evaluative workshop and discussion on the suggested method.

## 2. Designing learning activities for specific contexts

As mentioned in the introduction, CSCL activities have been studied extensively within the context of schools. One example of this “contextual bias” is the proceedings of the fourth international CSCL conference. The proceedings present 51 full papers (Stahl, 2002). Out of these 51 papers 34 was involved with design and/or implementation and/or study of CSCL activities within school student context (from kindergarten through to university studies). Four papers focused on a school context but from a teacher perspective. Six papers discussed CSCL theories or methods from a non-specific context standpoint. Of the other seven papers four papers did in some way include research on adult learners and only one of these papers studied the design and implementation of CSCL activities within the workplace. The CSCL community has been successful and innovative concerning new ways of incorporating computers in learning activities for the classroom and it is important to be able to use these experiences in CSCL design aiming at new contexts.

Research on computer supported learning that focuses on student-student interaction has also been done within the studies of asynchronous learning networks. Within this field of research the effects that computers have on the learning outcomes have been in focus (Dutton, Dutton, & Perry, 2002). However little work has been done concerning workplace learning and how computer supported learning activities can be designed for settings other than traditional education.

The research on the involvement of IT in learning activities has traditionally focused on making courses available for distributed students as well as using the computer individually and collaboratively in the classroom (Laurillard, 1993; Leidner & Jarvenpaa, 1995), taking a school or classroom perspective on learning activities. However, “Learning can no longer be dichotomized into a place and a time to acquire knowledge (school) and a place and a time to apply knowledge (the workplace).” (p. 3, Fischer, 2000). Concerning IT-support for learning in work the dominating research fields are knowledge management (KM) and organizational learning. Within these fields, however, the main focus has not been on creating IT-supported learning activities but rather on how to codify, store, distribute and manage information as a support in knowledge work. Thus, taking an infrastructural perspective on learning at work as compared to a focus on activities (Alavi & Leidner, 2001; Hendriks, 2001). In workplace learning, IT-support that stimulates active participation in collaborative learning activities in work as well as at work will be needed.

This paper is based on an understanding of learning and knowing as actions of humans participating in social contexts. Learning is situated in social practices and is shaped and framed by these practices. Lave & Wenger (1991) argue that “learning is not merely situated in practice – as if it were some independently reifiable process that just happened to be located somewhere; learning is an integral part of generative social practice in the lived-in world.” (p. 35).

Learning is not a specific kind of activity but rather a component of all activity (Säljö, 2000). However, activities can be supported (or hindered) and so can also learning. In this paper learning activities is used to describe an activity where the aspects of learning are in focus. Following this line of argumentation learning is the collection of experience from activities, or more precisely the appropriation of resources to think and resources to perform practical endeavors. What is described as knowing is putting these experiences to use (making them resources) in new situations. The learning activities discussed in this paper are activities that seek to bring new (and guided) experience to the learners.

Concerning the connection between technology and learning activities Alavi (1994) discusses: “The integration of information technology with the college classroom, however, is by no means trivial and is not simply a matter of training the instructor and the students in the use of computers.” (p. 3).

In this paper we agree that the study of how IT affects the learning activities and the outcome of these activities might be relevant, but we emphasize the need to examine how the context, as a whole, shapes and frames the engagement in CSCL activities. Research on collaborative use of computers in work have pointed to the importance of understanding the use from a perspective of the use context and situation (Schmidt, 1999; Suchman, 1987; Whittaker, Frohlich, & Daly-jones, 1994). Also in the field of learning in work the aspect of situated action has been in focus brown (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991). To design innovative computer supported learning activities we have to take into account the aspects of the new technology as well as the new context of use, not only regarding the content but also regarding the organization and design of the activities.

We argue that pedagogical activities developed for school activities can serve as basis and inspiration in the design of activities for use in the workplace. Even though school and work are in many ways different, there are also many similarities. Svensson (2002) discusses this: “Examples of such more or less globally shared

educational characteristics are the power relationships between students and teachers, methods for instruction, and structures and methods for examination.” (p. 7)

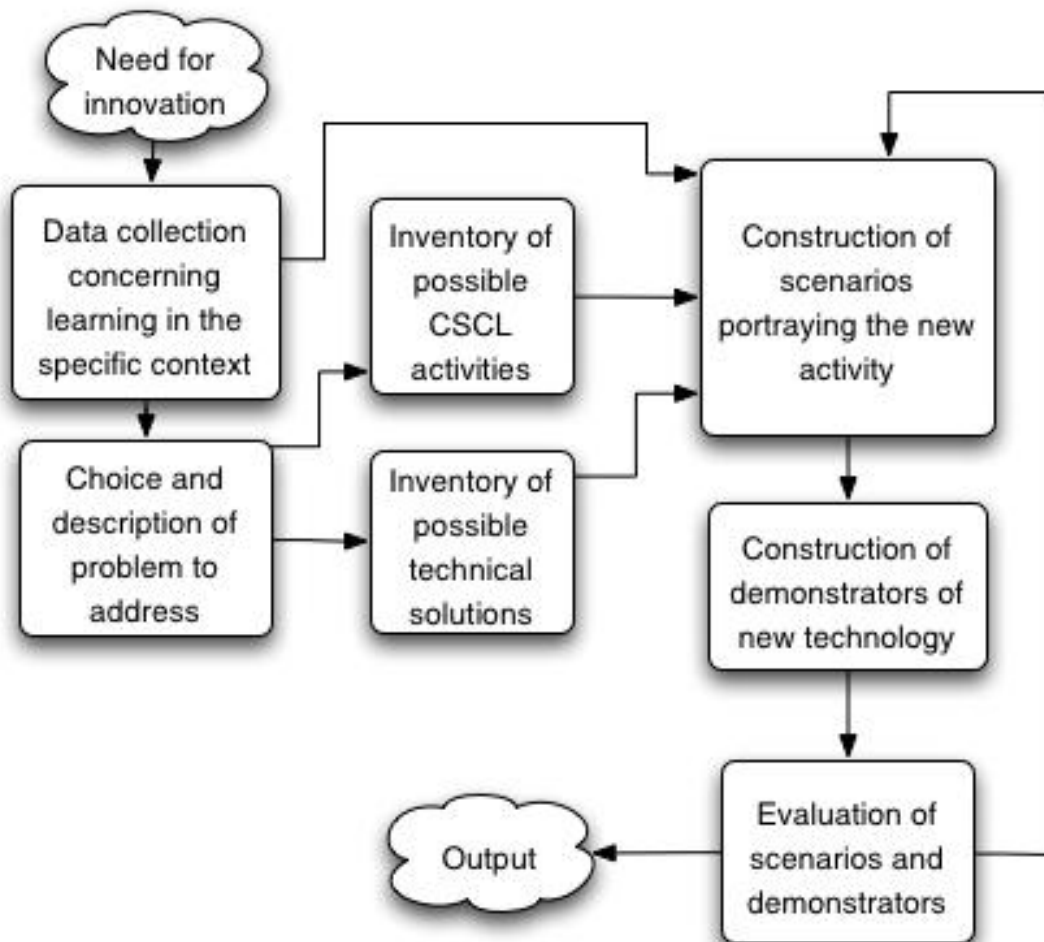
Fisher (2001) describes how conceptualizations of learning have to be changed when moving from a school/university perspective to a perspective of workplace learning. The change in conceptualizations points to the importance of contextualizing learning in real work activity (not viewing it as something to be involved with only in a classroom), understanding lifelong learning as something that involves peers and collaborating in real problem solving. He also points to how the new understanding has to affect the structuring of the learning activities.

### **3. A scenario-based approach to designing CSCL activities for workplace learning**

The design method suggested here treats design problems as dynamic and ill-defined. The process of design is not understood as the addressing of specific problems but rather the formulation of an understanding in a dialogic process with the design problem (Schön, 1983). Carroll (2000) describes the use of scenario-based methods in design in a similar way, “[scenario-based methods]... seeks to exploit the complexity and fluidity of design by trying to learn more about the structure and dynamics of the problem domain...” (p. 45). Thus, the design process is not only about merely “solving” problems but rather about exploring the problem through different designs. It is a process of learning, and understanding new problems through interaction. Orr (1996) describes a similar process of producing a representation of a problem through reflective manipulation of resources available. Problems are not out there for us to address but rather to formulate in the process of intentionally creating something new.

The design method presented in this paper (see figure 1) builds on the use of stories (scenarios) as a tool to explore the possibilities for design of learning activities. As discussed above, learning is understood as contextually situated activity. To explore the context, data is collected concerning what shapes and frames learning activities within the intended context of use. This data is used to be able to develop further understanding of the problem as well as a scenario that portrays new use in a relevant and authentic fashion. We then look into what learning activities are suitable. If the design ideas could benefit from using new technology these possibilities should also be explored. Then scenarios are developed describing the suggested learning activity, the use of new technology and framing this in the context of future use. The use of

early prototypes as demonstrators is sometimes beneficial. This way the demonstrator introduces sometimes unfamiliar technology and creates a more specific picture of the intended use. It can also give the users a look and feel of the technology. The scenarios and the demonstrators are presented to the potential user group to be able to get feedback and inspiration for the continuation of the design work.



**Fig. 1:** A method for designing CSCL activities adapted to specific contexts.

The use of fieldwork as an input into design processes is preceded within the field of computer supported collaborative work. Fieldwork can identify new possibilities for design of IT as well as provide an understanding of the context one is designing for (Bly, 1997). The use of ethnographic field studies in the design of IT is typically devoted to work settings such as offices (Belotti & Bly, 1996; Belotti & Smith, 2000; Suchman & Wynn, 1984), police work (Ackroyd, Harper, Hughes, Shapiro, & Soothill, 1992), control rooms (Hughes, King, Rodden, & Andersen, 1994), and public organizations (Simonsen & Kensing, 1997). The data from the field help to further

explore the initial problem and thereby work as input to the design suggestions. When writing scenarios we also suggest the use of input from data collected in the setting of the intended use. The studies make it possible to incorporate some of the cultural and communicative aspects that are relevant in the organization, in the scenarios.

Stories or scenarios have not only been explored within the field of design. Orr (1996) discusses how stories are used to represent the construction of understanding and how stories are used to represent and define problems. Wenger (1998) also discusses the importance of stories as tools in the construction of meaning. "Stories, for instance, can be appropriated easily because they allow us to enter the events, the characters, and their plights by calling upon our imagination. Stories can transport our experience into the situations they relate and involve us in producing meanings of those events as though we were participants." (p. 203). The use of stories as a method for change and innovation is also used in organizational change, to be able to introduce and help the "users" of the story to appropriate new concepts (Denning, 2001).

Involving stories in the design process is something different from only applying them ad hoc in everyday life. The scenarios that we use here are designed for specific purposes. They should portray a setting, include actors, have a plot and try to make the use of the proposed design explicit (Carroll, 2000). The story should enable readers or listeners to imagine themselves in the use situation, and in that way make them able to provide critique and new ideas concerning the use.

#### **4. Mobile workers and organized learning**

During the past decades the understanding of work and management has been changing, evolving from predictable, deterministic work patterns to more contingent and idiosyncratic forms, distributed in both time and space (Brown & O'hara, 2003). Work-conditions demand that people become more mobile and new technological possibilities is allowing a mobile and distributed work style (Ljungberg & Kristoffersen, 2000). The evolution of work and the development of expertise have not been accompanied by innovations in the models used in workplace learning and training to develop this expertise. Although contemporary models are useful for many types of employee development, their potential for developing the type of skilled performance needed in a contingent and dynamic work environment is questionable (Torraco, 1999).

Mobile work is often distributed in time as well as place (Ljungberg & Kristoffersen, 2000). Workers operate in temporary work constellations. People work from home, on

the move and in flexible office environments. These people have to adapt their everyday learning to these mobile situations (Lundin & Magnusson, 2003).

Previous research and also the interviews presented later in this paper indicate, that it is often difficult for people working distributed and mobile to allocate time to participate in face-to-face co-located learning activities (Fagrell, 2000; Lundin & Nuldén, 2003; Nardi & Whittaker, 2002). The respondents in the interviews also express that it is problematic to coordinate their mobility to allow synchronous interaction with colleagues. Mobile workers and their organizations request alternative learning opportunities suitable to their prerequisites. This difficulty is what establishes the need for changing and innovating learning activities for this group of workers.

## **5. Research approach**

The research approach applied in this paper suggests that there is a need for critical and systematic research in the realm of IT, but this has to be accompanied with creative and innovative ideas for designing new applications and services. In this paper the design method applied is combining pedagogical research, data from the context of use, as well as an understanding of possible technical solutions. This research is based within the field of informatics, which is a discipline focusing on the current developments in IT use (Dahlbom, 1996) and presenting new ideas for such use (Dahlbom & Ljungberg, 1999).

Using the proposed method we first need to identify a problem. This was done through interviews, previous field studies and with inspiration from other research. To give input to the design process we conducted interviews with six project managers from three Swedish organizations. The interviews were of informal conversational format (McCracken, 1988) and lasted for approximately one hour. The interviews covered the person's background and how they have engaged in learning activities concerning project management, how they manage projects in general and people in projects more specifically. They were also asked to comment the ideas of mobile learning activities.

In combination with previous experience within CSCL, the interviews constitute the firm ground on which the scenarios are built. Demonstrators of suggested technology was constructed. To receive feedback and evaluate the ideas concerning mobile learning activities, the scenarios, as well as some of the possible devices which the suggested types of applications might be used on, was presented to a group of potential users during a workshop.



## 6. Results from interviews

All the interviewees manage large and critical projects. They work while traveling, they go from one meeting to the next and their working days are filled with unplanned meetings. They rarely have time for informal interaction with colleagues and have difficulties in engaging in collaborative activities. This small sample is used mainly as an inspirational input to the scenario, rather than trying to provide complete understanding. An analysis of the data from the interviews has been previously published (Hardless, Lundin, & Nuldén, 2001).

Below we present some of the statements made by the project managers concerning time and organization as two of the main difficulties when trying to find time for organized learning activities as well as a lack of possibilities to network and engage in collaborative activities.

The project managers bring up the management of time as an important issue. Most of them said that they feel that they only have time for the “real” work in the project and nothing else. They experience that projects are becoming more time critical and that there often is a lack of resources. One of the consequences is that organized learning activities have to give priority to other activities in the projects. Only one of the project managers saw the issue of time in a different way: “Planning is the key to successful competence development; you need to be very thorough with your calendar. If you do that, you can participate in as many courses as you want.” Whereas the rest of the project managers were quite unanimous in their comments. One said: “It doesn’t matter how thoroughly I plan, there are constantly situations emerging, forcing me to give courses very low priority.” This points to the dynamic and unpredictable environment in which these managers have to work and how any new activity has to be adapted to fit an unpredictable use pattern. During the interviews one of the managers stated that he had participated in courses, but that “coming back to work after a course you have a lot of work to catch up on, and the days before a course are quite hectic too.” In the descriptions that the managers give of learning and work, learning activities is not seen as an integral part of work but rather something else, something that is and should be separated from daily work activities.

The organizations have explicit policies stating the importance of competence development to the company. But then the “real work strikes back”; as one project manager puts it. “I have seen it so many times, that people been promised to

participate in a course, but then requested to cancel their participation because the project comes first.” Three of the managers admitted that they had denied project members to participate due to heavy workload in the project. Learning is talked about as something disconnected from everyday work.

A few of the managers had some experience of distance education and computer supported learning activities, but their experiences were not all positive. The main critique was the lack of interaction with other people in the courses they had attended.

This indicates that mobile workers often find it problematic to participate in traditional learning activities. They require new forms of educational activities, in which they can participate at the time and place of their choosing. New activities, based on learning through shared practices, shared goals and shared conceptualizations of work tasks are needed. Learning activities for mobile workers must strive to support continuous cooperation among colleagues, and continuous participation in the development of community practices.

The interviewees found it necessary to either change the organizational situation to allow employees to participate in traditional courses or find new approaches to organized workplace learning. We chose to explore how possibilities of continuous, daily and collaborative learning can be innovated among mobile workers. In the following sections we propose a new approach to workplace CSCL.

## **7. Learning Models**

In this section we introduce a suggested computer supported learning activity developed for face-to-face collaborative learning (i.e. not adapted for mobile use). The stationary model has been successfully tested in different organizations (Nuldén, 1999; Nuldén & Scheepers, 1998) and has been redesigned and implemented to support mobile workers (Lundin, 2003). The case presented in this paper is taken from this redesign process. We first present the stationary activity and then the suggested redesign for mobile settings is discussed.

### **7.1 Multimedia scenarios**

Multimedia scenarios are based on PIER, which is an approach to organizing learning activities using Problem based learning (PBL), Interactive multimedia (IMM), Experiential learning and Role-playing.

PBL builds on a fundamentally different understanding of learning than “traditional” teaching methodologies. It is a significant challenge to orthodox beliefs about education and learning (Margretson, 1991). PBL is;

“...a way of constructing and teaching courses using problems as the stimulus and focus for student activity. It is not simply the addition of problem-solving activities to otherwise discipline centered curricula, but a way of conceiving the curriculum which is centered around key problems in professional practice.” [...] “... problem based learning starts with problems rather than with the exposition of disciplinary knowledge” (p. 333, Boud & Feletti, 1991).

It is the responsibility of the educator in PBL to present stimulating problems. A great deal of attention has been focused on IMM in the educational domain. Commonly, IMM uses hypertext to permit links among pieces of information such as text, sound and graphics, and the learners “explore ideas and pursue thought in a free and non-linear fashion” (p. 77, Bieber & Kimbrough, 1992). IMM has evolved during the last years, from simple drill-oriented programs to advanced simulations where users receive support for understanding complex matters.

We see three current trends with IMM in general and educational settings. First, the World Wide Web rather than the CD-rom is becoming the main channel for distribution of IMM. Second, there is a shift from multimedia for individual learners towards multimedia application for groups (Nuldén & Scheepers, 1998). Third, the interactivity that is getting the most attention is the interaction among the participants in the group working with the IMM, rather than the human-computer interaction.

Experiential learning refers to an encounter that the learner experiences. From this encounter, learning is initiated. In experiential the learner directly encounters the studied phenomenon (Kolb, 1984). Experiential learning is participative, interactive, and applied. It means experiencing the environment at first hand and to be confronted with processes that are uncertain. There is a long history of simulations, games and role playing in various educational contexts (e.g. Van Ments, 1989). Role-plays can be described as dramas in which a number of participants are asked to portray a particular character, but no lines are provided for actors (Steinert, 1993).

The multimedia scenario takes about three hours to go through and is conducted face-to-face in groups of 6-8 persons with a big screen display for presenting the story. The scenarios paint a colorful picture of a situation relevant to the participants. Using

movie clips, audio files and text the group is introduced to a fictitious scenario. For example: one scenario describes the progress in a fictitious development project. This scenario is used in an organization that has a problem with overview in projects. The participants are confronted with some background information. They are each given different roles to play in the scenario. A story about a project is introduced to the participants, the storytelling is made vivid by multimedia. The members of the role-playing project group have to make choices, trying to make this project a success. A session is two to three hours depending on how much discussion the participants engage in. When the scenario ends the project also is finished. This way time is compressed in the project to create an overview. As mentioned the multimedia scenarios have been successfully tested in face-to-face settings.



**Fig. 2:** The picture shows a multimedia scenario used in a stationary setting where the group of learners participates synchronously in the scenario using a large screen.

Our application of the PIER approach consists of four activities: (1) concrete experience through role-playing with the aid of a multimedia scenario, (2) a period of reflection, (3) seminar where the scenario is discussed, and (4) ongoing and organized learning processes. The first activity is given most attention in this paper.

## **7.2 Mobile scenarios**

With mobile technology and new networking possibilities it is technically possible to make the multimedia scenarios available for mobile workers. Participants will have the

opportunity to connect and engage in role-play at the time and place of their convenience. However, the transfer to a mobile setting is a great challenge.

The original multimedia scenarios, being face-to-face, are suitable for role-playing, communication and direct response among the participants. In the mobile scenarios (MoS) it is important to sustain as much as possible of the original activity's benefits. It is difficult both because of the limitations of the communication technology available as well as the methodological differences concerning asynchronous and mobile participation. We are attempting to create an application and an activity used on handheld devices that encourages and simplifies communication within groups as well as supports CSCL activities.

The duration of the MoS will not be as compressed as in the multimedia scenarios. Since the participants engage in the activity in an asynchronous way and it is important that the scenario is role-played as a group activity, it is rather dependent on how much time the participants spend using the MoS and how fast they "role-play" through it. When introducing collaborative learning parallel to daily work tasks we cannot assume that all participants have the same possibility to actively engage. Therefore the learners can be at different levels of progress in the collaborative learning activity. To facilitate collaborative activity the progress of the participants has to be synchronized in some way. One way of creating synchronicity is to let the story guide the role-players. This can be done by locking the story at set scenes and not revealing the continuation until all participants have viewed the last part (this puts some pressure on the members to engage in the activity and not keeping the others waiting for them). The aspect of keeping momentum and keeping the group together have been further explored and has been addressed by using different methods that attempt to synchronize the participants (Lundin, 2003). The use of "cliffhangers" can also have effect that the participants anticipate the continuation of the story and actively use the MoS.

## **8. Scenarios**

In this section two fictitious scenarios of a possible organized learning activity suited for the mobile worker are outlined. The scenarios are applying MoS as technology and activity.

### **8.1 Scenario 1 - project manager education through a MoS**

In this section a scenario where a MoS is used in a mobile setting is presented. A group of eight project managers working in a global telecommunications company are participating in a project manager education, which consists of distributed role-playing supported by a MoS. The MoS is supposed to prepare them for an international project. They will each be in charge of a part of the project at their local office. Below one user's participation in the MoS on a typical workday is described.

Lisa is the project manager of the Brazilian office. She is having a hectic day at work as usual. At the moment she is visiting a customer's and waiting for a sales presentation to begin. She appreciates having some time to relax, but after a while she is getting bored. She is eager to see if there are any replies to her comment on the decision she, and seven other project workers, are trying to reach in the scenario. The scenario they are role-playing is a fictive IT project. She estimates that there is enough time to engage in the MoS so she connects her handheld device to the online activity. She views the new contributions to the discussion (Figure 3).



**Fig. 3.** Lisa views the new contributions to the discussion in the MoS.

In the scenario Lisa is acting as a controller, an unusual role for her. Bob, who is acting as the project-manager, has argued for a decision alternative that leads to high risk and high cost. Being the controller Lisa feels that the risk is too high. The other participants seem to go with Bob's line of argumentation and she feels she has to explain that this might have devastating consequences for the project. She disconnects and walks into the meeting-room just in time for the presentation.

Later that day, driving home from the customer, Lisa gets stuck in a traffic jam at a road construction. She doesn't get very upset by this because all day she has been

planning her comment to the group in the multimedia scenario, she has just been waiting for a moment to record it. Once again she connects to the MoS (Figure 4).



**Fig. 4.** Lisa records her contribution to the discussion while being stuck at a road construction.

She records her contribution. Now the cars around her start to move so she puts her device on audio and listens to the other contributions concerning the decision while driving home. When she reaches her destination and has parked the car, she decides to vote for the low risk decision alternatives. It was predetermined that this scene in the scenario should end this evening and that all votes should be submitted before midnight. Through her handheld device she chooses the low risk alternative. She looks forward to the next scene in the story that depends on the result of the vote. It will be available the next morning.

## **8.2 Scenario 2 - E-business education for mobile workers**

An insurance company is currently in the midst of an organizational change. In order to create a well-grounded starting-point for the change process concerning the salespersons, a learning initiative supported by the MoS is initiated. The focus is on e-business and the activity is launched among a sales team (that to a large extent are working mobile and distributed). A group of 15 salespersons are participating in the activity. Below is an illustration of a user's participation in the learning activity in a typical work situation.

Jack is traveling by train to meet an important client. He has to get prepared for the meeting but after reading through the background material of the customer he has time

to engage in the e-business role-play. He connects to the MoS activity that started this week, and views a short video that introduces the topic of the first week (Figure 5).



**Fig. 5.** Jack views the introduction of the e-business education on the train.

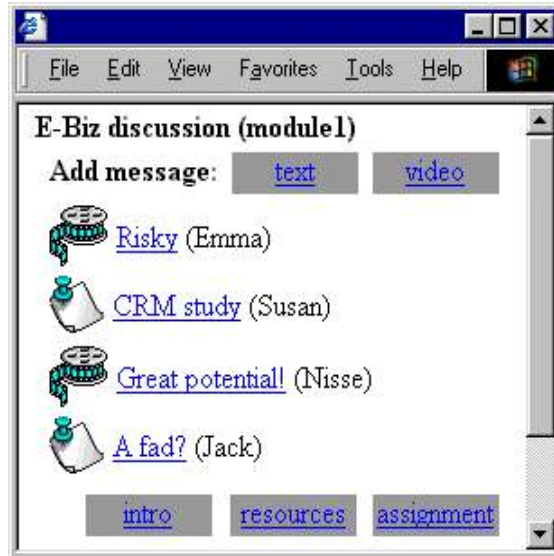
The video raises some interesting points. Jack is especially interested in the point about customer relations management (CRM). He decides to initiate a videoconference with a colleague in his group to discuss the issue right away. The handheld device indicates that his colleague will accept incoming videoconference calls related to the e-business education. Jack makes the call and they talk for five minutes and reach the opinion that CRM seems to be a fad. Jack decides to share their discussion with the rest of the group and posts a short written message in the common discussion area.

When the train stops he disconnects and in the cab to the customer he looks through the background material for the meeting once again. Later that day during a coffee break he is eager to know if the other participants have given any replies to his posting. He connects through his handheld device. There are three responses to his original message: one written message and two video-mails (Figure 6).

The written message is from Susan who has posted a part of a study showing that CRM systems can increase customer loyalty by 54%. The two video-mails are from colleagues who argue about the pros and cons of CRM. Jack is pleased by the quick responses, he enjoys and benefits from discussing with his colleagues. This has up



until now been problematic due to their mobile and distributed style of work. Almost the only time that he got a chance to talk to his colleagues was at the company's Christmas party.



**Fig. 6.** There are three responses to Jacks posting on the subject CRM.

On his way to his hotel, Jack connects to the e-business education and streams a recording of a recent debate on customer empowerment from public radio. At the hotel he reads through some of the articles available through his handheld device. He feels he is able to make a stronger argument in the discussion now. Just when he is about to record his message he gets a phone call. His boss is in town and asks him to attend a dinner meeting this evening. On the subway on his way to the dinner Jack records his message (Figure 7). He smiles to himself and thinks: "This is mobile learning at its best...."



Fig. 7. Jack records his message on the subway.

## **9. Workshop with potential users**

In accordance with the suggested design method we presented the two scenarios to potential users to evaluate the use and involvement in the proposed learning activity. The purpose was to examine whether MoS is a feasible way to support mobile workers and to receive input to the design process. Twelve people who considered their work to be mobile in some sense was guided through the scenarios as well as confronted with basic demonstrators (a mobile device with visualizations of the applications and some interactive capabilities). Demonstrators were implemented on the Sony VAIO C1 Picturebook (Figure 8) and on the Compaq iPAQ Pocket PC (Figure 9). iPAQs were used for simulation of the expected small screens of future portable devices. The Vaio (small size, built in video camera) is suitable for testing video conference with a wireless LAN. They had hands-on opportunities and were asked to think out loud. They were enthusiastic. One commented the use-cases: "It would be great to have the opportunity to competence develop while traveling but it should never be a must". Another of the participants said: "I like the idea of sharing knowledge with colleagues, I never have a chance to do that in my daily work". The participants generally expressed quite positive attitudes to the idea of MoS. When trying out the demonstrators we received mostly technical and design comments but one participant said, "I like the built in networking activities [text, audio and video communication], but I doubt that engaging in video conference in public will really work". The participant's reluctance was not further explored but one important aspect of the problem is the engagement in non-public activities in the public space.



**Fig. 8.** The Sony VAIO picturebook C1XS.

From this study we cannot draw any major conclusions concerning the use of the MoS, but the response from the participants indicate that the MoS are worth to explore more and therefore the learning activity will be further refined. The use of the demonstrators gave us valuable input on the possibilities and limitations of our concepts. Further refining of the concept of accessing role-play in a mobile setting and on mobile devices has been documented within the scope of a larger research project (Lundin & Nuldén, 2003).



**Fig. 9.** The Compaq iPAQ.

## **10. Discussion**

In this paper we have explored problems and possibilities concerning the design of CSCL activities. We have described a method using qualitative data, CSCL activities and technical possibilities as input in a design process. The method suggests using scenarios and experimental demonstrators to further refine and explore the problem and the design, and also to involve potential users in the process. The method is applied to a case of designing an organized learning activity (the MoS) for mobile and distributed workers.

The method proved useful for exploring and structuring the design work, and a suggested activity and its support with new technology was proposed and refined. However, the feedback from the users was not very challenging or provocative. Rather their comments were supportive of the ideas presented. This at least gives some confirmation to the value of the ideas, but it is not very helpful in the refinement. One suggested way to improve this would be to leave the scenarios more open for interpretation and making them somewhat more provocative. From the evaluation we got an indication that the MoS is one possible way to support learning activities for mobile people. We suggest that the design method is not to be used in a causal way,

meaning that we cannot expect great learning activities to be the results just as long as the processes are guided by the proposed method. Rather it should be seen as help and inspiration in the design process, giving guidance in what inputs could be used and how the design work can be structured.

Maintaining and developing knowledge is certainly also an organizational issue, not only a question about designing new activities supported by new technology. The cultural and organizational issues are important concerning how mobile workers prioritize and understand learning activities.

Despite the technical possibilities with new networked technology, it is not realistic to expect that most people will engage in nice-to-have job-related training on their own spare time. We are also aware that many people find more traditional organized learning activities as one very important way to get away from their regular work, creating some distance and opening up for reflection on everyday work. These are two of the issues this project is investigating further.

To further validate the method it should be tested in different contexts and with different groups of designers. It is also important that the proposed activities are brought to real use and are further evaluated.

## **11. Acknowledgements**

This project was made possible through the financial support from SITI (The Swedish Research Institute for Information Technology) and STINT (The Swedish Foundation for International Cooperation in Research and Higher Education).

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