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Conflict in GSS-based Virtual Teams: 
Findings from an Experiment

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ABSTRACT
The phenomenon of globalization and the increasing availability of collaborative technologies such as group support systems (GSS) have prompted multinational organizations to use cross-national virtual teams for various tasks. Such virtual teams are usually composed of members of different backgrounds and nationalities who may have differences in opinions, beliefs and orientations. This diversity of team members may enhance the level of group conflict. Unless effectively managed, intragroup conflict has the potential to make group decision making less effective. Using content analysis of group discussions in a set of experimental groups, we identify the positive and negative orientations of each group’s comments, assess intragroup conflict, and examine its impact on group agreement and satisfaction. The paper also examines the influence of the number of threads in the decision making discussion on the perceived participation. The preliminary results are encouraging and the area warrants more research.

Keywords
Virtual Teams, Group Choice Conflict, Group Support Systems, Content Analysis.

INTRODUCTION
The fast-paced globalization of commercial activity has forced organizations, especially those that span across nations, to group people from different locations in virtual teams. Interorganizational cooperation is a necessity in the business world, and technologies facilitating such cooperation are increasingly being sought after. Synchronization between supplier and customer organizations located across national boundaries, quicker development of new products, and the ability to transfer expertise from one location to another without dislocating the expert are some of the advantages of virtual teams, which have led to their widespread use by business organizations.

Virtual teams connect people distributed by time, space and organizational affiliation and enable them to work together in teams. Virtual team members may come from diverse backgrounds, cultures, and functional areas, which may lead to greater mismatch of ideas, opinions, beliefs and orientations in the teams and thereby result in conflict among team members. Conflict in group decision making has often been found to have mixed effects. While conflict may be beneficial to group decision making (Jehn, 1995), its adverse effects may lead managers to perceive it as harmful and thus avoid it (Schwenk, 1990). Thus, while the conflict arising from group heterogeneity may be beneficial to the organizations, firms would need to take additional care to ensure that the effects are channeled in the right direction.

Research on virtual teams has covered many important aspects such as trust, knowledge sharing, impact of diversity, impact of the use of lean medium, importance of conflict management styles, and so on. But there has not been sufficient in-depth study to understand the influence of team conflict on the performance of virtual teams. This study is an attempt to address this lacuna. It aims to explore the impact of intragroup conflict on the agreement and group satisfaction in virtual teams.
BACKGROUND

Virtual Teams

Virtual teams are “groups of geographically, organizationally and/or time dispersed workers brought together by information and telecommunication technologies to accomplish one or more organizational tasks” (Powell, Piccoli and Ives, 2004, pg. 7). Virtual teams can thus use asynchronous or synchronous means of communication depending on the requirements of the task and the available technology support. The temporal separation of group members in asynchronous virtual teams causes teams to experience certain hurdles as there could be long pauses and discontinuous discussions that lead to delayed feedback (Montoya-Weiss, Massey and Song, 2001). On the other hand, synchronous virtual teams, provide the opportunity for immediate feedback and active interaction but are likely to experience coordination problems, due to variations in the time zones (Duarte and Snyder, 1999).

Computer support for groups has been in use since 1980s, and information systems researchers have explored the various aspects of use of such systems (Fjermestad and Hiltz, 1998-99). More recently, research on virtual teams has looked at issues such as design of virtual teams, cultural differences, technical expertise, socio-emotional processes such as relationship building, trust, and task processes such as communication and coordination, and team performance (Powell et al., 2004).

Conflict in Groups

Conflict in groups has been defined as an action that is incompatible with another action and it prevents, obstructs, interferes, injures, or in some way makes the latter less likely or less effective (Deutsch, 1973). In virtual teams, conflict may arise due to various factors such as difference of opinions, conflicting goals or interests, demographic, cultural or attitudinal diversity of team members, incompatible behavioral preferences, informational diversity, and so on. (Earley and Mosakowski, 2000; Jehn, Northcraft and Neale, 1999; Mortensen and Hinds, 2001; Montoya-Weiss et al., 2001; Kankanhalli, Tan and Wei, 2000) conflict per se was not the focus of these studies. Given the “inherent communication and coordination challenges (such groups) face” (Montoya-Weiss et al., 2001, pg. 1252), it is important to examine the role of conflict and its impact on group performance.

Two types of conflict have been discussed in the literature on traditional groups- task conflict and relationship conflict (Jehn, 1995). Task conflict refers to the differences among group members regarding ideas and opinions concerning the task being performed. Relationship conflicts, on the other hand, are incompatibilities among group members about personal issues or dislike for certain members in the group. It has been found that moderate levels of task conflict can play a beneficial role in group performance whereas relationship conflict is often detrimental to group performance (Jehn, 1995). This is mainly because relationship conflict is likely to give rise to negative effects such as mistrust, anxiety, aggression, thus affecting adversely group performance and lowering satisfaction among group members.

Structured group decision making process can help increase task related conflict while trying to reduce relationship conflict. Researchers have suggested that team process can be considered as a mediating link between group diversity characteristics and team performance (Simons, Pelled and Smith, 1999). Additionally, debates or construct controversies where team members express opposing views and preferences in a problem solving task have been found to have an impact on group performance (Schweiger, Sandberg and Rechner, 1989). While virtual teams are very likely to be similar to such traditional groups, the characteristics of the communication medium used may constrain group interaction and add complexities to intragroup conflict.

GSS-based groups usually have low levels of relationship conflict vis-à-vis task related conflict mainly due low richness of the media, anonymity and greater focus on the task (Miranda and Bostrom, 1993-94). An important facility in GSS tools, anonymous commenting, could also be a major reason for low levels or absence of interpersonal conflict. As freedom to participate increases task conflict, the use of GSS encourages more constructive conflict (Poole, Holmes and DeSanctis, 1991).

Montoya-Weiss et al. (2001) argue that the medium used by virtual teams is lean and does not have the capacity to convey contextual and social cues. Hence, virtual teams experience coordination and communication challenges. This creates a high potential for conflict among group members. In addition to the characteristics of the medium used, the diversity of the group and cultural differences among group members cause coordination difficulties as multicultural groups often find cooperative decision making difficult (Maznevski and Chudoba, 2000). Team diversity also creates obstacles to effective communication
(Kayworth and Leidner, 2001-2002; Kankanhalli et al., 2000). Such communication difficulties may lead to conflict in virtual teams and affect the team performance.

**Group Performance**

An important aspect of success of group decision making lies in the group performance. Researchers have studied the performance of GSS groups through measures such as decision time, member satisfaction, participation, consensus, agreement, and perceived decision quality (see Fjermestad and Hiltz, 1998-99 for a complete review). Virtual team performance has also been studied through decision quality, number of ideas generated, time to reach decision and satisfaction (see Powell et al., 2004 for a review).

In the context of face-to-face groups, a very high level of group conflict leaves the members of the group dissatisfied with the decision making task while very low levels of conflict leaves the team with the feeling of incompleteness or discontent due to insufficient in-depth interaction. Hence, members’ satisfaction is an important performance variable in a model that explains the effects of group conflict. We explore the conflict-satisfaction relationship in the context of GSS-supported virtual teams.

We consider three different types of satisfaction – satisfaction with decision making process, satisfaction with decision outcome and perceived participation. Prior studies exploring conflict in a GSS and virtual team environment measured perceptions of members with respect to productivity of conflict experienced (Miranda and Bostrom, 1993-94) and performance of teams measured through efficiency, technical innovation, adherence to schedule and work excellence (Mortensen and Hinds, 2001).

**RESEARCH MODEL**

**Theory Development and Research Hypotheses**

As discussed above, virtual teams are characterized by members with varied backgrounds and cultural orientations. Cultural diversity in groups results in variations in cognition, values and demeanor (Hambrick, Davison, Snell and Snow, 1998). Members are likely to differ in their beliefs, opinions and attitudes towards decision situations and problem solutions thus giving rise to greater conflict in the team (Pelled, Eisenhardt and Xin, 1999). The conflict may become critical when a group makes choice from a set of competing alternatives. This is referred to as “group choice conflict” or simply “choice conflict” in this study.

In GSS-supported teams, the interactions are usually anonymous which reduces evaluation apprehension and individual dominance in group discussions (Straus, 1996). Members hence delve deeper and comment more critically on the various aspects of the decision choice thus exploring the choice in depth (Pinsonneault and Kraemer, 1990). The discussion will be intense when group members experience a difference of opinions on the final choice of the group. As interactions are anonymous, members will not hesitate to contradict others’ views directly when they disagree on a particular comment. This leads to more threaded discussions (i.e., submission of comments against a previously submitted comment) in groups. Threaded discussions are focused debates on a particular comment. Members of groups with many threaded discussions are likely to perceive that the discussion in the group is intense and that group members have participated quite actively in it. Hence,

\[ H1: \text{In GSS-based virtual teams, the higher the level of group choice conflict, the greater is the number of threaded discussions.} \]

\[ H2: \text{In GSS-based virtual teams, the greater the number of threaded discussions, the higher is the level of perceived participation of the team members.} \]

Virtual teams which experience higher levels of conflict over the group choice are likely to have lower agreement on the final decision outcome. Jehn and Mannix (2001) argued that task conflict which occurs too late in the team’s interaction (like conflict in the choice phase) is likely to reduce consensus and threaten implementation. The lower levels of agreement signify that some group members are not sufficiently convinced of the group’s choice and continue to be inclined to their respective personal preferences. They would thus not agree to the group’s final choice. Thus,

\[ H3: \text{In GSS-based virtual teams, the higher the level of group choice conflict, the lower is the agreement on final outcome.} \]
When groups have lower levels of agreement on the final choice, members realize that the group has not converged completely on a decision. The decision making process may appear to be incomplete and the progress towards the goal in the process may be unsatisfactory. Hence:

\( H_4: \) In GSS based virtual teams, the lower the level of group agreement, the lower is the level of satisfaction with decision making process.

In addition, when some members disagree on the final choice of a group, members are likely to perceive that the decision outcome is not the best decision as it is not preferred by all in the group. Therefore,

\( H_5: \) In GSS based virtual teams, the lower the level of group agreement, the lower is the level of satisfaction with decision outcome.

The research model as shown in Figure 1 depicts the hypothesized relationships.

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**RESEARCH METHOD**

We conducted a laboratory experiments to test the hypotheses. The subjects of the experiment were graduate students from a mid-western university in the US and a premier business school in India. A total of 22 groups of 3 or 4 members each participated in the study. There were 4 US-only groups, 9 India-only groups and 9 heterogeneous groups. Heterogeneous groups consisted of both US and Indian participants.

The following section discusses the experimental task, procedures, and the operationalization of variables.

**Task Identification and Description**

Given that the participants were students, it was felt that the involvement of the students would be better if the task was one to which they would easily relate. Accordingly, the task chosen was the selection of a computer use fee for students enrolled in an online university. Groups were provided with a printed and online task description that identified five fee options: a flat fee for all courses; one fee for undergraduate courses and a higher fee for graduate courses; a graduated fee, based on intensity of computer use in a course; a “fee for use;” and a fee based on the country of origin of the student.

As part of the experimental procedures, discussed below, students in each group discussed these options among themselves and selected one option as the one to recommend to the university’s administration. Experimental procedures did not provide for identifying and recommending any option other than the five discussed above.
Experimental Procedures

Subject to the constraints of an approximate 10 ½ hour time difference between the US and India and the schedules of the students in each location, the participants were assigned randomly to groups and were informed as to when they would participate. Each session consisted of the following:

Activity 1- Each person commented on the advantages, disadvantages, etc. of each option. The software allowed students to read each option, comment on options as desired, and comment on other members’ comments,

Activity 1a - When the group had discussed each of the options in depth, each group member rated the five options from 0 (least appropriate/worst) to 4 (most appropriate/best). Subsequently, each group member viewed the rating results for his/her group.

Activity 2 – Commenting on the group’s rating in activity 1a. This Activity centered on discussions about why or why not the best option was good, etc. and resolved conflict if more than one option had similar ratings. Groups could select an option following multiple paths: selecting the option that had maximum average rating or minimum standard deviation or both in the group rating process of activity 1a; or select an option that might not have the highest rating in activity 1a but appeared to be satisfactory to the majority of the group members during the course of the discussion in activity 2. Near the end of Activity 2, each group identified an option as a choice of the group and members voted “yes” or “no” to accept or reject the proposed choice.

Activity 3 – Each group completed a short post-test questionnaire.

These activities were implemented using Consensus@nyWARE, a web-based group decision support system (GDSS). Anonymity among the group members was maintained throughout the study. Each group was under the control of a facilitator, who monitored the discussions and dealt with any technical software questions. The facilitator communicated using “instant messaging” but did not interject anything into the discussion regarding the task and the computer use fee options.

Variable Identification and Measurement

Group choice conflict

A record of the groups’ communication and discussion was available to the coders as captured by the group support software. The transcripts were coded using the rules based on the classification system used by (Valacich and Schwenk, 1995) and
Conflict in GSS-supported virtual teams (Connolly, Jessup and Valacich, 1990). A brief description of the coding rules used to code the group discussion is given in Table 1. In the structure used in the experiment, in activity 1 the groups discussed all the alternatives in detail and arrived at a possible candidate for the final decision. The group then discussed this final choice in depth in activity 2 after rating the different alternatives in activity 1a. The extent of supportive and critical remarks and arguments made by the group members in activity 2 reflects the level of group choice conflict that prevails among them. We hence measured group choice conflict as the proportion of the total comments (in activity 2) on group choice that were critical in nature i.e. \( \frac{(CR+CA)}{(CR+CA+SR+SG)} \).

Two coders independently identified the categories of the comments and confirmed the comments belonging to the supportive and critical categories. The intercoder correlation for number of supportive and critical comments is 0.82 (n=22, \( p< 0.0001 \)) which is acceptable in view of the exploratory nature of the study in the context of virtual teams.

**Number of threads in the decision making**

In a computer mediated discussion, usually, the software allows a group member to select the comment to which he/she is replying. Figure 2 shows how the software used for our study allowed threading of discussions. The members could thread on different aspects of the same discussion at different points of time, unlike a face-to-face discussion, where members usually restrict themselves to the aspect being currently discussed. We measured the total number of threads present in each group’s discussion in activity 2.

**Level of group agreement**

Level of agreement refers to the extent of acceptance of the group’s decision by individual members (Mejias, Shepherd et al. 1996-97). In contrast to “consensus”, which refers to the complete match of the individual’s preferential decision to that of the group’s final decision, level of group agreement encompasses the possibility that a group member may not fully conform to the group’s decision. The level of agreement among the group members was measured in terms of the votes cast in favor of the final decision made by a group in activity 2.

<table>
<thead>
<tr>
<th>Type of Discussion Statement</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supportive remark</td>
<td>SR</td>
</tr>
<tr>
<td>Expresses support for the option chosen by the group, without adding evidence or remark. (“I am for this option”; “I agree with you”)</td>
<td></td>
</tr>
<tr>
<td>Supportive argument</td>
<td>SG</td>
</tr>
<tr>
<td>Supports the option chosen by the group, and gives evidence or argument to justify (“I support this option because it will eliminate may problems.”)</td>
<td></td>
</tr>
<tr>
<td>Critical remark</td>
<td>CR</td>
</tr>
<tr>
<td>Expresses opposition to the option chosen by the group but does not add evidence or argument (“I don’t like that”; “I don’t agree with you”)</td>
<td></td>
</tr>
<tr>
<td>Critical argument</td>
<td>CA</td>
</tr>
<tr>
<td>Expresses opposition to the option chosen by the group and gives evidence or argument to justify (“I don’t like this option because it has the following drawbacks.”)</td>
<td></td>
</tr>
<tr>
<td>Query</td>
<td>QS</td>
</tr>
<tr>
<td>Requests clarification of another person’s comment or about the option chosen.</td>
<td></td>
</tr>
<tr>
<td>Group comment</td>
<td>GC</td>
</tr>
<tr>
<td>Remark about the interpersonal process of the group (let’s summarize”, “lets try to agree on something, anyway”).</td>
<td></td>
</tr>
<tr>
<td>Remark about the system</td>
<td>COM</td>
</tr>
<tr>
<td>General remark about the computer system or the software used for the task.</td>
<td></td>
</tr>
<tr>
<td>Off the track comments</td>
<td>OTT</td>
</tr>
<tr>
<td>Remarks that are “off the topic” and do not fit into any of the above categories.</td>
<td></td>
</tr>
<tr>
<td>Uncodable text</td>
<td>UC</td>
</tr>
</tbody>
</table>

Table 1. Coding Rules
Perceived participation

Participation refers to the level of active contribution by the members as perceived by themselves as well as other members of their respective groups. This was measured using a questionnaire which contained items relating to the perceived freedom to voice one’s comments, perceived response from team members, active participation in the meeting, and the chance to express one’s opinions. Perceived participation was thus measured using a Likert-type scale ranging from 1 (almost never) to 5 (almost always).

Satisfaction with decision making process

Satisfaction with the decision making process refers to the member’s perception regarding the decision procedure. Comprehensive evaluation of alternatives, consensual solution of the conflict, sufficient time to reach the solution, completeness of the process and the progress towards the group’s stated goals are the various attributes which constitute the member’s satisfaction with the decision making process. This variable was measured using a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Satisfaction with decision outcome

Satisfaction with the decision outcome refers to the perceived quality of the group’s decision. When members perceive that their group’s decision was practical, fair and implementable, they are satisfied with their group’s decision outcome. This variable was assessed by using a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

RESULTS

As some of the measures in this study were based on self-reported data, it was necessary to assess reliability and validity of the instruments used to capture the data. Cronbach Alpha coefficients were calculated for each instrument. As the measurement scales used had not been tested and validated before and the research is exploratory nature, a cut-off value 0.70 was considered acceptable (Nunnally, 1978). An alpha of 0.833 was found for “satisfaction with decision making process;” 0.903 for “satisfaction with decision outcome”; 0.816 for “perceived participation.”

In order to determine construct validity, we conducted factor analysis employing VARIMAX orthogonal rotation for each instrument. The factor analysis for each instrument resulted in a single factor structure with high factor loadings.

<table>
<thead>
<tr>
<th>Dependent Regressor</th>
<th>Threaded Discussion</th>
<th>Perceived Participation</th>
<th>Level of Agreement</th>
<th>Satisfaction with decision making process</th>
<th>Satisfaction with decision outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Choice Conflict</td>
<td>2.191 (1.5399)</td>
<td>-0.664*** (0.2193)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threaded Discussion</td>
<td>0.077** (0.0298)</td>
<td></td>
<td></td>
<td>0.830** (0.2903)</td>
<td>1.734**** (0.3120)</td>
</tr>
<tr>
<td>Level of Agreement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

R² | 0.0919 | 0.2485 | 0.3255 | 0.3009 | 0.6190 |
F  | 2.02  | 6.61  | 9.17  | 8.18  | 30.87  |
N  | 22    | 22    | 22    | 22    | 22     |

Hypothesis Supported? | H1: No | H2: Yes | H3: Yes | H4: Yes | H5: Yes |
* p<0.10   ** p<0.05   *** p<0.01   ****p<0.001

Standard errors in parentheses

Table 2. Regression Results [Hypotheses Test 1 – 5]
Hypothesis Testing
The hypotheses were tested using regression analyses with a level of significance of 0.05. Regression analyses demonstrated a statistically significant relationship between group choice conflict and level of group agreement. Agreement in its turn has significant relationships with both satisfaction with decision making process and decision outcome. However, group choice conflict does not have any significant effect on threaded discussions. The results, summarized in Table 2, support hypotheses 2 through 5 with hypothesis 1 remaining unsupported in this study.

DISCUSSION
We examined the intra-group conflict that exists when a GSS-based virtual team finalizes the group decision. Unlike many other prior studies that captured team members’ perception of conflict, we measured conflict by analyzing the content of group discussion that was captured in the GSS data repository. As expected, we find that conflict has an adverse impact on level of group agreement. We also find that agreement level impacts process and outcome satisfaction of a virtual team. When agreement level is high, group members perceive that the decision making process converged to a decision and is thus complete. In addition, the members of these groups perceive that the final decision is acceptable to most of the members and is thus the best possible choice of the group.

In this study we did not find any support for the relationship between group conflict and threaded discussions. One possible explanation is that threaded discussions may not necessarily take place only when a group is experiencing conflict. Even when members do not disagree, they may wish to have detailed discussions on some specific issues. However, having many threaded discussions does have an impact on group members’ perception of participation in the group decision process.

Limitations
Content analysis, as a means of qualitative analysis of group discussions, has its disadvantages as it is limited in its scope and ability to fully capture the meaning and essence of the discussion. Further, as in any other qualitative analysis, content analysis is subject to the interpretation of the coder.

The use of students in a laboratory experiment may be viewed as a limitation of this research. Other research methods, such as field and case studies, may be more appropriate though laboratory experiments using student subjects on virtual teams are not uncommon. Also, complete anonymity in group discussions may sometimes give rise to certain unproductive discussions and low levels of ownership to views and opinions. This can be reduced if partial anonymity is introduced in group interactions.

Conclusions and Implications
This study is an attempt to understand the role of conflict in GSS-supported virtual teams. Having a high level of conflict in the final phase of a decision making process can lower the satisfaction of virtual team members. Acceptance and continued use of a particular information system depend on the satisfaction of its users (Bailey and Pearson, 1983). The widespread use of virtual teams will depend greatly on the satisfaction obtained by its members in the technology mediated interactions and communications. The managers and facilitators of virtual teams should train and motivate the members to collaborate with each other on the group task and be tolerant to the diverse views that may pervade the discussions of global virtual teams.

REFERENCES