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CSCW 2004 Position Paper for W11:  
Methodologies for Evaluating Collaboration Behavior in Co-Located Environments

**Vision**

In recent years, technology has increasingly become a part of the social and work spaces that we inhabit. Mobile phones, laptop computers, and personal digital assistants, to name a few, are now an integral part of how we communicate and complete everyday tasks. The portability of these devices and the proliferation of wireless networks have further spurred the use of these technologies across any number of social situations. This pervasive use of technology raises important questions for how users manage interactions between co-located collaborators and the technology. This form of coordination is relevant to collaborative situations because the user multi-tasks with an activity that simultaneously requires face-to-face interaction.

Co-located collaborators who use technology must orchestrate their activities and attentions across competing realms. For example, users in a meeting may be listening or participating in the group discussion, and during these same moments, are checking e-mail, sending instant messages, taking notes, or playing Solitaire on a laptop computer. When we communicate face-to-face, individuals use non-verbal cues such as facial expressions and posture, and verbal cues like tone of voice and cadence to convey information. There is also a feedback process between speakers and listeners with a rhythmic pattern for how a dialogue is acknowledged and proceeds. The presence of technology allows users to break from these traditional modes of conversation which creates new challenges for understanding co-located collaboration. In this context, users are faced with decisions on how to attend between information to be learned or shared in the physical setting and information to be conveyed or processed using technology.

The topic of this workshop and my own research interest is a natural development from Grudin's (1990) evolution of user interface research. This evolution describes how human-computer interaction research has progressed outwardly, meaning that it has increasingly incorporated aspects of the social world as part of the focus of study. My vision is to push Grudin's research evolution further. In his final stage of growth, the social world is made up of users with the same technology, such as collaborators sharing a groupware application. I see the next step of the evolution as incorporating not only the users of technology, but also those co-located individuals, regardless of technology use, who inform the social environment of the interaction.

**Experiences & Challenges**

In this section I discuss the exploratory research I am currently conducting on co-located collaboration, and then examine the theoretical perspectives of activity theory and situated action. I believe that one of the key challenges in any methodological undertaking is in finding an appropriate theoretical framework. Theory is important because it helps provide an

explanation for *why* our predictions and observations are true for the situation we are studying. In the case of co-located collaboration, both activity theory and situated action are useful because of their emphasis on understanding how individuals interact with tools in a given social or organizational environment.

*Current Exploratory Research*

My current research on co-located collaboration is investigating how individuals use laptop computers in the classroom. I have specifically chosen a small graduate-level class as an appropriate site because it is expected that everyone in the room be an active participant in the discussion. I am interested in looking at how the laptop changes the experience of people in the classroom who have gathered to be collaborators in learning. Some of the questions driving this research are: How does the individual use the laptop in class? Who does the technology benefit, and how? What hindrances does it impose, and to whom? How are interactions between collaborators in the classroom affected by the presence of laptops?

There are fifteen people in this class, and three of them use their own laptops throughout the class period. I have selected one of these three students to observe in detail as Jack (a pseudonym) is the most “active” in terms of the variety of tasks performed throughout the discussion. Jack uses two instant messenger clients, two e-mail programs, a web browser, and a word processor program throughout class. The other two students only use their laptops for note taking during class.

I am currently collecting observational data on: 1) what is being discussed (and who is speaking) when Jack turns his attention to the computer, 2) what tasks Jack uses the laptop for, and 3) what notifications/interruptions come from virtual sources (e.g. new e-mail symbol blinks). I record my observations in the following format and show some sample data:

<b>Time</b>	<b>Classroom Discussion</b>	<b>Task on Computer</b>	<b>Virtual Notification</b>
15:35	Student Y asks class what is meant by Durkheim’s category of norms.	Jack opens web browser and goes to Sociology web site from bookmark and looks up Durkheim.	
15:36		Taking notes in MS Word as he listens to class discussion.	IM friend sends message to Jack.
15:36		Sends back IM – “I’m in class right now, I might be slow responding.”	

I have completed four hours of observation on Jack’s computer use during class, and will be collecting an additional 30 to 40 hours of data over the next three months. Since the observations are exploratory at this time, I am not yet focusing on any specific aspect of the co-located collaboration. However, one of the most interesting findings that I see happening is when Jack manipulates the conversation with his virtual communication partners (in instant messenger) to gain time to participate in the co-located activity.

This manipulation of the virtual conversation occurs when Jack wants to have an uninterrupted time period in which to participate in the co-located collaboration. Jack will respond to a message from the virtual communication partner by either 1) requesting the virtual partner go look at particular web site link or 2) asking for elaboration on the topic being discussed (e.g. “Tell me more about your day.”). By giving the virtual communication partner a task or request for information Jack gives himself space to participate in the co-located activity while maintaining the appearance that the virtual communication is continuing seamlessly.

Beyond this qualitative exploration of co-located collaboration, I plan to conduct experiments that look at the nature of group interactions as people simultaneously collaborate with each other and use technology. I would like to see how interactions change across different types of groups—from groups not using any technology, those where only some people use technology, to groups where everyone is equipped with technology. The challenges highlighted in the workshop description about participant and task selection, individual differences, and the measurement of these interactions will be of key interest.

### *Theoretical Challenges*

Activity theory and situated action are two perspectives that help frame the methodological issues in co-located collaboration. I like these perspectives because both are interested in examining how people do things by using the actual activities and practices of real life. I am also interested in distributed cognition and the technique of microethnography, but will not be discussing these due to space limitations.

Nardi (1996) presents activity theory as a perspective to be used by HCI researchers because it accommodates context. Activity theory is not a predictive framework, rather a way to organize rich descriptions of individual activity. Activity theorists seek to analyze “individual consciousness” by looking at how the user achieves their goal in relation to the particular tools and situation. Individual consciousness manifests itself through the actions of the individual, embodied through real world practices.

Activity theory is similar on the surface to the work of Suchman’s (1987) situated action. Situated action analyzes user behavior through the emergent moment-by-moment actions of users during a particular activity. Both perspectives are focused on this meaningful human action in context, however, there is a key difference. Situated action dismisses the role of pre-determined plans made by the user. Suchman believes that a *post hoc* rationalization for a plan of activity can be described after the outcome, but this rationalization in no way influences how the activity actually unfolds.

Another area of difference between the two is the viewpoint on *persistent structures*. Nardi (1996, p. 83) defines persistent structures as artifacts, institutions, and cultural values that “stretch across situations and activities that cannot be properly described as simply an aspect of a particular situation[.]” In activity theory, an artifact like a computer spreadsheet is analyzed as having a particular set of design features that will remain persistent across activities. These design features can be identified as a structure that shapes how the user’s activity unfolds.

Suchman does not dismiss the idea of routine actions, but does not view persistent structures as the means by which activity is determined, but rather, the opposite. Suchman (1987, p. 66) explains, “Rather than actions being *determined by* rules, actors effectively *use* the normative rules of conduct that are available to produce significant actions.” What Suchman is emphasizing is that no action in and of itself can be analyzed as being the same due to structural features of the situation. While people do apply normative rules of action based on the situation, the structure emerges after the actions, and not before.

Activity theory and situated action can inform work on co-located collaboration in different ways. From activity theory, the focus on incorporating tools and the organizational structure as part of the analytic framework helps synthesize interactions across tools and social contexts. However, activity theory has its limitations in that its focus is only on the individual, and does not purport to account for the activities of a group (though some research has attempted to extend activity theory to a group level). Another issue with activity theory is that it cannot account for multi-layered consciousness, by this I mean that the activities of the user are not single and linear in co-located collaboration—the user may be both listening to other people and checking e-mail at the same time.

Situated action, with its focus on the emergent actions of users in specific material and social circumstances, also well matches the study of co-located collaboration. And, unlike activity theory, situated action handles multiple individuals in a given situation. However, one of the limitations of applying situated action is that the boundaries for what constitutes an activity may be too narrow. In Suchman’s (1987) work she studies the activities of people using a photocopier to make double-sided prints, this activity has a defined beginning and ending, and a clear outcome for what constitutes a successful action. It is not clear at this stage whether these boundaries are too restrictive for studies on co-located collaboration.

### **Workshop Goals**

While I am still in the early stages of looking at how technology is used in co-located collaborations, I am very interested in learning from, and sharing with, other researchers working in this area. This workshop’s focus on the methodological issues in evaluating group interactions will become even more relevant to my research as I begin designing experiments. My goals for the workshop are: engage in discussions about these methodological issues, learn from participants’ research experiences, and share my own views and perspective on this topic.

### **Bio**

Lisa Kleinman is a Ph.D. student at the University of Texas at Austin in the School of Information. She holds a B.S. in Information Systems and Human-Computer Interaction from Carnegie Mellon University. Prior to graduate school, Lisa worked as a user interface designer and usability analyst in San Francisco for clients such as The Sharper Image, Pottery Barn, and AltaVista. And much prior to learning about the field of HCI, she ran a computer bulletin board system from her parents’ telephone line in Portland, Oregon, which is where she first became fascinated by the social effects of technology.

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