

Methodologies For Evaluating Collaboration In Collocated Environments

CSCW Workshop Position Statement

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Abstract

My approach to building tools for collocated collaboration is to first observe and research existing problems in group collaboration and then to build technology that addresses these problems. Then when evaluating the effectiveness of the collaborative technology, I can rely on existing methods for evaluating group collaboration processes drawn from the field of social psychology.

The specific domain of my research is small group decision-making and the challenges groups encounter in making decisions because of the tendency for groups to conform and commit to the majority-held opinion, before considering all of the decision options available to the group. In my research, I work to build technology that can assist a group in becoming aware of its interaction process, as a way of assisting a group in observing and correcting imbalances in its discussion.

Vision

Consider the scenario of a group deciding to hire a new employee. Each member of the group will likely have slightly different information about the job applicants, derived from interviewing the candidates, reading resumes, and speaking to references. In this situation, the group must determine the best choice by sharing both opinions and facts they have collected. While this seems to be a straightforward task, there is a substantial risk that the individuals who hold critical information will not effectively share it to enable the group to make the best choice [7, 8]. When there is poor information sharing in a discussion to the detriment of exploring new ideas and when groups move to extremes in their commitment to the prevailing viewpoint, there is an increased likelihood that a group will make a strong commitment to a faulty decision [2, 4-6, 9]. So while meetings can seem frustrating due to inefficiencies, there is a larger issue looming: group-wide dynamics often prevent all viewpoints from being shared and this process decreases the group's ability to make high quality decisions.

My research postulates that a system that can observe the natural, face-to-face dynamics of a group interaction can detect skewed group processes and can then influence the group, through social information displays, to alter its interaction to more successfully focus on the breadth of ideas in a discussion. Thus far, my research work has been to build different tools and visualizations that reflect on-going social dynamics and then evaluate the behavior of a group with and without the presence of the collaboration technology.

A Display of Speaker Participation

To evaluate the premise of this research, that a display of social information can have an impact on group interaction, I ran a controlled behavioral experiment to understand how a display of speaker participation rates would impact the participation of a group in a decision-making task [1]. The purpose of this was to begin exploring the area of how to influence, and improve, the behavior of groups through the use of social information displays.

The interface for the experiment displayed the quantity of spoken comments made by each participant during the meeting. As a group interacts, the display dynamically adjusts the bars of a histogram to indicate the relative participation rates. (See Figure 1 for a screenshot.) The system was built with a client-server architecture, where each client machine determined when someone was speaking by detecting the sound level from individual microphones.

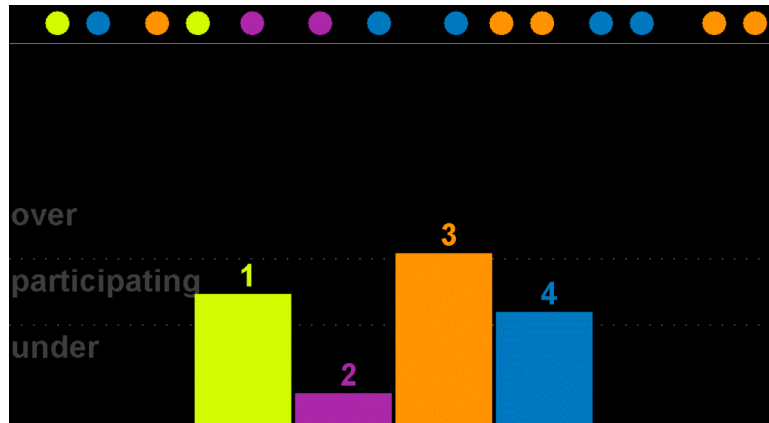


Figure 1. Histogram display of speaker participation

The behavioral experiment's protocol was based on an information-sharing task previously used by Hollinghead [3] in which each subject group was given a task to solve and successful completion of the task depended on the amount of information shared by the group. The study's control condition had groups complete two tasks with no technological assistance; the experimental condition had the display projected onto the wall during the second of two tasks.

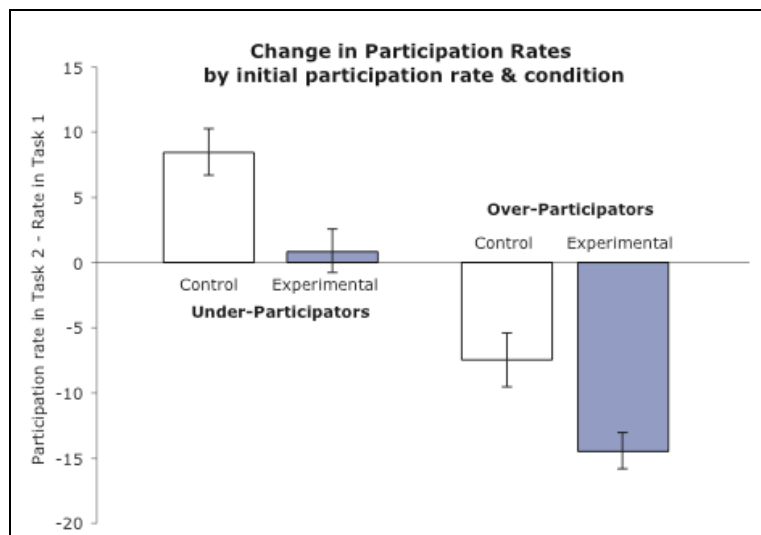


Figure 2. Changes in Participation Rates by Participation Rate and Condition

The main finding from the study was that the over-participants¹ decreased the amount they spoke in the experimental condition significantly more so than those in the control

¹ The definitions for over- and under-participant were defined by measuring the participation of subjects during a preliminary task and categorizing subjects who participated above the (mean + one standard deviation) as "over" and those who participated below the (mean - one standard deviation) as "under."

condition ($p < .05^*$, t-test of independent samples) and the under-participants did not change the amount they spoke in the experimental condition ($p < .05^*$, t-test of paired samples), in contrast to the under-participants in the control condition who did significantly increase the amount they spoke ($p < .05^*$, paired t-test). Figure 3 shows these results graphically and the full details of this study can be found in [1].

Future Directions

The study results confirmed our hypothesis that a display of social information impacts the behavior of individuals in a group decision-making setting, specifically encouraging over-participants to temper their comments. Yet the finding that under-participants did *not* increase the amount they spoke was unexpected and has led us in new research direction and intentions for further evaluations.

Our current work has been focused on building different visualizations of on-going social interaction and developing a deeper understanding of how these displays encourage and discourage certain behaviors. Our goal is to produce a set of interfaces that increase the diversity of a group's discussion and assist in improving the quality of the interaction. Our plan for evaluation is to examine how different visualizations of social behavior interact with different types of groups and different types of group tasks.

Workshop Goals

During the workshop, I would like to share experiences with others who have run experiments evaluating face-to-face groups. In particular, I am interested in different ways people have measured successful collaboration, because my research goal is to demonstrate that the technology I am building leads to better collaboration and better group communication processes.

In running the experiment described above, there were several challenges encountered that I would like to share and discuss with others. Some of these challenges were:

- *Task design.* I based my study around an information-sharing task (sometimes known as "Stasser tasks") Examples of this type of task are found in these other studies: [3, 7, 8]. These tasks are designed to measure how effectively a group shares its privately-held information, but I found that it was hard to design a task that had the right balance so that the task was difficult enough that some conditions solve it, and other conditions cannot solve it. In my study, most subject groups got the right answer.

- *Counter-balancing.* Although counter-balancing is a well-established method for controlling for the impact of the order in which you introduce technologies, one of the difficulties of dealing with experimental groups is that their first encounter sets a standard of behavior that the group then uses during the second task. So in my study, the way a group behaved during a first task had a strong impact on their behavior in the second task - a much stronger effect than the introduction of technology during a second task. But I was hesitant about introducing the technology during a first task because it would reveal the standard by which I was measuring the group, and would encourage the subject group to comply to that standard. I'm curious if others have had similar issues in their study design and how they have circumvented these issues.

- *Experimental Groups vs. Real-world Groups.* There is always a challenge when evaluating collaborative technology in a controlled environment in generalizing the results to a real-world setting. We all want the findings of our evaluations to apply to real-world groups, but there are significant challenges to finding real-world groups that

are willing to use technology during their real-world meetings, and then there are additional challenges in controlling the variables and influencing factors in the group's meeting. I would like to learn how others have dealt with this tension between evaluating real-world versus experimental groups.

Bio

Joan Morris DiMicco is a Ph.D. student at the MIT Media Lab in Cambridge, MA, USA. She holds a B.S. in Applied Mathematics from Brown University and an M.S. from the Media Lab. Her research focuses on how to use technology to improve group interaction and group processes during collocated collaborations. Along with Kori Inkpen, Regan Mandryk, and Stacey Scott, she is one of the organizers of this CSCW workshop.

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