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Cultural Diversity, Perceived Work Atmosphere, and Intra-group Conflict in Global Virtual Teams: Findings from a Laboratory Experiment

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ABSTRACT

In this paper we focus on the relationships among cultural diversity, perceived work atmosphere, and intra-group conflict in global virtual teams. We report the findings of a laboratory experiment that was conducted involving the subjects who were geographically dispersed. The participants used IBM's Lotus Sametime to perform a group task. The findings of the study reveal that in virtual teams, task conflict overshadows relationship conflict; the cultural heterogeneity of the team members influences their perception of the work atmosphere, which in its turn aggravates task conflict in the teams. We also find that Intra-group conflict adversely affects team members' satisfaction and collaborative conflict management style has a moderating effect on this relationship.

Keywords

Virtual team, cultural heterogeneity, perceived work atmosphere, intra-group conflict, collaborative conflict management, and satisfaction.

INTRODUCTION

Virtual teams are groups of geographically, organizationally and/or temporally dispersed individuals brought together by information and telecommunications technologies to accomplish one or more organizational tasks (Powell, Piccoli, and Ives, 2004). With the globalization of business, virtual teams have become almost indispensable for business organizations. Although the use of advanced communication and information technology has enabled geographically dispersed individuals to interact with each other, the technology mediated interaction pattern among team members is adding some challenges in the functioning of the teams. As virtual teams cut across organizational, national, and functional boundaries, diversity is an inherent aspect of these teams. Although virtual teams with surface level diversity (observable differences, such as gender, race) can become cohesive over time, similar results have not been observed for the teams with deep-level diversity (differences that are not readily observable, such as vales, attitudes, experience) (Chidambaram, 2005). Members of culturally diverse global virtual teams have differences in norms, beliefs, and experiences and thus, encounter challenges in achieving cohesion and harmony. Moreover, members of virtual teams interact using collaboration technologies which, with the exception of audio and video conferencing systems, employ lean media. The use of lean media hinders transmission of non verbal cues (such as, gestures, facial expressions) and constrains the team members to rely primarily on written interactions to perform the group task. In absence of a physical work environment, the technology mediated interactions shape team members' perceptions of the work atmosphere. The question remains whether the team members with diverse beliefs, values, and experience can develop favorable perception of the work atmosphere and lower intra-group conflict. The paper attempts to explore these issues by studying two basic research questions:

- Can culturally diverse virtual teams develop favorable perception of the work atmosphere?
- Does the perception of work environment lower intra-group conflict in virtual teams?

In addition, we also study whether Intra-group conflict and conflict management styles impact the satisfaction of virtual teams. Although prior research looked into various aspects of collaboration technology supported virtual teams, none of the studies attempted to explore the perception of work atmosphere of these teams. Our research attempts to address this gap by focusing on the perception of work atmosphere and examining its relationship with intra-group conflict.

In the next section we review the literature on our study constructs, present the theoretical model, and hypothesize our research questions. Next, we discuss the research method, which is followed by the presentation of the results. We end the paper with a discussion on the findings, the limitations of the study, and the conclusion.

LITERATURE REVIEW

Global Virtual Teams, and Diversity

Virtual teams are defined as groups of employees with unique skills, often situated in different locations, whose members must collaborate using technology across space and time to accomplish important organizational tasks (Kirkman and Mathieu, 2004). The team members may not meet in person but they interact using communication technology to perform group tasks and make decisions (Maznevski and Chudoba 2000). Global virtual teams are internationally distributed groups of people with an organizational mandate to make or implement decisions with international components and implications. Global virtual teams usually comprise of individuals from different countries with diverse cultural backgrounds. Diversity is, thus, an inherent characteristic of global virtual teams.

Diversity within a work group refers to its composition in terms of the distribution of demographic traits and cognitive differences manifested as surface-level and deep- level attributes (Chidambaram, 2005). Pelled (1996) classified diversity in terms of visibility and job related categories. Visible diversity arises from the differences in age, gender and race, while job related diversity stems from differences in organizational tenure, education and functional background. Harrison, Price, and Bell (1998) classified it as surface level and deep level diversity. Surface level diversity is important in face-to-face teams. Team members can make reasonable estimates of age, gender or racial ethnic background of the other members and therefore, of that person's (dis) similarity to themselves almost immediately (Jackson, May, and Whitney, 1995). Most importantly, it is well established that individuals quickly use these characteristics to assign themselves and others to social classifications involving ascribed pattern of thoughts, attitudes and behaviors (Fiske, 2000). Tajfel and Turner (1986) have identified that as individuals are motivated to maintain or enhance their social identities, they are more likely to positively evaluate and identify with persons and groups whose members appear to hold the same overt features that they do.

Deep level diversity refers to differences among team members' psychological characteristics, including personalities, values, and attitudes (Jackson et al., 1995; Harrison et al, 1998). Clues to these latent individual differences are taken from members' interactions with one another as they unfold over time. Those clues are expressed in behavioral patterns, verbal and nonverbal communications, and exchange of personal information (Harrison, Price, Gavin, and Florey, 2002).

In virtual team, as team members do not usually meet face-to-face, they do not immediately perceive the surface level diversity. The members may perceive differences in ethnicity through the language used in conversation as D'Anglegan and Tucker (1973) observed that even sophisticated bilinguals in Canada sometimes fail to interpret correctly a monolingual's message. This difference creates a psychological distance.

Although race or ethnicity has been identified as surface level diversity, their characteristics lead to deep level diversity. Intricately associated with a race or ethnicity is its culture. Difference in culture is a major cause of perceived dissimilarity and it is manifested through different cognitive processes. Culture is defined as the set of deep level values associated with societal effectiveness, shared by an identifiable group of people (Maznevski, Gomez, and Noorderhaven, 1997). Culture plays a major role in information processing of individuals. Cultural values influence the perceptual filter through which an individual interprets information needed to make decisions (Adler, 1997; Hofsted, 1980). In a cross-cultural global virtual team, different members analyze and interpret facts using the cues provided by their respective cultures. Two types of cultural difference may prevail among the members of these teams: difference in national and organizational cultures.

National Culture is the collective programming of the mind, which distinguishes one group or category (nation) from another (Hofstede, 1980) and it helps us understand why the people from different countries may think, feel and behave differently when faced with problems. Hofstede identified five major cultural dimensions- individualism/collectivism, power distance, uncertainty avoidance, masculinity femininity, and long-term orientation and short term orientation.

Organizational culture is a common perception held by the organization's members: a system of shared meaning. Schein (1992) defined it as "A pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems."

Diversity and its effect on group behavior

Diversity has mixed influence on the effective functioning of the small groups (Jackson, 1991). Heterogeneous groups are more creative and more likely to reach high quality decisions than homogeneous groups (McGrath, 1984; McLeod, and Lobel, 1992; Triandis, Hall, and Ewen, 1965; Willems and Clark, 1971). It can increase potential productivity of the group (Jackson 1991; McGrath, 1984); improve the qualities of ideas generated by a group (McLeod and Lobel, 1992). The people of different cultures bring a variety of perspectives and outlooks to a task; thus, diversity may add to the pool of resources available to a group (Adler, 1990). The differences in the perspective offer potential for multicultural teams to perform well (McLead and Lobel, 1992; Watson, Kumar and Michaelsen, 1993). Another positive effect of diversity is that it reduces the probability of groupthink (Janis, 1982). However, there is evidence that diversity is related to lower levels of interpersonal attraction, more stress and more turn over. Diversity greatly increases the complexity of the process that must occur in order for the group to realize its full potential (Adler, 1990). Diverse groups may require more time to reach a decision (Fisher, 1980). They are more likely to explore the full range of possible solutions to the problem. Diversity has a negative impact on communication and interpersonal attraction (Adler, 1990; Steiner, 1972; Storey, 1991; Triandis, 1959). Language differences can impair communication and increase the chances of errors in message transmission and decoding (Samovar and Porter, 1988). Rogers and Bhowmick (1971) find that heterogeneous groups suffer from delayed transmission of messages, message distortion, and restriction of communication channels. The cultural values influence members' preferences for social interaction norms (Bettenhausen and Murnighan, 1991; Earley, 1993; Zander, 1997). Because of these hidden influences, multicultural groups find cooperative decision making difficult (Kirchmeyer and Cohen, 1992; Watson et al, 1993).

Diversity and the Perception of Work Atmosphere

Formation of a favorable perception of the work environment is critical in fostering collaborative interaction among the team members. Jehn and Mannix (2001) identify trust, cohesion, openness, and respect as four underlying dimensions of the perception of the work environment. Although Jehn and Mannix (2001) study these dimensions in the context of face-to-face teams, we expect those to be more relevant for virtual teams. The importance of these factors in group work has been discussed in the literature (Jarvenpaa, Knoll, and Leidner, 1998; Jarvenpaa and Leidner, 1999; Cartwright, 1968; Edmondson, 1993).

In the heterogeneous group, the group members perceive dissimilarity with fellow members. Cultural distance is a major cause of perceived dissimilarity. Triandis (2003) mentioned that cultural distance is greater when members of two cultures speak very different languages, have different social structures, religions, standards of living, and values. People work comfortably when they are interacting with persons from same culture.

Team social integration is considered as a multifaceted construct including elements of cohesiveness, satisfaction with coworkers, positive social interaction, and enjoyment of team experiences (O' Reilly, Caldwell and Barnett, 1989; Smith, Smith, Olian, Sims, O'Bannon, and Scully, 1994). Elements of team social integration are the most commonly studied outcomes in diversity research (Tsui and Gutek, 1999). Prior research suggests a negative relationship between work team diversity and team social integration. At the same time, team social integration is a strong predictor of team performance (Harrison et al, 2002).

Cultural values influence members' preferences for social interaction norms (Bettenhausen and Murnighan 1991; Earley, 1993). Communication difficulties in the diverse group can result in reduced attraction and cohesion (Adler, 1990; Jackson, 1991; O'Reilly, Caldwell and Barnett, 1989). Conversely, similarity in beliefs, attitudes, and values contribute to cohesiveness (Yukl, 1985) and heterogeneous groups are generally less cohesive (Adler, 1990; Shaw, 1981).

In the global virtual team, while surface level diversity can be perceived by the members through the language used, some aspects of the deep level diversity become apparent through the interaction process. Heterogeneous groups, as evident from the literature review, are less cohesive. The negative perception of the work atmosphere result in aggravated intra-group conflict

Intra-group Conflict and Virtual Teams

Conflict is broadly defined as perceived incompatibilities or perceptions by the parties involved that they hold discrepant views or have interpersonal incompatibilities (Boulding, 1963). Conflict can be both functional and dysfunctional. Intra-group conflict stem from relationship issues and with task issues (Guetzkow and Gyr, 1954; Jehn, 1997). Relationship

conflicts arise from difference in personal taste, political preference, values and ideology, whereas task conflicts are conflicts about the distribution of resources, about procedures and policies, and about judgments and interpretation of facts (De Dreu and Weingart, 2002). Relationship conflict exists when there are interpersonal incompatibilities among group members, which typically include tension, animosity, and annoyance among group members within a group (Jehn, 1995). The relationship conflict is generally detrimental to the team functioning. But task conflict is actually beneficial to the team effectiveness (Van de Vilert and De Dreu, 1994). Task conflict, which is basically disagreement focused on task content or process, is positively associated with performance because it can cause team members to consider more alternatives. Jehn (1997) found that type of task that group members perform, affects the relationship between conflict and group performance. The author also observed, "in groups performing routine tasks, disagreements about the content of the task were generally detrimental to the group functioning. In contrast, in groups performing non routine tasks, disagreements about the task did not have a detrimental effect, and in some cases, were actually beneficial."

In the virtual teams, the members are unaware of others non verbal communication cues (except when group members use video conferencing systems). In addition, when the members are physically separated, the scope of their social interaction is also limited. In such a condition, the nature of the conflict is expected to be different from that of face to face group.

Virtual teams experience two direct consequences of their virtuality: mediated communication and unshared context (Hinds and Bailey, 2000). Mediated communication causes higher levels of affective and task conflict as group members neglect to censor their comments and to accommodate the preferences of their team members. However, Short, Williams and Christie (1997) argue that mediated communication reduces the extent to which participants and the interpersonal relationship are salient in the interaction. Similarly, Sproull and Kiesler (1991) argue that computer-mediated communication depersonalizes the interaction, leading to greater concentration on the message rather than the interacting persons. Moreover, most of the global virtual teams are time-limited, non-repetitive groups that are engaged in producing a one-time output (Massey, Montoya-Weiss, and Hung, 2003). These teams are usually engaged in non-repetitive group work, such as help desk, customer support. Thus, we expect that the relationship conflict in the virtual teams will be less than the task conflict, as the difference in personality or interpersonal issues has little scope to surface in the interaction of virtual teams that have a short life span.

Perceived Work Atmosphere and Task Conflict

Based on our discussion of prior research on group diversity, perception of work atmosphere, and intra-group conflict, we suggest that in the global virtual teams that are engaged in non-repetitive tasks, task conflicts will overshadow relationship conflicts. Diversity will adversely affect the perception of work atmosphere, which in its turn, will aggravate intra-group conflict. Thus, we propose:

> *Hypothesis-1: In ad hoc global virtual teams, task conflict is significantly higher than relationship conflict.*
>
> *Hypothesis 2: In ad hoc global virtual teams, the perceived work atmosphere of culturally heterogeneous groups will be less favorable than that of homogeneous groups.*
>
> *Hypothesis 3: In ad hoc global virtual teams, the perceived work atmosphere will have a negative relationship with task conflict.*

Intra-group Conflict, Team Member Satisfaction, and Conflict Management Style

In a meta analysis De Dreu & Weingart (2003) observed that all studies reported negative correlations between relationship conflict and team member satisfaction. Similar relationship exists between task conflict and satisfaction. Task conflict has typically shown a negative relationship with attitudinal outcomes for a variety of management and work groups (Jehn, 1997). However, Priem and Harrison (1995) find that task conflict actually improved both member acceptance of group decisions and overall group satisfaction.

Schweiger, Sandberg and Regan (1986) and Schweiger and Sandberg (1989) found that cognitive conflict encouraged thorough evaluation of an alternative's underlying assumptions. Hoffman and Maier (1961) found that group members' satisfaction with a decision was related to the influence they have exercised over it. In a study with top management teams, Amason (1996) observed that cognitive dimension of conflict does not weaken consensus. The author states cognitive conflict actually enhances team members' degree of understanding of their decisions. Researchers observed teams that experienced greater cognitive conflict better understood the rationale underlying their decisions.

The contradictory findings of researches linking conflict and satisfaction of the group may be explained if we consider the intervening role of conflict management style. Conflict management plays an important role in determining group outcomes (Murnighan and Conlon, 1991; Simmons and Peterson, 2000).

At the intra-group level, group conflict management describes the responses of members to conflicts internal to the group. It refers to strategies implemented by group members aimed at reducing or solving conflict. Rahim and Bonoma (1979) differentiated the styles of handling conflict on two basic dimensions; concern for self and concern for others. The first dimension explains the degree (high or low) to which a person attempts to satisfy his or her own concern. The second dimension explains the degree (high and low) to which a person attempts to satisfy the concern of others. A combination of these two results in five basic styles: Integrating style (high concern for self and others), obliging style (low concern for self and high concern for others), dominating style (high concern for self and low concern for others), avoiding style (low concern for self and others) and compromising style (intermediate in concern for self and others) (Rahim, 2002).

Montoya-Weiss, Massey, and Song (2001) demonstrate that collaborative conflict style has positive effect on group performance. DeChurch and Marks (2001) advocate that in groups where task conflict is managed in an active and agreeable manner (i.e., collaboratively), the conflict is likely to benefit both performance and member satisfaction. prior research on groupware based virtual teams has consistently identified collaborative style as the most effective conflict management style (Montoya-Weiss, Massey, and Song, 2001; Paul, Seetharaman, Samarah, and Mykytyn, 2004).

Based on our discussion of the prior research on intra-group conflict, group satisfaction, and conflict management style, we suggest that intra-group conflict in virtual teams will adversely affect team members' satisfaction and the relationship will be moderated by collaborative conflict management style. We have hypothesized that intra-group conflict in virtual teams is predominantly task conflict. Moreover, we focus only on decision and process satisfaction primary because prior research on GSS-based work groups has identified these as the two major types of satisfaction (Fjermestad and Hiltz, 1998-99). Thus, we hypothesize:

> *H4: In collaborative technology supported global virtual teams, task conflict will have a negative relationship with group members' satisfaction with group decision.*
>
> *H5: In collaborative technology supported global virtual teams, task conflict will have a negative relationship with group members' satisfaction with the decision-making process.*
>
> *H4a: In collaborative technology supported global virtual teams, collaborative conflict management style positively moderates the negative relationship between task conflict and group members' satisfaction with decision.*
>
> *H5a: In collaborative technology supported global virtual teams, collaborative conflict management style positively moderates the negative relationship between task conflict and group members' satisfaction with decision-making process.*

The five hypotheses are depicted in a theoretical model shown in figure 1.

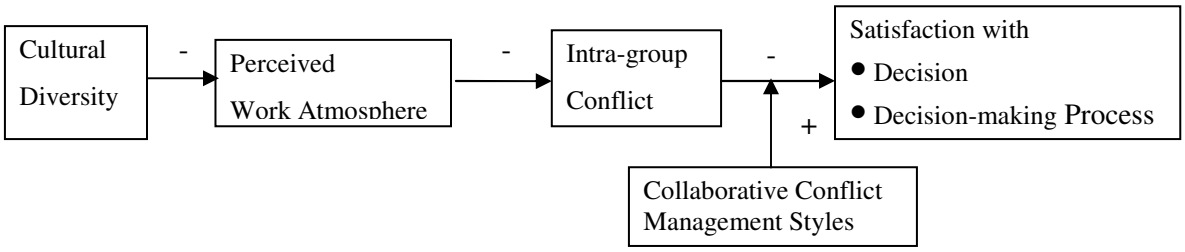

Figure 1. Theoretical Model

RESEARCH METHOD

Subjects and Tasks

We conducted a laboratory experiment to test our research model. We used IBM's Lotus Sametime, a groupware that is one of the most widely used collaborative technologies in business. Volunteer subjects enrolled in graduate business programs at a major Midwestern US university participated along with graduate students from a major management institute in India. All subjects were experienced with information and communication technology and familiar with Internet and web-based applications. The students enrolled at the US university represented different cultural and ethnic backgrounds, in addition to students who were born and raised in the US.

Each participant was trained on Lotus Sametime in separate training sessions in which the participants worked on a task that was similar to the experimental task. Altogether 28 three-member groups participated in the experiments. Each group was assigned to one of the following two categories: Homogeneous and Heterogeneous based on their national origin (see table 1 for the implementation of these categories).

Due to the nature of the study, the approximate 10 ½ hour time difference between the two countries, and the schedules of the students in each location, complete random assignment of subjects to groups was not possible. However, once the availability of the students in each location was known, accounting for the time differences, class schedules, etc., students were randomly assigned to either homogeneous or heterogeneous groups, based on their availability.

The groups were asked to assume the role of an advisory committee that would recommend to the administration of a fictitious university 5-6 proper uses of the technology fees that were collected from the students of the university. Thirteen groups performed this basic version of the task whereas the remaining fourteen groups had an additional component of the task. These groups suggested the allocation of technology fees to the 5-6 uses that they identified. Thus, two versions of a decision making task that were employed in the research had different levels of complexity.

Experimental Procedures

The experimental sessions were carried out at a major Midwestern university in the US and a premier business institute in India. The subjects used IBM's Lotus Sametime to work on the experimental task. Anonymity among group members was maintained. Each group was under the control of a facilitator, who communicated using "instant messaging" option of Lotus Sametime. The facilitator monitored the discussions and dealt with any technical questions that the participants had; the facilitator did not interject anything into the discussion regarding the task and the computer use fee options. Each session consisted of the following:

- Activity 1: Commenting on advantages and disadvantages of each option of using technology fees [all groups]
- Activity 2: Selecting 5-6 options of using technology fees [all groups]
- Activity 3: Allocating technology fees to the selected options
- Activity 4: Voting on the final decision [all groups]
- Activity 5: Completing questionnaires used to collect data of the experiment. [all groups]

Variable Identification and Operationalization

This study involved one independent variable (diversity of virtual teams), one moderating variable (collaborative conflict management style), and three major dependent variables (the perception of work atmosphere; relationship and task conflict; and process and decision satisfaction). With the exception of cultural diversity of groups, all other variables were measured with 5-point Likert-type scales (presented in appendix 1). None of these scales were developed in this study. These were validated scales reported in the literature. The operationalization of the variables is presented in table 1. The indicator items of the scales are presented in appendix 1.

Table 1. Variables and Their Measurements

Variables	Operationalization/Measured By	Data Type (Source)
Diversity	Each group was classified into one of the following three categories: • Heterogeneous: The members are from different national cultures. • Homogenous: The members are from same national .	Objective data
Perceived Work Atmosphere	Average score of ten indicator items reported in Appendix 1. The instrument is based on the "Perceived Work Atmosphere Test" used by Jehn and Mannix, (2001).	Self-reported data (Questionnaire)
Intra-group Conflict	Adapted from the instrument used by Jehn (1994). Average score of items 1, 2, and 3 measure relationship conflict while that of items 4, 5, and 6 measure task conflict (see Appendix 1).	Self-reported data (Questionnaire)
Collaborative Conflict Management Style	Average score of five indicator items reported in Appendix 1. The instrument is adapted from that used in Montoya-Weiss, Massey, and Song (2001).	Self-reported data (Questionnaire)
Satisfaction with Decision	Average score of four indicator items reported in Appendix 1. The instrument is adapted from that used by Paul et al. (2004).	Self-reported data (Questionnaire)
Satisfaction with Decision Process	Average score of five indicator items reported in Appendix 1. The instrument is adapted from that used by Paul et al. (2004).	Self-reported data (Questionnaire)

RESULTS

Reliability and validity

Reliability assessments are made for the self-reported variables. Cronbach Alpha coefficients are calculated. A cut-off value 0.70 is considered acceptable (Nunnally, 1978). To examine convergent validity, factor analyses employing VARIMAX orthogonal rotation is carried out. With the exception of the scale on perceived work atmosphere, all other scales demonstrate expected patterns of factor loadings. Although Jehn and Mannix (2001) had four underlying dimensions (trust, respect, cohesiveness, and openness) of work atmosphere, we find that the indicator items of perceived work atmosphere loaded on three factors, which are identified as trust, team spirit, and openness. The items for cohesiveness and respect load on one factor, which was named as team spirit. The reliability and validity results are presented in table 2.

Table 2. Reliability and Validity of the Instruments in the Study

Variable	Reliability [Cronbach's Alpha]	Validity [Factor Loadings]
Work Atmosphere - Trust	0.773	0.789-0.866
Work Atmosphere – Team Spirit	0.737	0.671-0.814
Work Atmosphere - Openness	0.719	0.685-0.862
Intra-group Conflict	0.745	0.770-0.864 [Task] 0.749-0.845[Relation]
Collaborative Conflict Management Style	0.772	0.601-0.810
Satisfaction with Decision	0.884	0.814-0.900
Satisfaction with Decision-Making Process	0.825	0.615-0.851

Hypothesis Testing

The hypotheses are tested using analysis of variance (ANOVA) and regression analyses with a level of significance of 0.05. Any weak significance level in the range of .05 to .10 is treated as suggestive of the nature of relationship between the

variables. We have tested the groups in two different task types to ascertain that their performance do not vary significantly. Task type is introduced as a control variable in the statistical models.

Hypothesis 1 is tested through a paired comparison t-test using the PROC MEANS of SAS. The result demonstrates That Task conflict is significantly higher than relationship conflict ($\bar{x}_{\text{Relationship}}$ = 1.48 and $\bar{x}_{\text{Task}}$ = 2.49, Mean difference in conflict types=1.02, t=9.83, p<0.0001), thus supporting hypothesis 1.

In order to test hypotheses 2 we have conducted ANOVA considering the level of diversity as the categorical variable and found mixed support for hypothesis 2. There is no significant variation in the trust of the two categories of groups. Both team spirit and openness vary significantly between the homogeneous and heterogeneous groups.

Table 3: Means and Standard Deviations of the Perception of Work Atmosphere and Results of ANOVA

Dimensions of Perceived Work Atmosphere	Mean (Std. Deviation)		F-Statistic		Hypothesis 2 Supported?
	Homogeneous Groups	Heterogeneous Groups	d.f. = 26	Sig. Level	
Trust	4.10 (0.386)	4.03 (0.279)	0.21	0.650	**No**
Team Spirit	4.24 (0.297)	3.88 (0.545)	4.90	0.037	**Yes**
Openness	4.06 (0.439)	3.66 (0.572)	4.18	0.052	**Yes**

Regression analyses were employed to test the hypotheses 3 through 5. The regression results demonstrate that team spirit is negatively related to task conflict in the teams (β=-0.597; p=0.02) and openness is positively related to task conflict (β=0.385; p=0.07). Thus, we find mixed support for hypothesis 3. The results are shown in table 4.

Table 4. Result of Regression Analyses of the Task Conflict with the Perception of Work Atmosphere

Independent Variable	Task Conflict	Hypotheses 3 Supported?
Intercept	2.787** (1.341)	
Trust	-0.044 (0.282)	**No**
Team Spirit	-0.685*** (0.240)	**Yes**
Openness	0.473** (0.200)	**Yes**
Task	0.323* (0.190)	
R^2	0.330	
Parameter estimates (β) are shown in each cell; standard errors are shown in parentheses * p<0.10; ** p<0.05; *** p<0.01; **** p<0.001		

As hypotheses 4 and 5 involved the moderating effect collaborative conflict management style, we tested these hypotheses in three steps. We followed the recommendation provided in prior literature regarding the test of moderating effects (Sharma, Durand, and Gur-Arie, 1981). First, we regressed the dependent variables on the main effect (task conflict). Next, we regressed the dependent variables on the main effect, moderator effect (collaborative conflict management style), and the

interaction between the main and moderator effects. Finally, we tested the significance of the interaction effect by comparing the two regression models. F-test comparison of the regression coefficients of the two models was significant at 95 percent confidence level for both moderators. The results of the regression analyses with the moderators and the interaction terms are presented in table 5. We found strong supports for both hypothesis 4 and 5. The moderating effect of the collaborative conflict management style was demonstrated for both hypothesis 4 and 5. In other words, collaborative conflict management style moderated the relationship between task conflict and satisfaction (with decision and process) in the virtual teams that we studied.

Table 5. Results of Regression Analyses Involving Task Conflict and Satisfaction

Independent Variable	Satisfaction with Decision Outcome	Satisfaction with Decision Making Process
Intercept	4.795**** (0.161)	4.278**** (0.196)
Task Conflict	-1.694**** (0.060)	-1.549**** (0.064)
Collaborative Conflict Management Style	-0.075** (0.035)	0.018 (0.044)
Collaborative Conflict Management Style * Satisfaction	0.379**** (0.015)	0.353**** (0.018)
Task	0.007 (0.024)	0.031 (0.029)
R^2	0.984	0.979
Hypotheses Supported?	***H4: Yes*** ***H4a: Yes***	***H5:Yes*** ***H5a: Yes***
Parameter estimates (β) are shown in each cell; standard errors are shown in parentheses * p<0.10; ** p<0.05; *** p<0.01; **** p<0.001		

DISCUSSION

In this research, we examined the effect of the cultural heterogeneity on the perceived work atmosphere in virtual teams. The groups that were culturally homogeneous had favorable perception of the work atmosphere for obvious reasons. Members of these groups were quite familiar with style of interaction of their counterparts and thus, they interacted naturally. On the contrary, the members of the groups that were culturally heterogeneous (with different national and organizational cultures) were unfamiliar with the interaction style of their counterparts and put in extra efforts to understand others views.

An unexpected result of the study is the statistical insignificance of the variation of trust among the three categories of groups. An explanation of this finding could be the nature of task that was selected for our study. Had it included activities such as sharing private or hidden information, we might have found the variation of trust across the teams.

We find mixed support for hypothesis 3. As hypothesized, we find that team spirit has negative relationship with task conflict. However, openness is found to have positive relationship with task conflict, which implies that the members of the groups that perceive the work atmosphere as open, exchange their views about the task freely, and are not hesitant to air their differences. However, no general conclusion can be made without conducting in depth studies involving virtual teams.

Hypotheses 4 and 5 were supported in our study. We also demonstrate the moderating effects of collaborative conflict management style on the relationship between task conflict and satisfaction (with decision and process).

LIMITATIONS

There can be a large number of culturally heterogeneous groups with different cultural dimensions. This study considers only a few of such diverse groups. Therefore, the results cannot be generalized to all culturally heterogeneous groups. Future research directions should consider the examination of other types of cultural heterogeneity.

The participants in this study were graduate business students and not regular users of groupware tools. Although these students were excited at the prospect of participating in the electronic meetings, it was difficult to ensure that the subjects put their best effort to work on the assigned task (which is true with most laboratory research).

The participants of the study were from the US and India and were separated temporally (about 10 ½ hours). As the meetings were synchronous, there was a variation in the actual working condition of the team members. Some members worked during their normal work hours (i.e. daytime) while others had to compromise and work at night to participate in the team work. This could have impacted group members' perception of work atmosphere.

CONCLUSION

Although this study marks the beginning of research on the perception of work atmosphere in virtual teams, we can draw some conclusions from this research. We find that when ad hoc virtual teams use collaborative technologies that do not use rich media, the task conflict overshadows the relationship conflicts. We also find that having favorable perception of the work atmosphere does not necessarily imply a lowering of the intra-group conflict. Openness of the work environment is positively associated with task conflict. This is obviously an area that warrants more in depth research. Overall, we find that task conflict adversely impacts team members' satisfaction with decision and process and when team members adopt collaborative conflict management style, the adverse effect of task conflict on satisfaction is weakened. Although no generalization can be made from the findings of one experiment, the results provide enough motivation to pursue in-depth research on cross-cultural virtual teams.

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APPENDIX 1. Indicator Items of Perceptual Variables

Indicator Items for Perceived Work Atmosphere (adapted from Jehn and Mannix, 2001)

1. How much did you trust your fellow group members?
2. How comfortable did you feel delegating to your group members?
3. Were your group members truthful and honest?
4. How much did you respect your fellow group members?
5. How much did you respect the ideas of others members in your group?
6. How much open discussion of issues was there in your group?
7. To what degree was communication in group open?
8. To what degree was conflict dealt with openly in your group?
9. To what extent is your group cohesive?
10. How much did you feel like your group had team spirit?

Indicator Items for Intra-group Conflict (adapted from Jehn, 1994)

1. How much emotional conflict was there among members in your group?
2. How much anger was there among the members in your team?
3. How much relationship tension was there among members in your group?
4. How much conflict of ideas was there in your work group?
5. How often did members in your group disagree about opinions regarding the work being done?
6. How much conflict about the work you did was there in your group?

Indicator Items for Collaborative Conflict Management Style (adapted from Montoya-Weiss, Massey, and Song, 2001)

1. I collaborated with my group members to come up with decisions acceptable to us.
2. I tried to bring all our concerns out in the open so that the issues could be resolved in the best possible way.
3. I tried to work with my group members to find solutions to a problem that satisfy our expectations.
4. I exchanged accurate information with my group members to solve a problem together.
5. I tried to investigate an issue with my group members to find a solution acceptable to us.

Indicator Items for Satisfaction with Decision (adapted from Paul et al. 2004/2005)

1. The decision made by my group is practical
2. The decision made by my group is fair
3. I am confident that the final decision we came up with is the best decision
4. I feel that the quality of the group's decision would have some positive effects on the performance of the university

Indicator Items for Satisfaction with Decision Making Process (adapted from Paul et al. 2004/2005)

1. I believe my contribution to be significant in our group arriving at the final decision.
2. Our group was able to reach a consensual solution without any major conflict.
3. I feel that the group members converged on the final decision.
4. The decision making process of the group was complete
5. The process of the group towards the stated goals of the task was satisfactory.