

Research Note

A Model of Conflict, Leadership, and Performance in Virtual Teams

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Organizations in many different industries employ virtual teams in a variety of contexts, including research and development, customer support, software development, and product design. Many virtual teams are geographically and culturally dispersed in order to facilitate around-the-clock work and to allow the most qualified individuals to be assigned to a project team. As such dispersion increases, virtual teams tend to experience greater and more diverse conflict compared to co-located teams. Since the dynamics of virtual team leadership are not yet well understood, research that examines how team leaders alleviate threats to team cohesion and provide strategies for conflict resolution makes significant contributions to the literature. Our study uses a survey-based methodology to examine the perceptions of 159 virtual team members employed by a large U.S. telecommunications corporation and five Korean firms involved in construction, finance, business consulting, sales, and distribution. The study integrates the dynamic model of conflict in distributed teams with the behavioral complexity in leadership theory to investigate the roles that virtual team leaders must effectively employ to reduce various forms of virtual team conflict. Our findings indicate that communication technologies are effective in reducing task conflict; however, the team leader may also mitigate task conflict by assuming the role of monitor. Likewise, process conflict may be abated in the virtual team as the leader performs coordinator activities. An effective virtual team leader exhibits specific roles to manage different types of conflict and the leader's response to conflict plays an important part in virtual team success.

Key words: virtual teams; virtual leadership; team conflict

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Introduction

The use of virtual teams is so common in organizations today that well over half of all professional employees are believed to work, or have worked, on a virtual team (Martins et al. 2004). Virtual teams are used in almost all industries and in a variety of areas, such as R&D and customer service (McDonough et al. 2001, Carmel and Agarwal 2001, Hertel et al. 2005). Although prevalent, virtual teams continue to present challenges to organizations. The removal of commonalities (i.e., location, culture) disrupts a team's mutual awareness of individual members (Cramton 2001). This in turn inhibits shared understandings (Cramton 2001) and results in electronic interactions among team members that may be misunderstood. It is no

surprise then that team conflict is a pressing problem facing virtual teams (Armstrong and Cole 2002, Hinds and Mortensen 2005). Because the nature and implications of virtual team conflict are only now becoming better understood (Mortensen and Hinds 2001, Hinds and Mortensen 2005), there is as yet little understanding of how a virtual team leader can manage conflict.

Although there are examples of highly self-organized virtual teams, there is general agreement that virtual teams function better with managerial guidance (Hertel et al. 2005). In spite of the recognition of the importance of the virtual team leader, little empirical research specifically examines the virtual team leader. In fact, five recent reviews (Bell and Kozlowski 2002, Martins et al. 2004, Powell et al. 2004, Hertel

et al. 2005, Webster and Staples 2006) on virtual teams collectively found only a few studies focused on leadership issues. The extant literature that does empirically examine virtual team leadership issues focuses primarily on describing the characteristics of effective virtual leadership including the engagement in extensive communication, the display of understanding, and the exercise of authority (Kayworth and Leidner 2001). Other research examines the effect of different leadership styles in remote settings (Konradt et al. 2000). To our knowledge, no research to date has examined the virtual team leader's role in ameliorating team conflict.

With this in mind, the objective of our study is to identify and empirically assess various roles that allow virtual team leaders to manage different types of team conflict. Quinn's (1984) model of competing leadership roles serves as the theoretical framework to map leadership to conflict in a virtual team. We construct a model that evaluates four leadership roles and the influence each has on task conflict, relational conflict, and process conflict. A survey-based methodology is used to gather the responses of actual virtual team members employed by a major telecommunications firm in the southwest United States, as well as virtual team members of five Korean firms. The results show that virtual team members believe the team leader can assume specific roles to alleviate the three types of conflict; however, not all leadership roles increase team members' perceptions of leader effectiveness. The result is a compelling description of the impact that leadership roles have on conflict management and improved team performance while preserving the distributed structure of virtual teams.

Background

Conflict in Virtual Teams

Consistent with the literature defining teams (see Powell et al. 2004), we describe a *team* as a collection of individuals that works on organizational tasks interdependently, shares responsibility for team performance, and is viewed as a distinct social entity embedded in a larger organizational system (Cohen and Bailey 1997). A virtual team is a team whose members rely on technology-mediated communication in working across geographical, organizational,

and/or time boundaries to accomplish team tasks and achieve team goals (Jarvenpaa and Leidner 1999, Martins et al. 2004). Virtual team members may be present locally within an organization's physical facilities, dispersed domestically within a single country or dispersed globally across several countries and time zones. Although prior literature is incongruent in the definition of a virtual team, a distinct feature of virtual teams is the predominant or exclusive use of technology-mediated communication to compensate for geographic distance, firm boundaries, and/or time constraints (Griffith et al. 2003, Fiol and O'Connor 2005). Although geographic or other forms of member dispersion are often associated with virtual teams, even co-located teams may choose to communicate and coordinate in a virtual manner (Kirkman and Mathieu 2005). Hence, technology support and member dispersion are descriptive of virtual teams rather than defining attributes (Fiol and O'Connor 2005).

The presence of conflict in virtual teams is well-supported in the literature. The dynamic model of conflict in distributed teams (Hinds and Bailey 2003) theorizes that the nature of virtual teams (i.e., distance and technology mediation) makes conflict difficult to manage (Hinds and Mortensen 2005, Mannix et al. 2002) and undermines resolution efforts. Moreover, technology-mediated communication diminishes the ability to share information (Tinsley 1998) and results in less collaborative conflict resolution (Purdy et al. 2000). Consistent with co-located team conflict literature (Jehn 1995, 1997), the three types of conflict proposed to have significant influence on virtual team performance are task conflict, relational conflict, and process conflict (Hinds and Bailey 2003).

Task conflict arises when task knowledge—an understanding of the necessary activities to reach team goals—is not fully understood or shared by team members. The result may be disagreements among members about work content, appropriate tasks, or assignment of team activities. *Relational conflict* arises when relational knowledge—personal understanding of team members including individual cultures and norms—is insufficient. Relational conflict may evoke negative emotions and interpersonal disagreements between members not directly related to tasks. *Process conflict* surfaces when members disagree on the methods and processes required to complete tasks.

Researchers propose that task, process, and relational conflict are consistently detrimental to the performance of distributed teams (Hinds and Bailey 2003). Although not all conflict is “bad,” conflict that undermines team performance and organizational outcomes requires effective management. The active management and earlier detection of conflict may be particularly crucial in virtual teams (Hinds and Mortensen 2005). Thus, we propose that the detection and management of conflict occurs more readily in virtual teams with effective leaders than in those with less effective leaders. This leads to our goal of understanding the leadership roles that virtual team leaders may enact to effectively manage the conflict that arises in the virtual team.

Leadership in Virtual Teams

Consistent with Katz and Kahn (1978), we define leadership in the virtual team context as the leader’s incremental influence over and above general compliance with routine organizational directives. One indication of managerial effectiveness is the success of influencing people and developing a greater commitment to task objectives (Yukl 1981, 2002). Research on leadership in organizations can be broadly grouped into three areas: (1) attribute-focused research that focuses on understanding specific leader attributes and how these attributes influence individual, group, or organizational performance, (2) relationship-focused research that examines the actions leaders take to foster relationships with followers (Howell and Hall-Merrenda 1999), and (3) role-based research that examines the functions or roles performed by effective leaders.

In general, these streams of research examine separate facets of leadership, with the first viewing leadership as *who* one is; the second, as *how* one interacts; and the third, as *what* one does. Examples of the attribute-focused research include transformational, charismatic, and values-based theories of leadership. Examples of the relationship-focused research include leader-member exchange theory and management-by-objectives theory (Howell and Hall-Merrenda 1999). The most prominent example of role-based research is the theory of behavioral complexity in leadership (Denison et al. 1995). Our paper falls within the tradition of the role-based view of leadership. As the

managerial purpose changes from one of direct supervision to one of enabler, as happens in the virtual team context, it takes on facets of leadership that include the providing of services to subordinates (Kanter 1989). Not only must the leader oversee the work of other team members, but as a member of the team the leader also sets the standards for collaboration and the expectations for how the team functions (van Knippenberg and Hogg 2003). In this context, it is helpful to consider team leadership in terms of “dimensions of influence” and the repertoire of behaviors used in leader-subordinate interactions. Thus, we draw on the theory of behavioral complexity in leadership to understand and examine leadership in virtual teams.

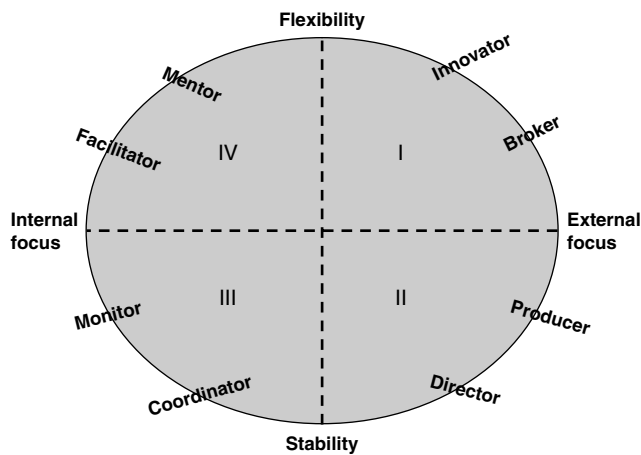
Theory

Theory of Behavioral Complexity in Leadership

The behavioral complexity in leadership (BCL) theory posits that effective leaders generally display a diverse set of behaviors in response to complex circumstances (Denison et al. 1995, Hooijberg 1996). The BCL theory proposes a portfolio of leadership roles or functions that allows a leader to react to varied demands encountered in team settings. Effective leaders draw from a repertoire of leadership roles as situations warrant, and these roles are relatively transparent to subordinates. Effective leaders are also highly competent in perceiving the needs of their constituencies and altering their behaviors to meet those needs (Kenny and Zaccaro 1983, Hooijberg 1996). Furthermore, effective leadership materializes when the leader assumes a variety of roles and behaviors dependent on circumstances (Murphy 1941, Ashby 1952, Mintzberg 1973). Thus, effective leadership involves the ability to perceive and respond to the needs and goals of a constituency, adjusting the leadership approach as necessary (Kenny and Zaccaro 1983). Leadership competence also involves *not* performing certain leadership roles when the situation does not call for them (Hooijberg 1996).

The BCL theory is useful to understand the means by which successful virtual team leaders respond to the conflicts in the virtual environment as identified in the dynamic model of conflict (Hinds and Bailey 2003). Virtual team success depends on the leader’s

Figure 1 Quinn's Model of Leadership Roles



ability to assume leadership roles that manage conflict before the conflict negatively impacts team outcomes. The roles team leaders must effectively employ in response to conflict are derived from Quinn's (1988) framework of complex leadership (see Figure 1). The leadership circumplex categorizes organizational leadership into eight roles based on two underlying dimensions: stability/flexibility and internal/external focus. The model depicts these polar opposites to stress the importance of leadership that encompasses both extremes. An effective leader not only maintains group stability or control but also demonstrates flexibility. Similarly, an effective leader displays roles to manage the internal environment (i.e., group-related activities and goals) as well as the external environment (i.e., organizational activities and goals).

The circumplex is divided into four quadrants with two of the eight roles in each quadrant. Quadrants 1 and 2 present leadership roles requiring adaptation to the organization's *external* environment (i.e., innovator, broker) and the pursuit of organizational goals that are *external* to the group (i.e., producer, director). The innovator and broker roles in quadrant 1 represent the skills required to facilitate change and maintain the legitimacy of a group within a network of *external contacts*. Similarly, the producer and director roles in quadrant 2 emphasize the rational pursuit of goals that are *external* to the group in contrast to intra-group goals (see Denison et al. 1995). Quadrants 3 and 4 emphasize the roles needed to maintain *internal* or intra-group stability and flexibility (i.e., monitor, coordinator, mentor, and facilitator).

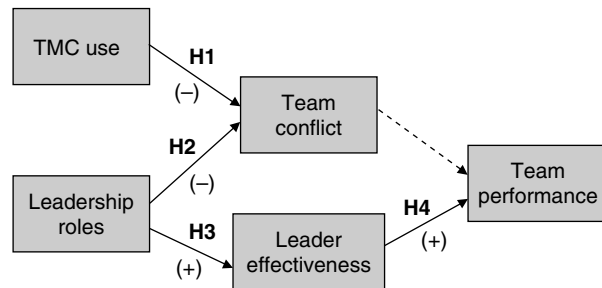
The present study investigates the nature and management of conflict that occurs *within* virtual teams; thus, our model of effective leadership focuses on the roles in quadrants 3 and 4. Prior research maintains that the conflict experienced by teams, which in turn impacts team outcomes, is group-based (i.e., internal) and related to tasks, processes, and relationships (see Jehn 1997, Jehn et al. 1999). Quadrant 3 emphasizes control and stability within a group for which the leader is responsible, and quadrant 4 is the human relations quadrant that focuses on human interactions between group members. Although not dismissing the importance of the leadership roles relevant to sources of *external* conflict, our study emphasizes the *internal* sources of team conflict and those leadership roles most relevant appear in quadrants 3 and 4.

We define the leader roles in quadrants 3 and 4 consistent with Denison et al. (1995). In the management of team operations, the coordinator administers by maintaining structure, scheduling, coordinating, and problem solving. This role involves a responsibility to follow set rules and standards. As a monitor, the leader collects and distributes information, checks on performance progress, and provides a sense of continuity between discrete team member tasks and the overall plan of the team. In the relational area of leadership, the facilitator encourages subordinates to express opinions, seeks consensus among divergent views, and negotiates compromise. In the mentor role, the leader is personally aware of individual needs, listens actively, is fair and supportive of legitimate requests, and facilitates the professional development of individual team members.

Hypotheses

Development of the Leadership, Conflict, and Performance Model

Our research draws upon the BCL theory and the dynamic model of conflict as the theoretical bases for developing the model of leadership, conflict, and performance in virtual teams (see Figure 2). The leadership, conflict, and performance model proposes that leadership roles and technology-mediated communication influence team conflict, leadership roles influence team members' views of their leader's effectiveness, and leader effectiveness influences team performance. The dotted line between team conflict and

Figure 2 Model of Leadership, Conflict, and Performance in Virtual Teams

team performance indicates relationships established in prior empirical research (Hinds and Mortensen 2005, Mortensen and Hinds 2001). The research model is constructed and examined at the team-member level. At the individual-member level, perceptions of conflict and leadership roles provide a general picture of how team members understand conflict, the actions of team leaders and the characteristics of effective leaders. The heterogeneity of virtual teams that may occur due to the geographic dispersion of members, member age, culture and team size, among others, suggests that team member differences may influence member perceptions of conflict and leadership with implications for how the team performs. Member differences may therefore be quite important in understanding team conflict and the effect of leadership in virtual teams.

Technology-Mediated Communication Use. The reliance on technology-mediated communication is a defining characteristic of virtual teams and distinguishing teams by the extent of technology-mediated communication use may partially explain the type and degree of conflict experienced. Therefore, the use of technology-mediated communication is included as an independent variable. Past research has compared face-to-face and virtual teams, noting that the latter experience more task and interpersonal conflict (Hinds and Mortensen 2005). However, to conclude that virtual teams are conflict-laden because of their reliance on technology-mediated communication is misguided because studies comparing face-to-face and virtual teams did not control for the extent of technology usage. Our model includes the construct to assess the influence that communication technology has on virtual team conflict. However, we do not

posit a relationship between communication technology use and the specific leader roles because it is expected that communication is a basic underpinning of any of the roles.

Additionally, research on computer-mediated groups finds that groups specifically choose the technologies that best meet members' needs (Hinds and Kiesler 1995, Walther and Burgoon 1992) and use these technologies to engage social processes (Hertel et al. 2004, Orlikowski 2000). Over time, the potential negative effects of technology mediation may be lessened with experience and adaptation to best serve the team's interests (Hinds and Bailey 2003). Indeed, channel expansion theory (Carlson and Zmud 1999) suggests that as members gain experience and comfort with the electronic communication technologies, the use of the technologies feels richer, rather than leaner, particularly when communicating with the same individuals. Thus, the greater the use of technology, the less conflict one might expect a virtual team to experience. Virtual teams that make greater use of technology-mediated communication are more likely than those with lesser use to engage in more task, relational, and process knowledge exchange, thereby resulting in less task conflict, relational conflict, and process conflict. Stated formally, we hypothesize:

HYPOTHESIS 1A (H1A). *The greater the use of communication technology among virtual team members, the less the task conflict.*

HYPOTHESIS 1B (H1B). *The greater the use of communication technology among virtual team members, the less the relational conflict.*

HYPOTHESIS 1C (H1C). *The greater the use of communication technology among virtual team members, the less the process conflict.*

Leadership Roles and Team Conflict

A premise underlying the BCL theory is that leadership must be performed through action. Effective leaders have a cognitive and behavioral ability to recognize and react to their environments (Denison et al. 1995, Maruyama 1976). According to the BCL theory, to lead effectively, virtual team leaders take on specific roles that represent an appropriate response to situational conflict. Because the execution of leader roles is evident to subordinates (Denison et al. 1995),

team members are in a unique position to assess the efficacy of each role. Moreover, team members can readily evaluate the effect of leadership on team performance. Quinn's (1984) model of leadership roles in organizations reflects the complex nature of leadership and the ability of effective leaders to assume diverse but beneficial roles (Denison et al. 1995). Four of the eight roles—monitor, facilitator, mentor, and coordinator—are relevant to the three types of distributed team conflict because they reflect leadership over *internal* group interactions that are task oriented, process oriented and relational.

The Monitor Role and Task Conflict. In performance of the monitor role, a leader collects and distributes information of a primarily internal nature, checks performance using traditional measures, and provides a sense of stability and continuity (Denison et al. 1995, Hooijberg 1996). The monitor role emphasizes measurement, information management, and analysis of project data. A team leader assuming the monitor role is concerned with the internal functioning of the team and demonstrates the ability to maintain tight logistical control (Hooijberg 1996). The monitor role provides a sense of stability as the team leader guides the team toward consensus concerning appropriate and effective team tasks, and keeps the team unified and goal directed.

One of the most important functions of a virtual team leader is the monitoring of ongoing team performance (Bell and Kozlowski 2002). Virtual team members in particular may need assurances that group activities are progressing in a manner that is purposeful and goal oriented. Yet, performance of the monitor role can be challenging for a virtual team leader particularly in the context of temporally dispersed team members. The more temporal dispersion among team members, the greater the delay of the information received by the leader who inhibits early detection of potential performance problems (Hertel et al. 2005). However, the virtual team leader himself need not necessarily be the focal point of monitoring; instead, an effective leader may empower team members to monitor their own task performance relative to task goals (Bell and Kozlowski 2002, Hertel et al. 2005). The task-oriented nature of the monitor role (Hooijberg 1996, Denison et al. 1995) as well as the importance of effective monitoring in achieving

task performance (Kipnis et al. 1980) suggest that a virtual team leader's effective execution of the monitor role has a significant influence on the degree of task conflict experienced by a virtual team.

Since the monitor role is strictly task oriented, there is no reason to expect that performance of this role is related to either relational or process conflict. Relational conflict stems from a lack of understanding about the personal situations of other team members. Process conflict stems from a lack of agreement concerning how work should be done. Neither relational conflict nor process conflict are directly related to task goals per se, but rather to the individuals performing the task and their means of accomplishing the task. Thus, the effective performance of the task-oriented monitor role is not expected to directly influence either relational or process conflict, leading to the following hypothesis:

HYPOTHESIS 2A (H2A). *The greater the extent to which a virtual team member perceives his/her team leader to perform the monitor role, the less task conflict perceived by the team member.*

The Coordinator Role and Process Conflict

The coordinator role involves the anticipation of work-flow problems and the maintaining of order (Denison et al. 1995). The coordination of tasks, problem solving, and the maintenance of structure are important aspects of the coordinator role. Effective coordination is both participative and directive (Kahai et al. 1997, Sagie et al. 2002). Coordinator behavior may include questions, debates and analysis to encourage member interactivity that enhances team outcomes (West 2002) by streamlining group processes. To avoid workflow problems, the coordinator maintains adherence to standards and rules so that processes are stable and consistent. By encouraging members to reflect on team strategies and processes, the leader fosters interactive practices among team members to get work accomplished (Simons et al. 1999, Tjosvold 1990).

In the virtual team context, the coordinator role may be difficult to execute as virtual team members may be more apt to approach tasks independently rather than expend the effort to gain an understanding of the team approach. Although electronic

tools support interdependent team work, technology constraints may cause teams to create more independent tasks as a way to manage physical separation (Griffith et al. 2003). Hence, when virtual team members approach tasks independently team norms and relationships are slower to develop, and teams are less likely to share an understanding about the work processes that exist among all members. Virtual teams that cross cultural boundaries are also likely to have members with differing assumptions about how best to organize, delegate, and complete tasks. Thus, it is important for the virtual team leader to coordinate across a diverse set of team members and facilitate a shared understanding of how the work is to be conducted. Past virtual team research shows that teams with consistent communication behaviors across members performed better than teams with inconsistent communication behaviors (Jarvenpaa and Leidner 1999). A virtual team leader is responsible for establishing expectations around such fundamental processes as team communication behaviors. Effective virtual team leaders are proactive in the creation of explicit structures to ensure that communication and coordination processes are understood and followed consistently by all team members (Bell and Kozlowski 2002).

Because the emphasis of the coordinator role is on how work is done (rather than what is done or by whom), it is expected that a virtual team leader's performance of the coordinator role is related to the degree of process conflict experienced by the team. The establishment of procedures for how a team conducts its work is not expected to be directly related to either task conflict or relational conflict, because setting procedural expectations does not guarantee that team members agree with the tasks or experience closer relational ties to other team members. Task conflict emerges from disagreements about team goals, and establishing procedures for carrying out the task is not expected to ameliorate disagreements revolving around the task itself. Similarly, relational conflicts result from non-task issues, such as dislike for another team member's style of communicating (word choice, tone, use/lack of salutations, etc.). Relational conflict is not expected to be directly influenced by the establishment of procedural work processes. Members may well agree on the mode and frequency

of communication as well as who is to conduct which tasks (process decisions), but differences will continue among team members in how they express themselves and the interpretations assigned to those expressions by other members—regardless of how well the team follows procedural expectations. Therefore, we propose that a leader's performance of the coordinator role directly influences the degree of process conflict, but not task or relational conflict. This leads to the following hypothesis:

HYPOTHESIS 2B (H2B). *The greater the extent to which a virtual team member perceives his/her team leader to perform the coordinator role, the less process conflict perceived by the team member.*

The Mentor Role and Relational Conflict

In the mentor role, a leader engages in the development of team members by listening, providing support and helping members understand their individual roles. Mentoring involves the showing of empathy and concern, and treating each team member in a sensitive and caring way (Denison et al. 1995). Mentoring is associated with consideration—the degree to which team leaders demonstrate concern and interest for the well-being of team members, create a sense of belonging, and provide team members with a sense of support, concern, and appreciation (Sarin and McDermott 2003). Mentoring activities help foster more satisfied employees (Chao et al. 1992, Kram 1985, Levinson et al. 1978) and higher levels of socialization including successful and satisfying relationships with organizational members (Chao et al. 1992).

One challenge in mentoring virtual team members is that they may be participating on multiple teams, and thus have multiple roles to fulfill. Research shows that team members with multiple roles often experience role ambiguity and dissatisfaction (Bell and Kozlowski 2002). However, virtual team leaders who are able to clearly define members' roles strengthen the team members' sense of belonging and reduce role ambiguity (Fiol and O'Connor 2005). Thus, a leader able to establish a sense of belonging or cohesion is likely to foster interpersonal relationships among the team members as well as with the team leader. Although mentoring from a distance may be challenging because mentors are unable to observe team

members in action (Cooper and Kurland 2002), high quality leader-member relationships are possible even in virtual environments (Howell and Hall-Merenda 1999).

Given the personal nature of the mentor role, we anticipate that this role is directly related to the degree of relational conflict experienced in a virtual team. By listening to team members and helping them develop an understanding of their individual role on the team, the virtual team leader is able to build relationships and minimize relational conflict. The underlying notion of the mentor role is that the team leader has a responsibility to treat team members with concern and empathy. As such, the leader must respect team members as individuals and hold an awareness of their personal circumstances. Given the emotional underpinnings of establishing a relational connection to team members, there is no reason to expect that the performance of the mentor role directly influences task or process conflict. Individuals who understand and like each other may still disagree over task goals, and the fact that individuals successfully relate to one another does not guarantee they will de facto agree on work processes. However, we expect that the expression of concern and empathy by the team leader in the personal development of team members reduces the potential for relational conflict. We thus hypothesize:

HYPOTHESIS 2C (H2C). *The greater the extent to which a virtual team member perceives his/her team leader to perform the mentor role, the less relational conflict perceived by the team member.*

The Facilitator Role and the Three Forms of Conflict

In the facilitator role, a leader is engaged in actions to surface key differences among team members and to work participatively to resolve them (Denison et al. 1995). As a facilitator, a leader is charged with fostering collective effort, building cohesion and teamwork, facilitating participation, and resolving conflict (Quinn 1988, Denison et al. 1995). Differences in opinions among group members concerning how and what the team does may be reduced by facilitating the exchange of ideas and perspectives (Curral et al. 2001, Lewis et al. 2002). Although the facilitator role encourages the expression of opinions, it also seeks consensus and negotiates compromise.

In virtual teams, the presence of mutual knowledge about individual team members' working contexts is influential in improving team performance and reducing team conflict (Hertel et al. 2005, Hinds and Mortensen 2005, Cramton 2001). Thus, to facilitate such mutual knowledge, a virtual team leader must employ technologies that enable him to enhance the equal distribution of information and ensure a thorough documentation of the existing knowledge and activities of each team member (Hertel et al. 2005). Because each form of conflict has at its core a lack of understanding or knowledge about the other team members (who they are, what they do, and how they do it), the team leader that exposes differences, disseminates information, and works toward consensus and/or understanding among members effectively performs the facilitator role. We thus hypothesize:

HYPOTHESIS 2D (H2D). *The greater the extent to which a virtual team member perceives his/her team leader to perform the facilitator role, the less the task conflict perceived by the team member.*

HYPOTHESIS 2E (H2E). *The greater the extent to which a virtual team member perceives his/her team leader to perform the facilitator role, the less the relational conflict perceived by the team member.*

HYPOTHESIS 2F (H2F). *The greater the extent to which a virtual team member perceives his/her team leader to perform the facilitator role, the less the process conflict perceived by the team member.*

Leadership Roles and Leader Effectiveness

A leader's ability to successfully influence a group of individuals to maintain commitment to team goals is an important determinant of leader effectiveness (Yukl and Tracey 1992). Thus, leaders capable of directing members away from detrimental conflict are likely more effective than leaders who are unable to manage conflict. However, being an effective leader requires the ability to draw from an extensive behavioral repertoire in reaction to complex demands (Bass 1981). Depending on the situational context, it may prove critical that the specific leadership skill pulled from the leader's repertoire is appropriate to the circumstance at hand (Stott and Walker 1995). Effective leaders are also able to adapt their behaviors

and employ the needed skills in ways that influence subordinates (Yukl and Falbe 1990) and improve productivity and morale (Kipnis et al. 1980). Consequently, managers that perform both people-oriented and task-oriented leadership roles are more effective than those who tend to focus solely on one leadership function (Quinn 1988, Hart and Quinn 1993, Denison et al. 1995). Therefore, we posit that virtual team leaders who are able to draw on all of the internal leadership roles will be perceived by team members as more effective than virtual team leaders who are less skilled. This leads to the following hypothesis:

HYPOTHESIS 3 (H3). *The greater the extent to which a virtual team member perceives his/her team leader to perform the internal roles (monitor, coordinator, mentor, facilitator), the greater the team member's perception of his/her team leader's effectiveness.*

Leader Effectiveness and Team Performance

One of the underlying assumptions in the BCL theory is that effective leadership depends on the direct interaction of the leader with team members in the processes of team development and performance management (Fleishman et al. 1991, Kozlowski et al. 1996). Thus, as leadership effectiveness increases, positive team outcomes follow. For example, prior virtual team research indicates that team leader effectiveness is related to greater team member satisfaction and performance (Kayworth and Leidner 2001). Effective leaders are expected to have technical knowledge, skills, and abilities that provide clear, engaging direction to team members (Hackman and Walton 1986). The ability of leaders to provide clear guidance and goals enables members to monitor and evaluate their own contributions to the team (Kozlowski 1998); and under effective leadership, members tend to reinforce team processes in order to regulate team performance (Zaccaro and Burke 1998). Furthermore, participative leadership styles in functionally heterogeneous teams foster team innovations (Somech 2006) and leadership that is both directive and participative is associated with high-performance work groups (Katzenbach and Smith 1993). A key factor in team outcomes is the nature of leadership (Fjermerstad and Hiltz 1999), implying that teams with effective leaders maximize team performance. This leads to our

final hypothesis:

HYPOTHESIS 4 (H4). *The greater the virtual team member's perception of his/her Team Leader's Effectiveness, the greater the Team Performance.*

Methodology

Participants and Data Collection

The survey method was used to test the relationships hypothesized in the model. Data were collected from virtual team members employed by a major U.S. telecommunications corporation and virtual team members representing five firms located in Korea. The specific firms, and the resulting geographic locations, were chosen based on the personal contacts of the researchers. In the event that a respondent was a member of more than one team, the survey instructed each participant to evaluate the virtual team that occupied most of their time. The U.S. firm posted an annual profit over \$7 billion in 2006 and employed over 250,000 individuals. Requests for participation were sent to all 98 members of the HR technology division, of which 42 team members representing approximately 12 different teams completed the online questionnaire for a 42.8 percent response rate. The U.S. telecommunications team members were dispersed throughout eight different states with 43 percent of members in Texas, 26 percent in Florida, 12 percent in New York, 5 percent in Massachusetts and Pennsylvania, and 2 percent in New Jersey, Georgia, and Virginia.

CEOs of 23 Korean organizations listed on the two Korean stock markets (Korea Composite Stock Price Index (KOSPI) and Korean Securities Dealers' Automated Quotation (KOSDAQ)) were e-mailed a brief introduction of the study and were asked for permission to survey employees. An attempt to increase generalizability was made by surveying virtual team members working in small, medium, and large firms. Companies with approximate annual profits of less than \$10 million were treated as small, those with sales between \$10 million and \$249 million as medium-sized, and those with sales of \$250 million or more as large (Drury and Farhoomand 1999). Five CEOs, representing one small, two medium, and two large-sized firms, responded favorably. These organizations were involved in construction, finance, business consulting, distribution, and sales. A telephone

call was made to each of the responding CEOs to discuss the study and gather a list of employees working in virtual teams. In total, 250 surveys were distributed to the employees and 117 responses were collected yielding a 46.8 percent response rate. The respondents represented 11 different teams with titles including R&D, legal support, human resource, client services, marketing, education, and sales (among others) with the number of participating members from each team ranging from 1 to 15 (mean = 7.1, S.D. = 4.9).

Of the total 159 respondents from all organizations, 65 percent were male and 35 percent female with an average age of 36 years (S.D. = 7.99) and an education level of at least a bachelor's degree (95%). A majority of the respondents (56%) indicated that their team consisted of fewer than 10 members and 28 percent had teams comprised of between 10 and 20 members (mean = 9.18, S.D. = 4.58). Tenure with the team ranged from less than one year (4%), one to five years (75%), and greater than five years (20%) with an average of 2.97 years (S.D. = 3.02). Most respondents had been with the company between one and five years (66%) and others more than five years (28%), with an average of 3.58 years (S.D. = 2.84).

Nonresponse bias was evaluated using the time trends method that compares the responses of early and late responders (Armstrong and Overton 1977, Bachmann et al. 2000). Time-stamp data collected with the questionnaire were used to differentiate the responses. *T* tests compared the means between early and late responders for the major constructs and the demographic variables. Two variables show significant differences: process conflict and age. Early responders indicated slightly more process conflict (mean = 2.09) compared to late responders (mean = 2.00) suggesting that nonresponders may perceive less process conflict, and early responders tended to be older.

Measures

Measurement Items. Measurement items were adapted from the literature and measured on a 1–7 scale. The technology use variable measured the extent of team members' use of conference calls, e-mail, telephone, fax, video conferencing, voice mail, and web collaboration tools. Conference calls were the

most often used communication channel (mean = 6.26, S.D. = 1.25) followed by e-mail (mean = 5.77, S.D. = 1.77), web collaboration tools (mean = 5.77, S.D. = 1.73), voice mail (mean = 5.67, S.D. = 2.02), video conferencing (mean = 4.97, S.D. = 2.42), and fax (mean = 4.52, S.D. = 2.38). The telephone was used least (mean = 4.16, S.D. = 1.97).

Multiple items were used to measure each construct and the scale items and anchors are shown in Table 1. Task and relational conflict were measured using the intragroup conflict scale (Jehn 1995) and the process conflict items were derived from Shah and Jehn (1993). The leadership role measures were based on Denison et al. (1995). These measures originated from a summary of prior literature including Mintzberg's (1975) ten leadership functions and Yukl's (1981) 19 categories of leader behavior. The leader effectiveness scale was derived from Denison et al. (1995) and items measuring team performance originated with Mortensen and Hinds' (2001) evaluation of conflict and shared identity in distributed work groups.

Control Variables. We controlled for several characteristics of virtual teams that prior research identified as potentially influencing the conflict variables. First, greater face-to-face communication among team members is thought to negatively influence team conflict as the social and psychological effects of distance are abated. This contributes to greater rapport and long-term relationships (Grinter et al. 1999), shared context (Hinds and Bailey 2003), familiarity (Armstrong and Cole 2002, Kraut et al. 2002), and collaboration (Purdy et al. 2000) among team members. Second, team size may also influence conflict if coordination within the team becomes problematic and members are "out of sync" with group work processes (Hinds and Bailey 2003). Lastly, individual team member factors (i.e., age and company tenure) were included to account for possible relationships between individual member demographics and the various types of virtual team conflict.

Evaluating the Measurement Model

All of the multiple item constructs were assessed for unidimensionality, convergent validity, internal consistency, and discriminant validity. Structural equation modeling (SEM) provides a rigorous assessment of the fit between the data and the factor structure and

Table 1 Measurement Items and Descriptive Statistics

Construct	Measure	Mean	SD	Cronbach's alpha	Composite reliability	AVE
Task conflict (1–7 scale; none → a lot)		2.84	1.21	0.91	0.93	0.83
TC1	How frequently are there conflicts about ideas in your team?	2.92	1.39			
TC2	How often do people in your team disagree about opinions regarding the work to be done?	2.86	1.29			
TC3	How much conflict is there about the work you do?	2.80	1.28			
TC4	To what extent are there differences of opinions regarding tasks?	2.80	1.45			
Relational conflict (1–7 scale; none → a lot)		2.72	1.39	0.92	0.95	0.87
RC1	How much friction is there among members of your team?	2.90	1.41			
RC2	How much are personality conflicts evident in your team?	2.81	1.41			
RC3	How much tension is there among members of your team?	3.39	1.26			
RC4	How much emotional conflict is there among members of your team?	2.44	1.47			
Process conflict (1–7 scale; none → a lot)		2.69	1.11	0.89	0.93	0.82
PC1	How often do members disagree about who should do what?	2.81	1.38			
PC2	How frequently do members disagree about the way to complete a team task?	2.74	1.19			
PC3	How much conflict about delegation of tasks exists in your team?	2.54	1.10			
To what extent does your Team Leader:						
Monitor (1–7 scale; never → always)		4.72	1.18	0.79	0.91	0.83
M01	Maintain tight logistical control.	4.58	1.36			
M02	Compare records or reports to detect discrepancies.	4.86	1.25			
Coordinator (1–7 scale; never → always)		4.76	1.24	0.86	0.94	0.88
CO1	Anticipate workflow problems, avoid crises.	4.57	1.39			
CO2	Bring a sense of order to the team.	4.96	1.26			
Mentor (1–7 scale; never → always)		4.34	1.53	0.95	0.97	0.95
ME1	Show empathy and concern in dealing with team members.	4.36	1.58			
ME2	Treat each team member in a sensitive, caring way.	4.33	1.57			
Facilitator (1–7 scale; never → always)		4.54	1.32	0.74	0.88	0.78
FA1	Surface key differences among team members, then work participatively to resolve them.	4.74	1.35			
FA2	Encourage participative decision making in the team.	4.35	1.62			
Leader effectiveness (1–7 scale)		5.21	1.11	0.96	0.97	0.86
LE1	Meets leadership performance standards. (below most standards → above most standards)	5.26	1.16			
LE2	Comparison to leadership peers. (worse than leader peers → better than leader peers)	5.14	1.29			
LE3	Performance as a role model. (poor role model → excellent role model)	5.08	1.28			
LE4	Overall leadership success. (a leadership failure → a leadership success)	5.39	1.11			
LE5	Overall effectiveness as team leader. (ineffective team leader → effective team leader)	5.21	1.21			
Team performance (1–7 scale; poor → excellent)		5.12	0.88	0.88	0.92	0.68
TP1	Efficiency	5.01	1.13			
TP2	Quality	5.18	1.07			
TP3	Technical innovation	4.93	1.19			
TP4	Adherence to schedule/budget	5.16	0.97			
TP4	Work excellence	5.33	0.97			

assesses the measurement properties of the constructs (Bagozzi 1980). Unidimensionality and convergent validity ensure that the survey items measure a single construct. First, the measurement model was assessed and indicated a poor fit as demonstrated by the SEM fit statistics ($X^2 = 1,032.89$, $X^2/df = 3.04$, RMSEA = 11, GFI = 0.70, NFI = 0.80, CFI = 0.86, TLI = 0.83). Two survey items (RC3 and FA1) showed factor loadings (standardized regression weights) below the 0.7 criterion (Hair et al. 1998) and squared multiple correlations (SMC) below 0.5 (Bollen 1989). RC3 had

a factor loading of 0.60 and SMC = 0.36, and FA1 had a loading of 0.63 and SMC = 0.39. All other measurement items demonstrated adequate loadings (0.71–0.94) and SMC (0.50–0.92) and were retained. RC3 was removed from further analyses but FA1 was retained so as not to restrict the construct to a one-item content domain because additional scale evaluations (to follow) were acceptable.

A repeat of the analysis on the measurement model showed marked improvement of the SEM fit statistics. Although several SEM fit statistics were

slightly below the 0.9 criterion ($GFI = 0.76$, $NFI = 0.84$, $TLI = 0.87$) and $RMSEA = 0.10$ is slightly above the 0.5–0.8 criterion, Bollen (1990) notes that cut-offs are arbitrary and model assessments should be made relative to progress in the field. Other measures of the revised model demonstrated good fit: $X^2 = 793.28$, $X^2/df = 2.61$, $CFI = 0.90$, and $IFI = 0.90$. Additionally, when degrees of freedom are large relative to sample size, GFI is biased downward and may be underestimated (Bollen 1989, 1990). The calculation of GFI^1 that accounts for sample size and degrees of freedom showed an acceptable fit ($GFI^1 = 0.94$).

Cronbach's alpha, composite reliability (CR) and average variance extracted (AVE) demonstrated the internal consistency of each construct (Table 1). All measures of Cronbach's alpha and CR exceeded the 0.70 criterion (Nunnally 1978) and AVE measures exceeded the recommended 0.50 threshold (Hair et al. 1998). Additionally, as shown in Table 2, the correlations of the constructs were all below the 0.90 threshold (Bagozzi et al. 1991) indicating the distinctness of each construct. The square root of the AVE shown in bold on the diagonal in Table 2 also provided evidence of discriminant validity in that the average variance shared between each construct and its indicators is larger than the variance shared between each construct and other constructs.

Multigroup Invariance. Since the primary focus of our study relates to the structural paths among the constructs, we tested the parameters for invariance across the two distinct respondent groups (i.e., U.S. and Korean). Following the procedure described by Byrne (2001) for invariance tests at the factor covariance level, a multigroup SEM model was estimated in which all paths were constrained to be equal. The X^2 difference test was then used to identify invariance by comparing the constrained model to subsequent models in which one constrained path was freed.

The invariance tests showed mixed results in that the model is invariant between the U.S. and Korean groups for all paths except monitor $\rightarrow$ task conflict ($\Delta X^2 = 68.16$, $p < 0.01$) and leader effectiveness $\rightarrow$ team performance ($\Delta X^2 = 10.69$, $p < 0.01$). Compared

to the U.S. respondents, the Korean respondents indicated less of a negative relationship between monitor behavior and task conflict (Korean, $\beta = -0.827$; U.S., $\beta = -0.976$) and a stronger positive relationship between leader effectiveness and team performance (Korean, $\beta = 0.802$; U.S., $\beta = 0.353$). That is, for U.S. respondents, monitoring behavior by the team leader has a greater effect on mitigating task conflict; however, a weaker relationship exists between perceptions of the team leader and how the team performs.

These differences may be explained by examining the cultural characteristics of "collectivism" and "individualism." For example, Gelfand et al. (2001) found that compared to Asians, Americans perceived conflicts to be more about winning and individual rights; thus, U.S. teams may perceive a greater need for leader intervention in order to mitigate team conflict. In contrast, teams in collectivist cultures are characterized by higher levels of cooperation (Eby and Dobbins 1997), members are more likely to defer to authority (Iyengar and Lepper 1999), and members believe that positive outcomes (team performance) result from the collective efforts of all members (Niles 1998). Hence, the Korean teams may be more inclined to attribute team performance to the actions of the team leader.

Although two paths in the model were positive for group-based differences, these paths do not vary in terms of direction or significance, but differ solely on the strength of the relationships. We therefore proceeded to test the model combining the data of both groups of respondents.

Testing the Structural Model

Procedure. Partial Least Squares (PLS) was used to test the structural model. PLS simultaneously models both measurement paths (i.e., relationships between latent variables and indicators) and structural paths (i.e., relationships among latent variables) and is increasing in use among IS researchers (Ma and Agarwal 2007, Chin et al. 2003, Brown and Chin 2004). The major benefits of this method include robustness for small to medium sample sizes (Cassel et al. 2000) and fewer constraints on the data (e.g., normality assumptions) compared to covariance-based methods such as LISREL (Chin et al. 2003). It should also be noted that

¹ $GFI^1 = p/(p + 2 * F^1)$, $F^1 = (X^2 - df)/(n - 1)$ where p is the number of parameters, df is degrees of freedom, and n is sample size.

Table 2 Bivariate Correlations

	TU	TC	RC	PC	Mon	Fac	Men	Coor	Inn	Bro	Pro	Dir	Lead	Perf	F2F	Size	Age	Tenure
Technology use (TU)	0.66																	
Task conflict (TC)	−0.39**	0.91																
Mean = 2.84, S.D. = 1.21																		
Relational conflict (RC)	−0.41**	0.80**	0.93															
Mean = 2.72, S.D. = 1.39																		
Process conflict (PC)	−0.38**	0.85**	0.76**	0.91														
Mean = 2.69, S.D. = 1.11																		
Monitor	−0.18*	−0.33**	−0.32**	−0.35**	0.91													
Mean = 4.72, S.D. = 1.18																		
Facilitator	−0.26**	−0.19*	−0.17*	−0.19*	0.73**	0.88												
Mean = 4.25, S.D. = 1.32																		
Mentor	−0.47**	0.06	0.11	−0.01	0.47**	0.66**	0.97											
Mean = 4.34, S.D. = 1.53																		
Coordinator	−0.14*	−0.32**	−0.32**	−0.38**	0.79**	0.73**	0.58**	0.94										
Mean = 4.76, S.D. = 1.24																		
Innovator	−0.25**	−0.01	−0.05	−0.13	0.53**	0.63**	0.63**	0.65**	0.92									
Mean = 4.52, S.D. = 1.10																		
Broker	−0.27**	−0.09	−0.04	−0.15	0.59**	0.62**	0.67**	0.65**	0.67**	0.94								
Mean = 4.65, S.D. = 1.16																		
Producer	−0.38**	−0.06	−0.04	−0.16*	0.68**	0.66**	0.69**	0.74**	0.64**	0.77**	0.97							
Mean = 4.79, S.D. = 1.23																		
Director	−0.35**	−0.12	−0.10	−0.16*	0.72**	0.74**	0.68**	0.75**	0.62**	0.71**	0.82**	0.98						
Mean = 4.81, S.D. = 1.27																		
Leadership	−0.05	−0.31**	−0.31**	−0.33**	0.69**	0.71**	0.60**	0.78**	0.66**	0.67**	0.68**	0.71**	0.93					
Mean = 5.21, S.D. = 1.11																		
Team performance	−0.29**	−0.30**	−0.22**	−0.34**	0.67**	0.63**	0.51**	0.68**	0.59**	0.57**	0.71**	0.69**	0.59**	0.83				
Mean = 5.12, S.D. = 0.88																		
Face-to-face	−0.59**	0.31**	0.30**	0.21**	0.23**	0.27**	0.46**	0.26**	0.34**	0.45**	0.49**	0.44**	0.26**	0.35**	1.0			
Mean = 2.87, S.D. = 1.86																		
Team size	−0.32**	0.33**	0.18*	0.22**	0.05	0.13	0.38**	0.09	0.29**	0.20**	0.29**	0.28**	0.12	0.10	0.42**	1.0		
Mean = 9.18, S.D. = 4.58																		
Team member age	0.46**	−0.26**	−0.30**	−0.27**	−0.02	−0.07	−0.30**	−0.01	−0.15*	−0.18*	−0.18*	−0.19*	0.01	−0.07	−0.41**	−0.29**	1.0	
Mean = 36, S.D. = 7.99																		
Tenure with company	−0.44**	0.27**	0.32**	0.19**	−0.09	0.12	0.30**	−0.07	0.17*	0.02	0.13	0.08	−0.09	0.11	0.25**	0.33**	−0.23**	1.0
Mean = 3.58, S.D. = 2.84																		

Notes. Bold entries on the diagonal are the square root of the average variance extracted (AVE).

* $p < 0.05$, ** $p < 0.01$.

multicollinearity is not a limiting factor in PLS analysis because technically PLS produces a model that transforms a set of correlated predictors into a new set of uncorrelated variables (Tenenhaus 1998).

The bootstrapping approach was applied prior to hypotheses testing as recommended (Chin 1998). This process entailed generating 500 random samples from the original data set ($n = 159$). The samples were generated using replacement sampling, and parameter estimates and standard errors were computed across the total sample set. All statistical tests were evaluated at the 0.5 significance level using one-tailed tests because the hypotheses are unidirectional.

Results. Table 3 presents the results of PLS analysis in the estimation of three models: the full model, the theoretical model, and the control model. Following Fichman and Kemerer (1997), three models were estimated using the controls-only model as a benchmark in order to show the impact of the theoretical constructs.

In the full model, two of the control variables show a significant association with the conflict constructs: virtual team size is positively related to task conflict ($\beta = 0.228$, $p < 0.01$) and process conflict ($\beta = 0.162$, $p < 0.05$), and company tenure is associated with greater relational conflict ($\beta = 0.165$, $p < 0.05$). The comparison of the full model and the control model demonstrates the contribution of the research constructs above that of the control factors. A substantive increase in variance explained is shown for task conflict (41% – 21% = 20%), relational conflict (15%), and process conflict (30%). In contrast, a comparison of the full model and the theoretical model shows that the control variables account for a smaller increase in variance for task conflict (7%), relational conflict (3%), and process conflict (3%). This suggests that the inclusion of leadership roles provides a substantial contribution to the understanding of task conflict, relational conflict, and process conflict in virtual teams.

Hypotheses Testing. The path estimates of the research model (full model) are reported in Table 3 with a summary of the hypotheses tests in Table 4. With the exception of H2C, H2D, and H2F, all hypothesized relationships are supported at the $p < 0.01$ significance level. H1A, H1B, and H1C are supported and indicate that the use of communication technologies among virtual team members is associated with

Table 3 PLS Analysis of Three Models

Constructs	Path coefficients		
	Full model	Theoretical model	Control model
Technology use			
Task conflict (H1A)	–0.369**	–0.485**	
Relational conflict (H1B)	–0.318**	–0.425**	
Process conflict (H1C)	–0.455**	–0.483**	
Monitor → Task conflict (H2A)	–0.371**	–0.355**	
Coordinator → Process conflict (H2B)	–0.469**	–0.436**	
Mentor → Relational conflict (H2C)	0.098	0.179*	
Facilitator → Task conflict (H2D)	–0.089	–0.082	
Facilitator → Relational conflict (H2E)	–0.37**	–0.414**	
Facilitator → Process conflict (H2F)	–0.011	–0.013	
Leadership roles	0.806**	0.809**	
→ Leader effectiveness (H3)			
Leader effectiveness	0.591**	0.591**	
→ Team performance (H4)			
Face-to-face (control)			
Task conflict	0.122		0.148*
Relational conflict	0.091		0.178**
Process conflict	0.011		0.068
Virtual team size (control)			
Task conflict	0.228**		0.234**
Relational conflict	–0.020		0.024
Process conflict	0.162*		0.112
Team member age (control)			
Task conflict	0.014		–0.103*
Relational conflict	–0.070		–0.185**
Process conflict	–0.034		–0.184**
Tenure with company (control)			
Task conflict	0.015		0.159
Relational conflict	0.165*		0.245**
Process conflict	–0.089		0.093
Task conflict R^2 (%)	41	34	21
Relational conflict R^2 (%)	34	31	19
Process conflict R^2 (%)	41	38	11
Leadership effectiveness R^2 (%)	67	67	
Team performance R^2 (%)	35	35	

* $p < 0.05$, ** $p < 0.01$.

less task conflict, relational conflict, and process conflict. The strongest effect of technology use is on the reduction of process conflict ($\beta = -0.455$, $p < 0.01$), followed by task conflict ($\beta = -0.369$, $p < 0.01$), and relational conflict ($\beta = -0.318$, $p < 0.01$).

The PLS results also supports three of the six negative relationships modeled between leader roles and conflict types in H2A–H2F. The association between the mentor role and relational conflict (H2C) is significant in the theoretical model but not in the full model. The relationships between the facilitator role and task conflict (H2D) and process conflict (H2F)

Table 4 Summary of Hypotheses Testing

Hypotheses	β	Sig.
H1A: The greater the use of communication technology among virtual team members, the less the task conflict.	-0.369	<0.01
H1B: The greater the use of communication technology among virtual team members, the less the relational conflict.	-0.318	<0.01
H1C: The greater the use of communication technology among virtual team members, the less the process conflict.	-0.455	<0.01
H2A: The greater the extent to which a virtual team member perceives his/her team leader to perform the Monitor Role, the less task conflict perceived by the team member.	-0.371	<0.01
H2B: The greater the extent to which a virtual team member perceives his/her team leader to perform the Coordinator Role, the less process conflict perceived by the team member.	-0.469	<0.01
H2C: The greater the extent to which a virtual team member perceives his/her team leader to perform the Mentor Role, the less relational conflict perceived by the team member.	0.098	n.s.
H2D: The greater the extent to which a virtual team member perceives his/her team leader to perform the Facilitator Role, the less task conflict perceived by the team member.	-0.089	n.s.
H2E: The greater the extent to which a virtual team member perceives his/her team leader to perform the Facilitator Role, the less relational conflict perceived by the team member.	-0.374	<0.01
H2F: The greater the extent to which a virtual team member perceives his/her team leader to perform the Facilitator Role, the less process conflict perceived by the team member.	-0.011	n.s.
H3: The greater the extent to which a virtual team member perceives his/her team leader to perform the internal roles (Monitor, Coordinator, Mentor, Facilitator), the greater the team member's perception of his/her Team Leader's Effectiveness.	0.806	<0.01
H4: The greater the virtual team member's perception of his/her Team Leader's Effectiveness, the greater the Team performance.	0.591	<0.01

are not significant. The monitor role is associated with less task conflict (H2A, $\beta = -0.371$, $p < 0.01$), the facilitator role with less relational conflict (H2E, $\beta = -0.374$, $p < 0.01$) and the coordinator role with less process conflict (H2B, $\beta = -0.469$, $p < 0.01$).

The model results also confirm a strong relationship between the internal leader roles assumed by the team leader and greater perceptions of leader effectiveness (H3, $\beta = 0.806$, $p < 0.01$). Moreover,

67 percent of the variance in leader effectiveness is explained by the internal leader roles. Hypothesis 4 is similarly supported. Leader effectiveness is positively associated with team performance ($\beta = 0.591$, $p < 0.01$) accounting for 35 percent of the variance in team performance.

Post Hoc Analysis. Data were gathered from the respondents that measured all eight of Quinn's (1984) leadership roles including the roles in quadrants 1 and 2 having an external focus. Although the innovator and broker roles (quadrant 1) were not significantly correlated to any conflict type (see Table 2), the producer and director roles (quadrant 2) showed significant negative correlations with process conflict ($r = -0.16$, $p = 0.04$; $r = -0.16$, $p = 0.04$ respectively). Post hoc PLS analyses modeling the producer and director roles in association with process conflict resulted in non-significant paths. This finding supports our presupposition that the *internal* leadership roles in quadrants 3 and 4 are most relevant to the conflict perceived by virtual team members.

We further analyzed the four internal leader roles to gain an idea of their contribution to the reduction in team conflict over and above that explained by technology use. For example, in a model excluding the internal leadership roles, technology use alone accounts for 19 percent of the variance in task conflict, 20 percent of relational conflict, and 19 percent of process conflict. A larger portion of the variance in each conflict type is explained with the inclusion of leader roles (41%, 34%, and 41% respectively), underscoring the contribution of leadership behaviors in managing virtual team conflict.

Assessment of Common Methods Variance. Common source variance must be considered in behavioral studies when the data are self-reported and the dependent and independent data are collected concurrently. This bias may result in detecting significant relationships between independent and dependent variables that are merely statistical artifacts originating from systematic bias among the respondents. Harman's single-factor test was applied as a diagnostic indicator of the extent to which common method variance may be problematic. This technique indicates whether a single factor emerges or one general factor accounts for a majority of the covariance among the measures (Podsakoff et al. 2003).

Results of exploratory factor analysis show eight factors extracted accounting for 83 percent of the variance with the first factor accounting for 34 percent. Indications are that common method variance is limited because multiple factors emerged and no single factor accounts for a majority of the covariance, similar to Igbaria et al. (1997) and Koh et al. (2004).

A latent common methods approach was also used to evaluate common methods variance as recommended by Podsakoff et al. (2003) in which items are allowed to load on their theoretical constructs as well as on a latent common methods variable. PLS was used to retest the model in order to examine changes in the structural parameters. The results show an increase in the variance explained (R^2) of the dependent variables in the model: task conflict = 0.67, relational conflict = 0.68, process conflict = 0.74, leader effectiveness = 0.73, and team performance = 0.52. The portion of the increase in R^2 attributable to the common method factor ranges from 6%–33%, suggesting that common method variance is not the sole source of variance in the dependent factors. These results are similar to Ma and Agarwal's (2007) detection of common method variance at a 13%–26% level and the observation by Williams et al. (1989) of 16%–42%. With the exception of a significant relationship between the facilitator role and process conflict (H2F), the stated hypotheses retain their prior levels of significance. Overall, the methods we performed to evaluate common method variance suggest this bias is not the primary driver of the results.

We also performed analysis to evaluate possible effects from clustering in which correlations occur within subsets of data in the data set. Clustering may affect generalized linear model frameworks when a pre-existing group structure is used to select respondents, but the analysis is performed at the individual level. Intraclass correlations (ICC) may be used to measure the degree of non-independence among a set of observations or the proportion of total variance of a variable that is accounted for by clustering (group membership) of the respondents (Shrout and Fleiss 1979). ICCs were calculated using a two-way random effect model with measures of absolute agreement because systematic variance due to respondents is relevant (McGraw and Wong 1996). ICCs were calculated for each construct and in each case ICCs are

positive and range from 0.78 to 0.96 with F -statistics significant at $p < 0.01$. ICCs approach 1.0 when there is little variance among the respondents indicating that a large proportion of the variance of each construct is a result of measurement rather than clustering. Thus, the respondents are conceived as being a random selection from among all possible respondents in which case possible team effects from clustering are not overly influential.

Data Aggregation. The ICCs performed measured between group variances, but may be insufficient to determine the level of agreement within groups (James et al. 1984). In order to justify the aggregation of individual responses to the group level of analysis, it is necessary to evaluate the homogeneity of the data. Homogeneity or consistency of the data is integral to support data aggregation to the group level (Cohen et al. 2001) and inter-rater agreement (r_{wg}) measures observed within-group variances (James et al. 1984). We calculated the r_{wg} for each group on the main constructs following James et al. (1984). A value of 0.70 or better is generally considered a "good" amount of within-group inter-rater agreement (James et al. 1984) and the estimates generally indicated a high level of agreement with average r_{wg} ranging from 0.69 (mentor and facilitator roles) to 0.96 (technology use). A total of 230 individual r_{wg} s were calculated (23 groups across 10 variables) with 89 percent above 0.70. The implication of acceptable data aggregation is that the findings of our study may be indicative of important relationships, among conflict, leadership, and performance at the virtual team level. However, additional team-level data is necessary to substantiate these results.

Discussion

The substantive question motivating this study is: How do virtual team leaders demonstrate effective leadership in the face of team conflict? By focusing on leadership roles, we expand the dynamic model of conflict (Hinds and Bailey 2003) to identify conflict handling strategies embodied in specific leadership skills. Effective virtual team leaders assume specific roles as well as a multiplicity of roles that benefit organizational outcomes. Our findings suggest that both the perceptions of the leader and the team are

enhanced when leadership roles “fit” the situational nature of conflict. Thus, a leader that can draw from a repertoire of roles is better equipped to manage a virtual team, and in so doing, achieves greater unity and cohesiveness among team members.

Several insights from our study merit attention. A large amount of variance in a virtual team member’s perception of the leader’s performance—67%—is explained by the leader’s assumption of multiple roles. This is consistent with the BCL Theory by Denison et al. (1995). Specifically, when the internal roles of monitor, facilitator, mentor, and coordinator are exhibited by the team leader, team members indicate less overall conflict and attribute greater effectiveness to the team leader. The strength of this relationship ($\beta = 0.806, p < 0.01$) further complements the BCL theory. Additionally, the strong influence of a successful leader on the team’s perceived performance ($\beta = 0.591, p < 0.01$) is a notable finding for virtual team research. Team members with a strong sense that their leader is an effective manager of tasks, people, and processes also believe their team performs at a higher level. Conversely, teams that perform poorly may attribute this outcome to a lack of overt leadership skills rather than team member inadequacies. Whereas by the BCL Theory Denison et al. (1995) links the leadership roles to leadership effectiveness, our results go a step further, linking the roles and leader effectiveness to the performance of the team supervised by the leader. Although our study is designed to examine the influence of the leader in reducing conflict, rather than the influence of conflict per se on team performance, the results support the current findings in co-located team conflict research that suggest consistent negative relationships between conflict and team performance (De Dreu and Weingart 2003). Given that team members who perceive that leader roles make for an effective team leader also perceive less conflict and higher team performance, one might infer that the reduced conflict, resulting from the leader’s assumption of various roles, is instrumental in improving team performance.

Despite our expectations, team members did not associate the virtual team leader’s performance of the mentor role with a reduction in relational conflict. Whereas prior virtual team research indicates the importance of the mentor role in virtual teams

(Kayworth and Leidner 2000)—and indeed the mentor role is significant in team member’s assessment of their leader’s performance—it appears that being an effective listener, being fair and supportive toward individuals, and facilitating the development of individuals on a team does not ensure that team members will behave similarly to each other. Perhaps effective performance of the mentor role by the team leader reduces relational conflict between the leader and team members, rather than among team members. Thus, our research supports the conclusion that relational conflict is better avoided than managed (De Dreu and Van Vianen 2001, Murnighan and Conlon 1991). Given the strong negative relationships between relational conflict and team member satisfaction observed across a variety of studies (De Dreu and Weingart 2003), future work should meticulously investigate the appropriate roles a leader can assume to reduce relational conflict among team members.

Additionally, the relationships hypothesized between the facilitator role with task and process conflict are not supported. Although the facilitator role is effective in mitigating relational conflict, it appears less useful for the reduction of task and process conflict. It may be that the delegation of tasks and procedural expectations among these virtual team members are not participative functions in which team members expect to interject their opinions or preferences. Whereas team member participation with the leader appears to alleviate relational conflict, this dynamic is less useful for the reduction of other conflict types. Rather, the results suggest that a greater sense of orderliness and a smooth workflow process promoted by the coordinator role is more beneficial in mitigating process conflict, and the monitor role is instrumental in reducing task conflict.

Notably, the control variables are significantly associated with some of the conflict types in the control model with only a few maintaining significance in the full model (see Table 3). Virtual team size appears to be an important factor that should be considered in team formation, and tenure with the company continues to positively affect the amount of relational conflict in the team. However, overlooking leadership traits and technology use factors may lead to incorrect inferences about the effects of team size, face-to-face contact or other member demographics. Future

virtual team research should continue to acknowledge and control for factors such as team size and tenure which may exert influence despite effective team leadership.

Finally, in contrast to research suggesting that electronic mediation creates greater conflict in teams (Kiesler and Cummings 2002, Hollingshead 2001) and consistent with research that finds positive outcomes from increased use of electronic communication (Mortensen and Hinds 2001, Orlikowski 2000), our results show that technology-mediated communication contributes to a reduction in all types of team conflict. It appears that the team members in our study have adopted and adapted electronic channels in ways that accommodate and positively contribute to the tasks, work processes, and relational aspects of the virtual team. This is consistent with channel expansion theory's assertion that over time, individuals' use of technology-mediated communication will become natural and cease to pose the same constraints that might occur with an initial transition from a face-to-face to a computer-mediated work environment (Carlson and Zmud 1999). Interestingly, compared to process conflict, relational conflict is influenced to a lesser degree by technology intervention. This highlights the fact that even though individuals may become very familiar with, very comfortable with, and very accepting of the virtual environment and its limitations, the relational aspect remains challenging.

Limitations and Future Research

Applying the current findings to other virtual team members is tenuous because the extent to which these respondents are representative of virtual team members in other organizations is unknown. For example, the respondents represent team members operating in domestic teams that may not be characteristic of more globally distributed structures with greater dependence on technology-mediated communication or greater cultural heterogeneity. Given the global expansion of organizational work processes, an important extension of the research is to understand the influence of cross-cultural differences on leadership roles, conflict and team performance. As yet, the literature lacks cross-cultural models that may help organizations better navigate in the global context (Gelfand et al. 2007). This requires theory

development and modeling of the interplay of cultural differences at the work level, the team level and the business unit level. Whereas our research was conducted at the individual level, future research that examines leadership and performance at the team level can extend the current model and provide insight into models that specify changing relationships according to different types of teams (e.g., based on size, heterogeneity, activity, etc.). Virtual team research should begin exploring the influence of individual member attitudes, experiences, and perceptions at multiple organizational levels (cf Gelfand et al. 2007).

Furthermore, greater attention to the cross-cultural interface is needed (Gelfand et al. 2007) to predict the outcomes of cultural encounters in virtual team settings and identify the cultural forces that influence team dynamics. For example, how do team members manage or exert their cultural differences relative to team conflict or leadership roles in ways that increase positive team performance? An understanding of the adaptation or coping behaviors of individuals set into a global work context requires continued research in cultural intelligence (Earley and Ang 2003) with new theories explicating how behavioral processes are influenced by cultural elements. The complexity of a global virtual team is likely to increase with the inclusion of different cultures, time zones, work behaviors, and/or technologies. Knowledge of the interplay of cultural differences gives insight into the processes underlying beliefs, social norms, and roles within teams. It is likely that leader roles may be more important to manage conflict and influence team performance and effectiveness in more complex contexts. Indeed De Dreu and Weingart's (2003) meta-analysis of team conflict and performance suggests that the negative effects of conflict are even more pronounced in more complex (less routine, less certain) environments than in less complex ones.

One limitation of our study is that we did not control for or collect data on the stage of development of the virtual teams. The role of the leader may differ in the early phases of team formation as information distribution may be more sporadic in the early stages of collaboration (Cramton 2001), and the various leader roles play more, or less, importance at various phases of team development. Future research

can analyze leadership and conflict across various stages of virtual team formation. Furthermore, actual team outcomes were not measured. In examining only respondents' perceptions of team outcomes, the effect of leadership roles on actual performance outcomes is unknown. Additional research should address this issue to determine if leader effectiveness based on role behavior is associated with greater levels of actual team performance.

Moreover, it is important for subsequent virtual team studies to adequately address common source variance in the design phase of the research. Procedural remedies are preventative and support the statistical evaluations of common method bias. Procedural solutions for future virtual team studies may include collecting objective data on team performance or leader effectiveness (dependent variables) from a separate source, such as performance reviews. A design that separates construct measurement temporally, contextually, psychologically, or methodologically provides control for common method bias. Measurement items should be designed to eliminate item ambiguity, demand characteristics, positive/negative affectivity, and social desirability to the extent possible (Podsakoff et al. 2003). For example, in our study the evaluation of the items measuring the facilitator role indicated some degree of ambiguity, suggesting that future research should refine or re-specify the items of this construct.

Prior research shows that not all conflict is detrimental and some organizational behaviorists distinguish between the intensity of situations in which strong conflict results in predictable behaviors whereas weak conflict may allow other factors to influence perceptions (Davis-Blake and Pfeffer 1989). Thus, future studies may find it worthwhile to consider the differences between strong and weak conflict and how each is manifested in the virtual team. It may be that when the intensity of conflict is low, other variables are associated with effective leadership behavior and team performance.

Finally, our research focused on the internal, rather than external roles, as specified in the BCL theory, because it is unlikely that team members are fully aware of the performance, and significance, of the external roles that leaders may undertake. Supervisors, rather than subordinates, would be in a better position to evaluate a team leader's performance

of the external roles. This is an avenue for further investigation. Future research might also conceptualize leadership differently using either an attribute-based or relational-based theory, as opposed to the role-based perspective of leadership (Howell and Hall-Merrenda 1999).

Conclusion

This research was motivated by an interest in understanding how team leaders can be effective in managing virtual team conflict. Virtual teams can be very complex organizational structures integrating psycho-social variables, cultural diversity, economic and financial factors, and management processes. Furthermore, the complexity of the team increases with greater geographic dispersion, fewer face-to-face meetings, and greater dependence on computer mediation. Given the momentum toward more global virtual teams, it is critical to begin identifying factors that contribute to team success.

The dynamic model of conflict emphasizes the negative relationship between conflict and team performance (Hinds and Bailey 2003). The model proposes that conflict handling strategies are group-based norms that affect team performance prior to conflict and after conflict has risen. This concept is based on the development of collaborative norms for conflict resolution in co-located groups, because resolution is critical to maintain trust and improve team performance (Montoya-Weiss et al. 2001). However, absent from the discussion is the role of the team leader to either mitigate conflict or establish norms of conflict resolution. Because team leaders play a critical part in resolving conflict in work groups (Fjermerstad and Hiltz 1999), understanding the dynamics of leader roles contributes to more effective virtual teams.

The integration of the BCL theory with the dynamic model of conflict in distributed teams resulted in our model of leadership, conflict, and performance in virtual teams. Our research operationalized and empirically examined the role of technology and leaders in the management of task conflict, relational conflict, and process conflict. Our findings suggest that the virtual team leader may assume a specific role or roles to manage conflict. They also suggest that the better able a team leader is to perform the internal leadership

roles, the better will the leader and the team perform in the virtual environment.

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