Exploring the Influence of Cultural Diversity in Collaborative Design Teams: Preliminary Findings

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Abstract. Past studies loosely define culturally heterogeneous group composition as any combination of mixed nationality and/or ethnicity. A case study with three project groups was conducted to investigate if culturally diverse groups composed differently in terms of nationality/ ethnicity mix will experience different types of communication problems. Communication problems of discussion dominance, reduced communication frequency and discussion exclusion were coded from taped discussions. Findings indicate that ethnicity and nationality give rise to different communication problems. Future studies should be specific when defining heterogeneous groups in terms of whether they are manipulating differences in nationality, ethnicity or both.

Keywords: Cultural diversity, group composition, collaborative design, group process

1 Introduction

Past research investigating the effects of cultural diversity on group communication for collaboration compared the communication processes between culturally homogeneous vs. heterogeneous groups [see examples: 6, 17]. Group composition is defined by nationality and ethnicity. Majority of the studies compared European/ American homogenous groups with any set of heterogeneous individuals. It is assumed that all culturally diverse groups are alike [19].

However, there are indications in literature that this may not be the case. Take studies that investigate the effects of group heterogeneity on cooperative behavior in group setting for example. Cox, Lobel, and McLeod [6] conducted an experiment to compare cooperation and competition between homogeneous Anglo-American groups against heterogeneous groups composed of Asian, Hispanic, Black and Anglo-Americans. The Anglo-American participants represented communication behavior in individualistic culture. The Asian, Hispanic and Black participants were all taken to represent communication behavior in collectivistic culture. No differentiation was made between the Asian, Hispanic and Black participants. The study concluded that ethnically-diverse groups acted more cooperatively than homogeneous Anglo-American groups due to the influence of collectivistic group members.

Past studies have used the term "homogeneous" to refer to groups composed of members from the same nationality and ethnic group, typically Anglo-White. The term "heterogeneous" is used to refer to groups composed of members from different nationality and/or ethnicity. However, not all heterogeneous groups are alike. Heterogeneous group members could differ in terms of ethnic cultural background; they could differ in terms of national cultural background. Hence, this paper studies how groups composed of members from different cultural backgrounds will experience different communication problems in the collaborative design process.

2 Communication Problems in Collaborative Design teams

Collaborative design is largely a series of decision choices [5]. When team members come from different cultural backgrounds, they are able to contribute a wide range of perspectives to the decision-making process. However, communication problems can hinder the collaborative design process. Three main problems were discussed based on past research.

2.1 Discussion Dominance

In the context of group setting, dominance refers to a state of power, a reflection of team members' hierarchy in the group [15]. It is a function of power differences between group members in discussion. Watson et al [25] showed that groups composed of culturally different individuals experience more occurrences of discussion dominance than homogeneous groups. Their study compared the interaction process and performance of heterogeneous and homogeneous groups over time. When the workgroups were newly-formed, homogeneous groups reported fewer power struggles, equal participation and higher levels of cohesion heterogeneous groups on the other hand had more frequent occurrences where group members dominated the discussion and hindered member contribution.

   The context of group discussion affects the exhibition of dominance by team members. Hence, to understand communication issues in collaborative design groups, it is important to examine the relationship between cultural diversity and actual exhibition of dominating behavior during discussion.

2.2 Reduced Communication Frequency

Studies have consistently concluded that frequent communication between group members to their colleagues, both inside and outside of their project group, is vital to high project performance [10]. The frequency of communication between team mates is dependent on the familiarity and proficiency of each in the shared language of communication [14].

   Culturally diverse teams experience reduced frequency of communication if team members are not proficient with using the common language of discussion. Loosemore and Lee's [13] survey of the construction industry in Singapore and

Australia found that language barrier was the biggest difficulty that construction site supervisors faced when communicating with workers from other cultures. As a result, foreign workers were less likely to communicate potential problems to their supervisors. Foreseeable problems were not brought to light. Foreign workers either ignored the problems or tackled them without consulting with the supervisor. Similarly, a reduction of communication between team members has dire consequences to the success of collaborative design.

2.3 Discussion exclusion

Individuals in a team define their social identities by the process of social categorization using salient characteristics like ethnicity [23]. This in turn leads to social comparison with others so as to maintain a high level of self-esteem. Such social categorization results in the formation of in-group/ out-groups in teams [22]. People like to interact with those who are more like themselves, i.e., the in-group. Conversely, people exclude those who are less like themselves, i.e., the out-group, in their interactions [3]. Hence, in-group/ out-group differentiation results in the exclusion of ethnically different team members from the communication process [11]. The exclusion of out-group members from the communication loop reduces team cohesion. It also disadvantages the out-group from opportunities in mentoring and development [16].

Further, the exclusion of out-group members in the discussion can develop into prejudice and discrimination. Bochner and Hesketh [4] surveyed 263 employees of an Australian bank to understand inter-ethnic work-related friction. Cultural diversity was defined by nationality. The analysis compared between Anglo-Celtic vs. non Anglo-Celtic employees. Anglo-Celtic employees referred to those who identified themselves as Australian, British, New Zealanders and "other western countries". Non Anglo-Celtic employees were those who identified themselves as from Asian, Indian or Middle Eastern nations. Following the Australian societal context, Anglo-Celtic employees were defined as the in-group. Non Anglo-Celtic employees were defined as the out-group. Comparing between in-group vs. out-group employees, the authors found that the out-group reported perceiving more discrimination and inequality.
Hence, for group members who are willing and able to contribute to the discussion, exhibition of prejudice and discrimination in their teams will stymie their contribution in the team.

2.3 Research Issues

As discussed above, cultural diversity increases the project team's potential to generate more creative and high quality decisions. However, cultural diversity also brings communication issues that impede on the realization of process gain. Discussion domination reduces air-time for important contributions to be heard. A low proficiency in the common language used during discussion reduces team members' ability to articulate their ideas and air their views on problems they foresee with decisions made. Team members excluded from the discussion will not be able to

contribute to the discussion. Their ability to excel in the role they play in the team is also impeded as they are not kept in the information loop. If exclusion develops into prejudice and discrimination against ethnically different team members, their willingness and ability to contribute to the discussion will be stymied.

This study investigates whether groups composed of different nationality and ethnicity mix will experience different types of the most common communication problems, and/ or different degrees of the most common communication problems highlighted above.

3 Study

Three teams were formed through purposive sampling and given a collaborative design task to complete in laboratory conditions. The entire process was captured on video-tape and their behaviors were coded for analysis.

3.1 Participants in experimental conditions

Nine engineering undergraduates were recruited via snowballing to participate in the study. They were rewarded with a small cash reward for completing the assignment. All had attended the relevant engineering design courses that provided the knowledge for collaborative design. In addition to the homogenous discipline, participants selected for this research study were in their second year of undergraduate study. They aged between 20 to 24 years of age. As the cohort was big, care was taken to select participants who did not know each other prior to the study.

Nationality and ethnicity were manipulated to generate three groups. Group One comprised of three Singaporean Chinese participants. Group Two comprised of three Singaporean participants with varying ethnicity – Chinese, Indian and Malay. Group Three comprised of three participants from Singapore, Malaysia and China but with Chinese ethnic culture. Table 1 gives a summary of the group composition:

Table 1. Group Composition.

Group 1	Group 2	Group 3
Same Cultural Background	Different Cultural Background (Ethnic)	Different Cultural Background (National)
- Same nationality - Same ethnicity	- Same nationality - Different ethnicity	- Different nationality - Same ethnicity

3.2 Procedure

Teams were tasked to construct a model airplane within four sessions over a period of two weeks. Each session was one hour in duration and two sessions were

conducted each week. Participants were given an instruction guide at the start of the experiment detailing the deliverables for each session.

Session 1 was allocated for participants to familiarize with each to other and undergo first half of the planning stage. Participants were expected to complete the functional analysis and brainstorm about the airplane modeling. In the second session, participants continued with the brainstorming session and were required to complete their discussion and finalized the model of the airplane by the end of the session. In the third session, participants constructed the model airplane. The last session was the testing phase. The model airplanes were tested for their flight capability. Participants were allowed to make modifications if their planes that did not meet the required flight distance of three meters.

3.3   Coding and measures

The discussion sessions were recorded on videotape. The videotapes were then coded by trained coders. Coders worked simultaneously but independently from one another. Each of the measures was coded by two coders. In addition, one of the coders timed the speaking duration for each participant in the experiment using a stop-watch. Inter-coder reliability was reasonable (Spearman's rho .293, .307 and .406) and there was no significant difference between the coders' analysis of each of the measures.

Discussion dominance. Discussion dominance was assessed via total number of successful interruptions during discussion. Groups where members spent significantly more time interrupting each other are considered to have a greater problem with discussion domination than other groups [27]. The greater number of successful interruptions, the greater the problem the group faces.

Coders measured the number of successful interruptions in each group. Groups with a higher occurrence of successful interruptions were plagued by discussion dominance compared to groups where members interruption each other less often. Coders first identified areas of overlapping speech between team members. Interruptions were coded as successful when the interrupter completed an utterance and prevented the interruptee from completing an utterance. When one or both of these conditions were not met, an unsuccessful interruption was coded [21]. Discussion domination hence consists of a within-group comparison as well as a between-group comparison.

Communication frequency. Most organizational studies examine communication frequency amongst group via self-report. Team members are asked how often they communicate with each other, e.g., daily, weekly, etc [1, 9, 32].

However, for this study, team members are only allowed to communicate with each other within the laboratory session and not outside. Hence, this study operationalizes communication frequency differently. Communication frequency is assessed via total time spent on discussion and total number of turn taken during

discussion. Both are between-group measures. The first compares the total amount of time that the group spoke, between groups; the second compares the total number of turns that the group took, between groups.

Discussion exclusion. Discussion exclusion is defined as when team members ignore someone who is present from the ongoing conversation [11]. Discussion exclusion was assessed by counting the number of times a communication act was ignored or not reciprocated. This was a between-group assessment. In other words, discussion exclusion was deemed to be a problem in the group when there were instances of non-reciprocal communication. The analysis here was to assess if discussion exclusion was a problem of a greater degree in certain groups more than others.

4 Results

One-way Anova was computed to analyze for communication problems that each group experienced. All communication problems were observed in all three groups. However, communication problems occurred more frequently in different groups. Groups with different cultural composition experienced different degrees of the same communication problem. Group 2 faced significantly greater degree of discussion domination and discussion exclusion than Groups 1 and 3.

4.1 Discussion dominance

In all three groups, there was a significant difference between the groups in terms of the number of successful interruptions made, $F(2, 9) = 11.50$, $p < .05$. Group 2 has significantly greater number of successful interruptions than Groups 1 and 3. Hence, there was a difference in the degree of discussion dominance between groups.

4.2 Communication frequency

There was no significant difference between the groups in terms of the number of turns taken $F(2, 9) = 3.42$, $p > .05$. There was also no significant differences between the groups in terms of speaking duration, $F(2, 9) = 2.12$, $p > .05$.

4.3 Discussion exclusion

There was a significant difference in discussion exclusion between the groups. Group 2 experienced significantly more instances of discussion exclusion than the other groups, $F(2, 9) = 4.65$, $p < .05$.

Table 2 gives a summary of the communication problems experienced in each group.

Table 2. Differences among three groups

	Group 1	Group 2	Group 3
	Same Cultural Background	Different Cultural Background (Ethnic)	Different Cultural Background (National)
Discussion Domination			
Successful Interruptions	--	*Significantly MORE*	--
Communication Frequency			
Speaking Time	No Difference	No Difference	No Difference
No. of Turns	No Difference	No Difference	No Difference
Discussion Exclusion			
No response	--	*Significantly MORE*	--

5 Discussion

Compared to past studies which show that groups composed of culturally different members experience more problems than groups composed of culturally similar members, this study shows that all groups experience communication problems, albeit different ones. The group composed of culturally similar members experienced more reduced communication frequency. The group composed of members with different ethnic background experienced more discussion exclusion and dominance. The group composed of members with different national background experienced reduced communication frequency.

It is observed in this study that the impact of nationality on group communication is different from the impact of ethnicity on group communication. As can be seen from Table 2, the different national background group (i.e., Group 3) experienced relatively equitable speaking time and turns. There was less discussion exclusion and interruptions than the different ethnic backgroun group (i.e., Group 2). In observation of the group discussions, it is found that members of the different national culture group spent more time than other groups in explaining their experiences with model airplanes and how they came up with the ideas that they were proposing to the group.

This suggests that nationality gives the common background necessary for coming to a common understanding of what we are trying to communicate. Heterogeneous groups with different national backgrounds experience communication problems related to trying to understand where an idea, phrase, or joke originates and how to make sense of it. This is a situation that heterogeneous groups with different ethnicities from the same country have less of a problem with, having been educated in similar conditions and having access to similar entertainment media and lifestyles. This suggests that future research should employ both qualitative and quantitative understanding of communication problems that heterogeneous groups face rather than rely on numerical measures alone.

As can be seen from Table 2, there are more instances of discussion exclusion and dominance in Group 2, where members are from different ethnicity, than in Groups 1 and 3, where group members come from the same ethnic group. Discussion exclusion and dominance are part and parcel of the dynamics of open conflict strategies during

discussion. When group members openly challenge each others' ideas and allow disagreements to take place, interrupting another group member or ignoring another group member is bound to take place. This indicates that Group 2 utilized more open conflict strategies than Groups 1 and 3.

We propose that open conflict strategies were utilized more in Group 2 than Groups 1 and 3 because cultural differences in conflict strategies are more apparent between ethnicities than between nationalities. In other words, we propose that there are greater differences in conflict strategies between individuals from different ethnic group but same nationality than between individuals from different nationality but of the same ethnic group. Oetzel, Ting-Toomey, et al [20] conducted a cross-cultural comparison of Germans, Japanese, Mexicans and U.S. Americans in terms of the face and facework conflicts between parents and siblings. The authors found that individualistic, small power distance cultures use more dominating and integrating facework and less avoiding facework, giving evidence of cultural differences in conflict strategies. An interesting point for future similar-topic research would be to de-couple nationality from ethnicity. Oetzel, Ting-Toomey, et al [20] selected cases where ethnicity and nationality were the same, i.e., Japanese person is Japanese in ethnicity and Japanese in nationality. Based on our proposal, it would be interesting to conduct more research to affirm if there are indeed greater differences in conflict strategies between individuals from different ethnic group but same nationality than between individuals from different nationality but of the same ethnic group.

The above elucidates that ethnicity and nationality give rise to different communication problems. Therefore, future studies should be specific when defining heterogeneous groups in terms of whether they are manipulating differences in nationality, ethnicity or both. Different group compositions will give rise to different problems as well as different degrees of the same problem.

As this is an exploratory study, the sample size was small. There is much opportunity for future research to address its limitations. Future research can be done with more ethnic and nationality composition mixes to ascertain the different types of problems that different group compositions bring. In addition, more research is needed to understand why different ethnic and nationality composition result in different types and degrees in communication problems encountered by groups.

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