

# Group Dynamics Findings from Coordination in Problem Solving and Decision Making Meetings

Flaviu Roman  
Ecole Polytechnique Fédérale  
de Lausanne (EPFL)  
Lausanne, Switzerland  
flaviu.roman@epfl.ch

Patrick Jermann  
Ecole Polytechnique Fédérale  
de Lausanne (EPFL)  
Lausanne, Switzerland  
patrick.jermann@epfl.ch

Himanshu Verma  
Ecole Polytechnique Fédérale  
de Lausanne (EPFL)  
Lausanne, Switzerland  
h.verma@epfl.ch

Pierre Dillenbourg  
Ecole Polytechnique Fédérale  
de Lausanne (EPFL)  
Lausanne, Switzerland  
pierre.dillenbourg@epfl.ch

## ABSTRACT

We present the results of group dynamics and their effect on success in problem solving / decision making meetings. We use a novel multiple input environment for collaboration and data collection, and a hidden profile task given to groups, whose goals are to find the correct solution. We observe that groups elect 0, 1 or 2 leaders, and the best results are obtained by the groups with a single leader. Prior acquaintance (familiarity), does not show any effect on the success or on the group strategies. Groups with a single leader tend to be more successful, and leaders expressed their authority verbally rather than by through the collaborative system.

## Categories and Subject Descriptors

D.5.3 [Group and Organization Interfaces]: Computer supported cooperative work

## General Terms

Experimentation, Human Factors

## Keywords

Group Evolution, Human Computer Interaction, CSCW, Collaboration

## 1. INTRODUCTION

The success of problem solving and decision making in meetings is highly influenced by the way group dynamics emerge. We make use of a shared multiple-input system (using either multiple keyboards and mice or multiple pen) with a single display screen as an SDG (single display groupware), and a hidden profile task designed by Stasser [4], to evaluate how groups collaborate and how their internal dynamics are created, and to observe the impact of these on the

performance of the groups. Several authors have evaluated similar settings. Rienks and Zhang [3] are looking into participation levels, Matthews and Whittaker [2] are looking at teams from the individual's perspective. Kelly and Fisher [1] are analyzing structures that emerge from collaborations in teams.

## 2. SETUP

The setup includes a front projected display and a meeting table placed in front of it (Figure 1). The meeting table has a wave like shape (Figure 2) designed to facilitate positioning for both face-to-face interaction and the public display visibility. The system is equipped either with a wireless mouse and keyboard (Figure 1), or with a digital pen and paper (PP, Figure 2). The public display as well as the input devices are connected to a single computer.



Figure 1: Wall Display and Meeting Table with Keyboards and Mice.

## 3. USER STUDY

We conducted a user study recruiting 66 participants who formed groups of 3 (2 teams) and 4 (15 teams) people. The hidden profile task required the participants to play the role



**Figure 2: Meeting table in the Pen and Paper setup.**

of detectives in identifying a perpetrator, by combining information from investigation transcripts and records that were distributed as booklets (one per participant). The information in the booklets contained parts that were common (replicated on all booklets), but also parts that were available only on individual booklets. To solve the task, the participants needed to collaborate in order to successfully merge information from all booklets. The task time was capped to two hours, but we recorded the actual duration for each team. Groups were successful if they correctly identified the perpetrator.

During the study, we had three types of information collection: logs of system use by participant; a wizard-of-oz observer attending the meeting (in the background), counting the number of utterances (separated on task-related or coordination-related), and the number of gestures (to the screen and to the material); and the participants filling in a pre-test questionnaire with prior information, and preferences and a post-test questionnaire with their perception about the task, social aspects, coordination, etc.

We collected and grouped the data into individual and group results, and used statistics (ANOVA, Kruskal-Wallis and Linear Regression) to evaluate the relations between certain factors, using the R environment. Leadership was assessed by the observers, and we categorized it into groups with 0, 1, and 2 leaders. Familiarity of the group was considered negative if at most 2 (of 4) people knew each other previously, and positive if at least 3 people knew each other, but in the vast majority of the cases, they either didn't know anyone at all, or everyone knew everyone. Some individual ranked features were evaluated at the group level by computing the mean of the individual values for people in that group.

## 4. RESULTS

### 4.1 Results about Groups

First, we did not find any impact of the group familiarity on performance or other elements measured, including success ( $H[2] = 0.457, p = .499$ ). However, the perceived level of consensus was higher in successful groups compared to unsuccessful groups ( $H[2] = 6.583, p = .01$ ). Another

measure that had a relation with success was the gestures towards the board, in the sense that successful groups did less gestures ( $H[2] = 4.3012, p = .038$ ). An explanation for such a result could be that the large number of gestures were caused by confusion, which also lead to poor performance. On the other hand, in those the groups where individuals felt they participated more, they also felt that their contributions were taken into account more ( $F[2,17] = 24.46, p < .001$ ).

In terms of leadership, 73% of groups with one leader were successful, whereas only 16% of groups with 0 or 2 leaders were successful ( $H[3] = 5.2391, p = 0.073$ ).

### 4.2 Results about Individuals

We found that leaders did not do significantly more operations on the shared screen ( $F[2, 17] = 0.007494, p = .932$ ). On the other hand, leaders had significantly more total utterances than non-leaders ( $H[2] = 5.5761, p = .018$ ). Therefore we conclude that leadership was expressed through verbal communication, and not through monopoly over the shared space.

Another finding was that participants who made more gestures towards the display also had more organizational utterances ( $F[2, 66] = 12.27, p < .001$ ). This supports the hypothesis that more gestures were made in the presence of more confusion, and participants tried to over-organize to reduce this confusion.

## 5. FUTURE AND CONCLUSIONS

We presented findings about leadership, success and familiarity of groups performing a hidden profile task. Leadership is certainly an important aspect that requires more fine-tuned research, because it can prove instrumental in explaining certain patterns and in predicting the success of the groups. We plan to analyze different other ways of defining leadership, including defining formulas for leadership based on contribution and adjusting the thresholds for such measurements towards optimal values.

## 6. REFERENCES

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