Role Influence on Group Decision-Making Outcome

CM40149 Collaborative Systems

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ABSTRACT

Synchronous text communication are important for groups that work at remote locations. Motivations, individual characteristics, group interaction, and the type of task may influence the type of roles taken by group members. To investigate the influence of different roles on the group outcome, a study made up of 14 students at University of Bath participated in a lab activity to complete a Desert Survival task that requires problem-solving and decision-making skills. Analysis from chat transcripts and observations during the activity revealed that a balanced team made up of diverse roles would result in better group outcomes compared to those without. In addition, certain roles have more influence on others and that roles are more likely to stay the same across settings unless there is a change in context. Findings indicate a relationship between roles and group performance, with certain roles having more influence on the decision made by a group.

KEYWORDS

Computer-Supported Cooperative Work, collaborative systems, role formation, group decision making

1 INTRODUCTION

Making choices in a group setting can be a difficult task, and the number of people involved can vary greatly from group to group. Group decision-making is common and takes place in many different contexts, such as with family and friends, at work, or at school. With people increasingly in different physical locations, traditional forms of communication can get difficult in terms of presence. To help overcome this barrier, Computer-Supported Cooperative Work (CSCW) has developed various tools and technology to accommodate online chat systems so that collaborations, such sharing information, coordination, and communication, can take place as a group, whether synchronously or asynchronously, or even both. Synchronous communication such as video calls are real-time, meaning interactions are immediate and on-the-spot, whereas asynchronous communications such as emails take place at a different time. In situations where roles are not straightforward, people may take different or multiple roles to help make a decision or solve a problem. While there is debate over the efficiency of traditional face-to-face communication compared to that of communication technologies like text messaging tools, the group outcome effect of role formations in these situations is unclear.

1.1 Background

Many studies have compared face-to-face (f2f) communication with computer-mediated communication (CMC). While f2f communication provides both verbal and non-verbal cues such as body language, gaze, and facial expressions, computer-mediated communication focuses on verbal cues and does not provide non-verbal communication cues. It has been argued that face-to-face communication would have an advantage in a group decision making task, as the social proximity among the group would highlight participating members, thus promoting discussion [7]. However, the influence of roles on group outcomes in either type of communication method has not been well researched in recent years.

A paper by Barlow [2] studied the emergence of task-based roles in a group distinguished by individual characteristics, group interaction, and development of norms. By using computer-mediated discourse analysis (CMDA) tools based on both role theory and speech act theory, he generalized four clusters of roles known as *Organizers*, *Listeners*, *Opinionaters* and *Sharers*. According to these classifications, *Organizers* are characterised by directing conversations through the use of questions and requesting information. *Listeners* participate less in discussion, instead supporting others through the sharing of information, whereas *Opinionaters* are identified through excessive claims mostly consisting of long messages. *Sharers* provide more information than opinions on what decisions to make. These roles are suggested to be influenced by individual characteristics such as personality, group interaction, and the type of task the group is set out to do.

Based on six factors described by Barlow, these roles can be distinguished from a chat transcript, in which the first two were accounted by the participation (percentage of an individual's messages in the conversation) and contribution (average length of words in each message) to the conversation. The other four factors are speech acts: "inform" refers to the act of sharing information (corresponding with *Sharer*), "claim" refers to the assertion of an opinion (corresponding with *Opinionater*), "accept" refers to an agreement (corresponding with *Listener*), and a simplified "guide" factor in which discussion is guided (corresponding with *Organizer*). In terms of the latter, this factor involves inquiries or the requesting of information, as well as managing or directing the group towards a decision.

Furthermore, research has shown that team roles can affect team performance. Zheng, Zeng, and Zhang [9] have reported that group diversity would result in higher performance, even for virtual groups. This might be explained by the influence of individual roles on team performance as reported by Partington and Harris [6]. Individuals may have different motivations to complete a task, thus influencing the type of role they take. Plaisant et al. [7] reasoned users would participate in an activity based on six factors: egoism, altruism, principlism, collectivism, rewards, and social status levels. While egoism describes individuals motivated from personal benefits from an activity, altruism refers to those participants genuinely providing help. People motivated by principlism are driven by taught principles to do things out of kindness, whereas people

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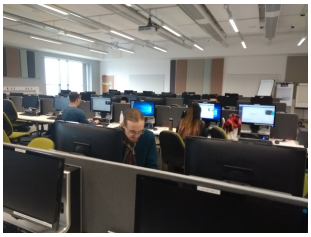
who are driven to support a community are motivated by collectivism. Based on these motivations, sharers described by Barlow [2] who engaged in providing information could have been motivated by altruism in which they just wanted to help the group perform the task.

Through these six factors of role formation, this paper seeks to address the roles formed from group decision-making tasks that may influence group decision-making outcomes.

2 METHOD

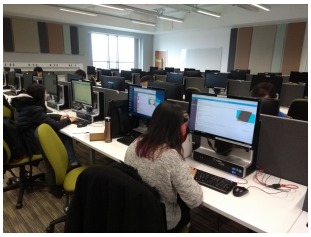
The experiment was conducted during a lecture of the Collaborative Systems module at the University of Bath. 14 students were asked to perform a Desert Survival task in two different settings: face-to-face communication and remotely via a synchronous text-based communication (Slack). The task involved decision-making and problem-solving skills with the goal of assigning priority to particular listed items in order to survive a desert after a plane crash. The 14 students were divided into four groups of three to four, each group ranking a list of items. In the first phase, Group 1 and Group 2 were each given the task separately to rank priority of 7 items on the list using face-to-face communication. Group 3 and 4 used Slack to communicate and rank 7 items separately. In this phase, Groups 1 and 3 shared the same 7 items while Groups 2 and 4 had another list of 7 items. In the second phase, Groups 1 and 2 were collectively given a list of 13 items to rank based on the first 7 items given to them previously. However, they communicated with Slack in this phase. The same list was given to Groups 3 and 4, but they then communicated face-to-face. Each of these phases was 20 minutes long. Students were also given a pseudonym when communicating on Slack.

(a) Group 1 and 2 - Face-to-face communication



(b) Group 2 and 3 - Slack communication

Figure 1: Phase 1



(a) Group 1 and 2 - Slack communication

(b) Group 2 and 3 - Face-to-face communication

Figure 2: Phase 2

The roles of individuals were analysed based on the six factors studied by Barlow [2] and the results exhibited in the chat transcripts obtained from the Slack conversations from both Phase 1 and Phase 2. The performance of their tasks was derived from the absolute difference of their ranking with the official ranking. The smaller the absolute difference, the better the group outcome.

3 FINDINGS

The chat transcripts from Slack were gathered and collated into a Google Sheets file for analysis [1]. From the analysis, there was an average number of 17 messages sent by the 14 participants in the study. The average word count in each message was 6.99 words. There was a big range between the number of messages sent in each channel. While there were 119 messages sent in the channels of Group 1 and 2, Group 3 had 86 messages and Group 4 had only 30 messages,

Using Barlow's interpretations of the four clusters formed from the six factors, the participation of a member was measured based on the number of messages sent into their respective group, and contribution was measured based on the average length of all the messages sent by that specific member. The percentage of each speech act was measured by the number of messages that matched the main acts corresponding with "inform", "claim", "accept", or "guide". Other speech acts were omitted from the table.

In Table 1, the bold values highlight extreme values that led to the interpretation of a role taken by an individual. It can be observed that all groups have an organizer. This could be due to a physical paper given to a member of each group to note the decisions taken by the group regardless of the setting. In an interesting observation, some of the sent messages were not related to the task, such as greetings or off-topic comments. Furthermore, some messages constitute more than one single act. For example, a member of Group 1 sent a message saying, "Sure. Compass?", denoting both an "agree" and "guide" speech act. Aside from simply agreeing to a suggestion, he then raised a question to initiate the next discussion. As a result, there are occurrences when the four speech act factors are more than or less than a 100%. As highlighted in the table, there are some members who exhibited behaviour that make it unclear as to which Barlow role they might fit. Hannibal Lector could be both an Organizer and Sharer due to the amount of speech acts in both the "inform" and "guide" categories. Similar to Hannibal Lector, Leia Organa displayed an overlap of behaviours in the "claim" and "guide" acts. Meanwhile, Peter Parker demonstrated a comparatively extreme contribution, but these mostly consisted of agreeing with other claims or opinions.

In the combined Group 1 and 2, it has been noted that there was one Organizer, one Sharer, two Listeners and three Opinionaters. However, from observation, there was a shift of roles between Phase 1 and 2. For example, Hannibal Lector, with the vague role of Sharer and Organizer, was previously providing information in Phase 1, but, as the group moved to Phase 2, one of the list of 7 items was in Hannibal Lector's possession. This might have given Hannibal Lector a sense of responsibility to guide the discussion, but this was overshadowed by Mary Poppins, the main Organizer from the f2f

[1] This document can be viewed on http://bit.ly/2HS4nbf

setting in the previous phase. However, all this does not explain the vague roles exhibited by Peter Parker and Leia Organa in Group 4.

In Group 4, although there was already an Organizer, Leia Organa tried to take charge of the discussion by requesting further information and claimed opinions with no agreement made in response to other claims made. From the conversation, it was expected that Peter Parker would be the Organizer, as this member had the list of items. This assumption was made since an Organizer could track and record the ranking of the items. However, from the cluster analysis, the Organizer role had instead shifted towards Bruce Wayne. This may indicate that there may exist more than one Organizer in an online setting as Barlow discussed in his finding. Since the conversation can be backtracked, the list is always visible, and changes can be made. Peter Parker's resulting amount of contribution could possibly be explained by the initial listing of items in which, unlike in Group 3, a full description was given.

In Group 3, the full description of items was not provided by the person with the list, causing a misunderstanding. From the chat transcripts, Jay Gatsby thought "torch" was a fire torch when, in fact, it referred to a flash light with batteries. This misunderstanding led to a few incorrect claims until Professor Moriarty informed the members what it really was. Nevertheless, this was not observed in the combined group of 1 and 2, despite "torch" having only appeared in Group 1's list and not fully described. The influence of Jay Gatsby as an Opinionater also led to other incorrect assumptions. From the chat transcripts, he argued that the "salt tablets" in the list were important as the body needs salt to survive, but, according to the official ranking explanation, "salt tablets" are less important, as they would dehydrate the body. As the Opinionater was confident with his claim, it led the group to believe the Opinionater, likely resulting in a poorer group outcome when compared to Group 1's results, as shown in Table 2.

Group	Member	Participation (%)	Contribution (words)	INFORM (%)	CLAIM (%)	ACCEPT (%)	GUIDE (%)	Total (%)	Role
2	James Bond	**19.33**	**10.17**	13.04	**52.17**	8.70	26.09	100.00	Opinionater
1	Sherlock Holmes	8.40	2.80	0.00	**60.00**	30.00	0.00	90.00	Opinionater
1	Huckleberry Finn	5.88	3.43	0.00	28.57	**42.86**	28.57	100.00	Listener
2	Mary Poppins	**23.53**	**15.54**	**35.71**	3.57	10.71	**46.43**	96.43	Organizer
2	Hannibal Lecter	12.61	8.07	**40.00**	13.33	6.67	**33.33**	93.33	?
2	Luke Skywalker	7.56	4.22	11.11	22.22	**55.56**	0.00	88.89	Listener
1	Victor Frankenstein	14.29	3.29	**58.82**	11.76	23.53	0.00	94.12	Sharer
1	Robinson Crusoe	8.40	5.10	20.00	**50.00**	30.00	0.00	100.00	Opinionater
3	Jay Gatsby	**45.88**	9.90	5.13	**53.85**	15.38	12.82	87.18	Opinionater
3	Professor Moriarty	**44.71**	7.97	18.42	18.42	18.42	**39.47**	94.74	Organizer
3	Moby Dick	10.59	3.22	0.00	22.22	33.33	11.11	**66.67**	Listener
4	Bruce Wayne	30.00	5.44	0.00	22.22	22.22	**66.67**	111.11	Organizer
4	Peter Parker	43.33	**12.31**	23.08	7.69	**38.46**	23.08	92.31	?
4	Leia Organa	26.67	6.38	12.50	**37.50**	0.00	**37.50**	87.50	?

Table 1: Summary of individual roles in all groups

Table 2 and Table 3 display the official rankings against the rankings made by the groups. The absolute difference between the two rankings was summed up to measure the performance achieved by each of the four groups in Phase 1. As there were two different lists circulating around, the groups were compared based on the same list to measure individual group performance.

The two tables show that Group 1 made better decisions than Group 3, while Group 2 had a better group outcome than Group 4. Among all four groups, Group 4 made poorer decisions than others while groups 1 and 2 made equally good decisions.

Items	Group 1	Difference	Group 3	Difference
1. Mirror	2	1	3	2
2. Torch	5	3	4	2
3. Raincoat	1	2	1	2
4. Pistol	3	1	7	3
5. Compass	7	2	6	1
6. Map	6	0	2	4
7. Salt tablets	4	3	5	2
Total difference		12		16

Table 2: Individual performance of Groups 1 and 3

Items	Group 2	Difference	Group 4	Difference
1. Water	5	4	6	5
2. Parachute	3	1	7	5
3. Knife	2	1	2	1
4. Sunglasses	1	3	1	3
5. First aid kit	6	1	5	0
6. Map	4	2	3	3
7. Book	7	0	4	3
Total difference		12		20

Table 3: Individual performance of Groups 2 and 4

Table 4 shows the combined group decisions made in Phase 2 of the experiment. The items are ranked in order based on the official ranking and the total difference in the combined groups 1 and 2 was lower than the combined groups 3 and 4, showing a higher overall performance in the former.

Items	Group 1+2	Difference	Group 3+4	Difference
1. Mirror	4	3	5	4
2. Water	1	1	1	1
3. Torch	6	3	6	3
4. Parachute	2	2	3	1
5. Knife	5	0	2	3
6. Raincoat	3	3	10	4
7. Pistol	7	0	13	6
8. Sunglasses	12	4	11	3
9. First aid kit	9	0	8	1
10. Compass	11	1	7	3
11. Map	10	1	4	7
12. Book	8	4	12	0
13. Salt tablets	13	0	9	4
Total difference		22		40

Table 4: Group performance of combined groups 1 and 2 with 3 and 4

4 DISCUSSION

Based on the findings in Phase 1, groups 3 and 4 made relatively poorer outcomes than groups 1 and 2. While there are reasons to believe that the group outcomes of 3 and 4 could have been the result of using CMC tools that could hinder effective group performance due to a lack of grounding constraints [1, 3] such as the misconception of the word "torch" in the findings, group decisions can be argued to be most influenced by an Organizer. In the transcripts of both groups 3 and 4, the Organizers who listed the items

also made changes based on the arguments made by Opinionaters and the support from a Listener. However, if either the Listener or Organizer holds doubt on the Opinionater's claim, the change of decision would not be made. Looking at each group individually, groups 1, 2 and 3 all had at least an Organizer, Opinionater and Listener. These roles might form the basis for a balanced team, as two Group 4 members lacked a clear interpretation of a role and had the poorest outcome among all four groups. Although it can be argued that groups 1 and 2 had a larger sample size when compared to groups 3 and 4 such that a variety of roles can be accommodated for a balanced team, Partington and Harris [6] found that a balanced team does not affect performance. In fact, he suggested that individual roles affect a group's performance more than diversity of a team. Even though Leia Organa had exhibited behaviour of multiple roles that should indicate the better group outcomes suggested by Zheng et al. [9], Partington and Harris [6] found that less Organizers in the group would be more ideal. The possibly two Organizers in Group 4 may have resulted in a disjointed discussion and poor decision-making as observed.

In Phase 2 of the experiment, small groups were combined to form a medium-sized group. The findings revealed that the shift of group size also affected the roles taken by individuals. While most participants exhibited similar behaviour, the former Organizer of Group 1 shifted to an Opinionater and did not guide the discussion at all. Together with the observation of Hannibal Lector's vague role classification, observations made in this study matched the statement by Dix et al. [3] in which group dynamics may change simply as a group membership and structure changes over time. Although the larger group size revealed a poorer decision outcome and a vague shift of roles between f2f and CMC, it can be assumed that, based on the observations made, most people would have similar behaviour in both contexts. However, if there is a change in authority to actually make or amend the decision, roles of individuals would adjust to accommodate the change. These taken social roles were also influenced by the motivation to complete the task. As observed from the chat transcripts, members of Group 4 were not enthusiastic on debating which decisions were optimal, with only 30 messages sent during Phase 1. Furthermore, a member of Group 3 said, "Old episodes of Ray Mears coming to me here" which was unrelated to the task. This probably indicated a lack of motivation in completing the task and, thus, a lack of data for the role classification cluster analysis, explaining the poorer outcomes in groups 3 and 4. This was even more evident in Phase 2 when the two groups were combined, as their performance was about two times worse than the combined groups of 1 and 2.

5 LIMITATIONS

The conducted study explored the roles through analysed chat transcripts focusing only on the virtual environment. As no audio recordings were conducted, the f2f conversations when groups were collocated were not examined. Several studies have suggested a difference in f2f and CMC communications in group decision-making, and there are mixed views in which is better [1, 3–5]. Furthermore, there was a question of true anonymity in using Slack, as viewing a participant's profile would reveal the email address of that member. Since all the participants were classmates and knew each other in real life, they would be able to identify each other and mediate their own speech to ascertain a role. The familiarity with the tasks and general competency of participants in problem-solving were also unknown, possibly heavily affecting the results. The study was also based on solely Barlow's definition of roles, meaning that other possible types of roles, such as those described by Yeh [8] and Partington and Harris [6], were not explored to explain the vague roles taken by the participants.

6 CONCLUSIONS

The current research demonstrated that Opinionaters and Organizers have more influence on the group outcomes when compared to the effect of Sharers and Listeners. Although the roles may change when the context is changed, most individuals remain with their social roles, and the group outcome varied with the sample size. Future work may build on social roles in other type of tasks such as brainstorming or planning that have less dependence on an individual's competency in problem-solving skills. Besides that, further research with a longitudinal study on asynchronous text-based communication would also benefit from understanding how social roles and group structure change over time that may impact on the group's performance.

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