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The Role of Leadership in Facilitating the Performance of Dispersed Teamwork

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THE ROLE OF LEADERSHIP IN FACILITATING THE PERFORMANCE OF DISPERSED TEAMWORK

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of the requirements for the degree of
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ABSTRACT

A mature body of research on leadership has investigated the impact of a variety of leadership behaviors and styles on team performance. This corpus of work is built on an assumption that team leaders can motivate, direct, and monitor teams by way of sustained, personal contact with team members. However, this assumption is being challenged by recent advances in information and communication technologies (ICTs). Use of ICTs has altered traditional team-based structures, enabling organizations to employ teams composed of members who are dispersed across geographic boundaries, while severing the direct, personal ties leaders have to team members. Recent reviews of the literature on dispersed teamwork point to the unique challenges faced by dispersed teams, including difficulties with communication, knowledge transfer, coordination, and social exchange. No less than five of these reviews call for research on leadership as a means to alleviate these challenges. This dissertation proposal, organized as three essays, seeks to respond to this call by examining leadership issues with respect to task structure, team development, and team structure. Essay 1 explores the role of empowering leadership in helping dispersed teams, and individuals within these teams, cope with information systems development (ISD) risk factors. Essay 2 investigates how technology capabilities can be leveraged to support coaching behaviors directed at facilitating interpersonal processes. Essay 3 draws on the theory of behavioral complexity in leadership to examine how leaders can help dispersed teams respond to the challenges incurred by differing forms of geographic dispersion. The models are tested with data collected from members and leaders of dispersed teams in a large, multinational organization. Results show that leaders have significant and varied influences on dispersed team functioning and can be both beneficial and detrimental for dispersed teams under different conditions. This dissertation makes importance contributions to both research and practice by deepening our understanding of the impacts of leadership in the dispersed team context and providing insight into leadership interventions designed to support dispersed teams in coping with the challenges they face.

This dissertation is approved for recommendation to the Graduate Council.

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CHAPTER 1

INTRODUCTION

Information and communication technologies (ICTs) enable organizations to employ teams that are dispersed across spatial, temporal, and configurational boundaries (O'Leary and Cummings 2007). Because they span boundaries, dispersed teamwork evokes unique challenges collocated teams do not face. Extant research provides consistent evidence of the multiple and unique challenges facing dispersed teams, including difficulty with communication (e.g., Baltes et al. 2002, Cramton 2001, Cramton and Orvis 2003, Sproull and Kiesler 1986), coordination (e.g., Espinosa and Pickering 2006, Kanawattanachai and Yoo 2007, Massey et al. 2003, Montoya-Weiss et al. 2001), and interpersonal relationships (e.g., Griffith et al. 2003a, Hinds and Bailey 2003, Kankanhalli et al. 2007, Maruping and Agarwal 2004).

Though many potential solutions have been explored by team researchers, leadership has recently begun to receive attention as a critical, and yet underexplored facet underlying dispersed team performance (Bell and Kozlowski 2002, Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006). A large corpus of research in the management literature has explored the role that leaders play in traditional teams (Bass and Bass 2008), yet the dispersed context is thought to engender different challenges to leadership. Dispersion severs the direct, personal contact that leaders and team members rely on when collocated, introducing significant difficulty in leaders' ability to motivate, monitor, and otherwise manage teamwork (Hertel et al. 2005, Webster and Staples 2006). Thus, there is a need to explore paradigms in the leadership literature to determine how and when these approaches are effective in facilitating the performance of dispersed teams. This dissertation responds to this need by integrating the literature on dispersed teams with that of leadership in order to understand how dispersed team leaders can help teams cope with the challenges they face.

Against this backdrop, I explore the role of leadership in dispersed teams through three essays. These essays each address a key factor of team performance—task structure/context (essay 1), team development (essay 2), and team structure (essay 3). A recent review of the team effectiveness literature highlights 12 of the dominant models of team effectiveness, with nearly all incorporating these three elements (Salas et al. 2007). Other research finds that team context (e.g., task structure), team development, and team boundaries (e.g. those created by dispersion), are the primary elements that drive team effectiveness (Sundstrom et al. 1990). In this way, the three essays are woven together to comprise a holistic investigation of team effectiveness. Each essay employs a different theoretical lens to examine the interaction between leader behaviors and different aspects of dispersed team functioning.

Essay 1 explores how leaders can help teams address the challenges due to task structure by examining the project risk factors associated with information systems development (ISD) projects and the stress this incurs for system developers. This essay draws on the empowering leadership literature to explore two primary research questions: (1) what are the implications of ISD risk factors for individual developer stress and team performance; and (2) what role do leaders play in enabling members of dispersed ISD teams to cope with the challenges posed by ISD risk factors? Essay 2 complements essay 1 by drilling down into team development issues related to coaching and interpersonal processes. Coaching is an important aspect of leader behavior, but how it functions in the face of differing dimensions of dispersion is not yet understood. In this essay, I explore this important role of leader coaching behaviors, with an emphasis on how technology capabilities can support the efficacy of coaching behaviors that are directed towards the enhancement of interpersonal relationships. Two primary research objectives are sought: (1) to explore the implications of configurational-dispersion for interpersonal process failures and team performance; and (2) to explore the interactive effects of configurational-dispersion, ICTs, and leadership on interpersonal process failures. While dispersion is an important factor in the research models for essays one and two, essay 3 takes a more explicit approach by examining the team structure cultivated by a range of differing forms of dispersion. This essay draws on the theory of behavioral complexity in leadership to explore the role of leadership in enabling teams to cope with the challenges due to different forms of dispersion. This essay builds on recent work that has refined our conceptualization of team dispersion as a multidimensional factor, consisting of spatial, temporal, and configurational components. The impact of leadership behaviors on team conflict and coordination effectiveness are considered in light of these differing dimensions of dispersion.

The models offered in each essay are tested via a field study of dispersed ISD project teams and their leaders. The organization from which data are collected is a large, multinational company specializing in hardware and software design. Their development teams are globally dispersed, with members in China, India, and the U.S., and data collection took approximately one year. The models proposed in each essay are largely supported by the data.

The remainder of this document is as follows. Essays one, two, and three are offered in succession. Each essay follows a standard research paper format: introduction, theoretical background, hypotheses, methodology, results, and discussion. The final chapter of this dissertation describes the overall contributions of this work.

REFERENCES

Baltes, B. B., Dickson, M. W., Sherman, M. P., Bauer, C. C., and LaGanke, J. S. 2002. "Computer-Mediated Communication and Group Decision Making: A Meta-Analysis," *Organizational Behavior and Human Decision Processes* (87:1), pp. 156–179.

Bass, B. M., and Bass, R. 2008. *The Bass Handbook of Leadership: Theory, Research, and Managerial Applications*, New York, NY: Free Press.

Bell, B. S., and Kozlowski, S. W. 2002. "A Typology of Virtual Teams: Implications for Effective Leadership," *Group & Organization Management* (27:1), pp. 14-49.

Cramton, C. D. 2001. "The Mutual Knowledge Problem and Its Consequences for Dispersed Collaboration," *Organization Science* (12:3), pp. 346-371.

Cramton, C. D., and Orvis, K. L. 2003. "Overcoming Barriers to Information Sharing in Virtual Teams," in *Virtual Teams That Work: Creating Conditions for Virtual Team Effectiveness,* C.B. Gibson, and S.G. Cohen (eds.), San Francisco, CA: Jossey-Bass, pp. 214–230.

Espinosa, J. A., and Pickering, C. 2006. "The Effect of Time Separation on Coordination Processes and Outcomes: A Case Study," in *Proceedings of the 39th Hawaii International Conference on System Sciences*, Hawaii, pp. 25-35.

Griffith, T. L., Mannix, E. A., and Neale, M. A. 2003. "Conflict and Virtual Teams," in *Virtual Teams That Work,* C.B. Gibson, and S.G. Cohen (eds.), San Francisco, CA: Jossey Bass, pp. 335-352.

Hertel, G., Geister, S., and Konradt, U. 2005. "Managing Virtual Teams: A Review of Current Empirical Research," *Human Resource Management Review* (15:1), pp. 69-95.

Hinds, P. J., and Bailey, D. E. 2003. "Out of Sight, out of Sync: Understanding Conflict in Distributed Teams," *Organization Science* (14:6), pp. 615-632.

Kanawattanachai, P., and Yoo, Y. 2007. "The Impact of Knowledge Coordination on Virtual Team Performance over Time," *MIS Quarterly* (31:4), pp. 783-808.

Kankanhalli, A., Tan, B. C. Y., and Wei, K. K. 2007. "Conflict and Performance in Global Virtual Teams," *Journal of Management Information Systems* (23:3), pp. 237-274.

Martins, L. L., Gilson, L., L., and Maynard, M. T. 2004. "Virtual Teams: What Do We Know and Where Do We Go from Here?," *Journal of Management* (30:6), pp. 805-835.

Maruping, L. M., and Agarwal, R. 2004. "Managing Team Interpersonal Processes through Technology: A Task-Technology Fit Perspective," *Journal of Applied Psychology* (89:6), pp. 975-990.

Massey, A. P., Montoya-Weiss, M. M., and Hung, Y. 2003. "Because Time Matters: Temporal Coordination in Global Virtual Project Teams," *Journal of Management Information Systems* (19:4), pp. 129-155.

Montoya-Weiss, M. M., Massey, A. P., and Song, M. 2001. "Getting It Together: Temporal Coordination and Conflict Management in Global Virtual Teams," *Academy of Management Journal* (44:6), pp. 1251-1262.

O'Leary, M. B., and Cummings, J. N. 2007. "The Spatial, Temporal, and Configurational Characteristics of Geographic Dispersion in Work Teams," *MIS Quarterly* (31:3), pp. 433-452.

Powell, A., Piccoli, G., and Ives, B. 2004. "Virtual Teams: A Review of Current Literature and Directions for Future Research," *DATA BASE for Advances in Information Systems* (35:1), pp. 6-36.

Salas, E., Stagl, K. C., Burke, C. S., and Goodwin, G. F. 2007. "Fostering Team Effectiveness in Organizations: Toward an Integrative Theoretical Framework," in *Modeling Complex Systems,* B. Shuart, and W.P. Spaulding, J. (eds.), Lincoln, NE: University of Nebraska Press, pp. 185-243.

Sproull, L., and Kiesler, S. 1986. "Reducing Social Context Cues: Electronic Mail in Organizational Communication," *Management Science* (32:11), pp. 1492-1512.

Sundstrom, E., De Meuse, K. P., and Futrell, D. 1990. "Work Teams: Applications and Effectiveness," *American Psychologist* (45:2), pp. 120-133.

Webster, J., and Staples, D. S. 2006. "Comparing Virtual Teams to Traditional Teams: An Identification of New Research Opportunities," in *Research in Personnel and Human Resources Management,* J.J. Martocchio (ed.), San Diego, CA: Elsevier, pp. 183-218.

CHAPTER 2

ESSAY 1: INFORMATION SYSTEMS DEVELOPMENT RISK FACTORS AND DISPERSED TEAMWORK: THE ROLE OF EMPOWERING LEADERSHIP IN LOWERING DEVELOPER STRESS

ABSTRACT

Information systems development (ISD) involves non-routine solutions requiring highly specialized expertise. Due to an increasingly competitive global marketplace, as well as advances in information and communication technologies, this work is increasingly accomplished via the use of globally dispersed project teams. ISD team members face significant challenges resulting from the nature of their work, which often includes large projects that are highly complex, with volatile system requirements. Given these challenges, cognitive regulation is key to producing functioning and high-quality information systems. Thus, it is important to understand how leaders can support dispersed team members by reducing the extent to which they experience project-related stress. Stress has been identified as a key proximal determinant of an individual's well-being, their performance, and their team's performance because it interferes with the self-regulation of emotions and cognitions. While there are many potential approaches to supporting dispersed team members, in this research I explore the role of empowering leadership. This leadership lens is well-suited to the dispersed team context because it involves both psychological motivation and the delegation of responsibility, both of which are necessary in a dispersed context due to leaders' lack of ability to closely monitor, direct, and engage with team members. Using this lens, I develop a cross-level model of the efficacy of empowering leadership in mitigating the effects of ISD risk factors on dispersed software developers' role perceptions, psychological stress, and ultimately, team performance. The model is tested via a field study of dispersed ISD project teams and their leaders from a large, multinational organization (n=350 individuals, 73 teams) with team members located in China, India, and the U.S. Results show that empowering leadership is effective in reducing the influence of ISD risk factors, role ambiguity, and role conflict. Specifically, empowering leadership weakens the influence of project size and requirements volatility on role ambiguity, as well as the influence of project size, complexity, and requirements volatility on role conflict. Empowering leadership is also effective in reducing the influence of role ambiguity on stress when role ambiguity is high.

INTRODUCTION

A combination of increasing reliance on information systems and the increasing cost of delivering such systems suggests that the success of information systems development (ISD) projects is highly consequential for organizations. The success of these projects is inevitably tied to the project teams that deliver them. ISD project teams are composed of developers who are aided by a host of software tools and development methodologies designed to structure and simplify a software development project. However, developers face increasing sophistication in the technologies they develop and the tools used to support that development, along with pressure to be more productive and take on more tasks (Brandel 2011). The consequence is that stress among IT professionals is at an all-time high (Computerworld 2011). This is problematic, as stress is a key proximal determinant of an individuals' well-being and performance because it interferes with the self-regulation of emotions and cognitions (House 1981). Further, individuals' performance affects team performance due to the reciprocal, interdependent nature of project teams (Thompson 1967). Stress tends to narrow a person's breadth of attention such that they become more self-focused and less team-focused (Driskell et al. 1999, Gladstein and Reilly 1985). This diverts attention from the team's goals and negatively impacts the development of mental models, transactive memory, and ultimately, team performance (Ellis 2006). Given these challenges, it behooves researchers to explore the causes, consequences, and moderators of developer stress in order to enhance ISD team performance.

The specific causes of work-related stress are varied, but a principal source is the characteristics of a person's day-to-day work (i.e., project or task characteristics) (Barling et al. 2005, Meglino 1977). In this research, I focus on stress arising from the discrete project context because the project context is highly salient in team-based work. Whereas tasks represent smaller divisions of work typically executed by an individual, organizational projects tend to be team-based endeavors and ISD is frequently (almost exclusively, some might argue) accomplished via the use of teams (Stellman and Greene 2005). Examining the effects of project characteristics allows us to enrich and extend our understanding of ISD by incorporating the multilevel effects of project-level factors on individual developers, and vice versa.

In this research, I examine the project context through project risk factors that may induce stress, and the support (in the form of leadership) that may be leveraged to reduce negative outcomes for both developers and development teams. The literature on ISD has devoted considerable attention to the impact of ISD risk factors—those characteristics that engender a high probability of failure coupled with a high magnitude of loss (Barki et al. 1993)—and how they negatively impact project outcomes (e.g., Barki et al. 2001, Gemino et al. 2008, Wallace et al. 2004). However, less is known about how these risk factors contribute to individual and team outcomes. This represents an important theoretical gap in our understanding of ISD, as it ignores the nested complexity of individual developers, the project context, and ultimately, the environment in which developers are embedded. This interplay between individuals and higher-level factors (i.e., project, team) has not been fully examined, despite several calls for examinations of such (Cohen and Bailey 1997, Klein and Kozlowski 2000, Kozlowski and Bell 2003). This is problematic because it can contribute to incomplete and misspecified models (Klein and Kozlowski 2000, Kozlowski and Klein 2000). Adopting a multilevel approach to studying developer stress draws attention to the importance of the context in which developers are embedded by providing a richer picture of the varied sources of influence on individuals and teams (Avgerou 2001, Johns 2006, Rousseau 2011, Rousseau and Fried 2001). It also sheds light on the consequences of top-down and bottom-up effects, while illuminating possible solutions to those challenges. Recent research acknowledges that the impact of context in organizational research has not been sufficiently appreciated as important part of scientific inquiry (Johns 2006, Rousseau 2011). Without adequate consideration of context, we risk over-generalizing and missing nuanced effects that may restrict, enhance, or reverse relationships previously studied (Johns 2006).

The literature on managing ISD risk factors has primarily focused on project-level process-control measures (project management, development methodologies) that provide structure to the complexity of the software development process (Banker et al. 1998, Barki et al. 2001, Beath and Orlikowski 1994, Gemino et al. 2008, Kirsch 1996, Kirsch 1997). At the same time, other research acknowledges that developers require autonomy and flexibility in responding to continuous changes in user requirements (Gerwin and Moffat 1997, Lee and Xia 2005, MacCormack et al. 2001, Rai et al. 2009). This balance between structure and flexibility is a delicate one, made all the more complex when one considers that IS development is increasingly accomplished via the use of dispersed teams. Dispersion obfuscates the kind of monitoring and control required by structured managerial approaches, as well as the intense communication and face-to-face interaction advocated by flexible, self-managing approaches. How then can organizations and more specifically, leaders of dispersed teams who are in a position to guide and oversee development efforts, enable developers to cope with the stress arising from their work? To explore these issues, this research aims to answer two primary research questions: (1) What are the implications of ISD risk factors for individual developer stress and team performance; and (2) what role do leaders play in enabling members of dispersed ISD teams to cope with the challenges posed by ISD risk factors?

Recent research on dispersed teams suggests that a combination of motivational and delegative leadership techniques may be helpful in striking a balance between structure and flexibility (Hertel et al. 2005). Motivational leadership behaviors are thought to help combat the inability to directly control and monitor team members by way of keeping them on task, while delegative behaviors help address the need for adaptation and flexibility through self-management (Faraj and Sambamurthy 2006, Hertel et al. 2005). While there are many potential leadership approaches, *empowering leadership* represents one approach that specifically emphasizes both motivation and sharing of decision-making authority (Spreitzer et al. 1999a), thus making it particularly well-suited for the context of dispersed ISD teams. Empowering leadership is defined as, "the process of implementing conditions that enable sharing power with an employee by delineating the significance of the employee's job, providing greater decision-making autonomy, expressing confidence in the employee's capabilities, and removing hindrances to performance" (Zhang and Bartol 2010, p. 109). Team leaders are recognized as an important source of empowerment, as they have both access to detailed knowledge of the team members' expertise, work roles and processes, and are formally vested with the authority to oversee and direct individuals' work (Chen et al. 2007, Faraj and Sambamurthy 2006, Kirkman and Rosen 1999, Srivastava et al. 2006, Zhang and Bartol 2010). Empowering leadership thus captures the ability to motivate team members while at the same time delegating responsibility to them under the supervision of a formal team leader. Research shows that empowering leadership has a positive impact on knowledge sharing and efficacy (Srivastava et al. 2006), individual and team empowerment (Chen et al. 2007), and ultimately, team performance (Chen et al. 2007, Kirkman and Rosen 1999, Srivastava et al. 2006).

Against this backdrop, I put forth a model in which ISD risk factors are posited to contribute to developer stress through their influence on role perceptions, specifically role ambiguity and role conflict. While there exist many important individual- and team-level cognitions influencing team member outcomes, the choice of role perceptions is grounded in the literature on IT personnel and organizational psychology and is of particular importance to the context of this research. Multiple studies show that improper definition of roles and responsibilities are among the top concerns regarding ISD projects for both project leaders and team members (Keil et al. 2002, Schmidt et al. 2001). Role perceptions have been consistently linked to job satisfaction, psychological stress and performance, through their impact on peoples' ability to do their work (Joseph et al. 2007, Lee 2000, Lee 2001, Moore 2000). As high-risk projects are likely to incur additional stress above and beyond what an individual may normally encounter in his or her job, role perceptions provide a means through which we may better understand how ISD risk factors influence team members' ability to cope. Empowering leadership is expected to moderate the influence of ISD risk factors on role perceptions and the influence of role perceptions on stress. Teams that experience greater stress are expected to have lower performance. The research model is shown in Figure 1.

This research contributes to the literature in several ways. Broadly, this research contributes to the information systems literature a contextualized, multilevel model of the individual- and project-level factors that influence developer well-being and team performance. Specifically, by uncovering the mechanisms by which leaders can help developers cope with the challenges incurred by project risk factors and by exploring the implications of role perceptions for dispersed team members, it extends the information systems literature on both ISD and team dispersion. This work also contributes to the management literature on empowering leadership by shedding light on whether and how empowering leaders can mitigate problems due to project characteristics among dispersed teams.

THEORETICAL BACKGROUND

While our understanding of the impact of leaders in dispersed teamwork is still in its nascent stages, prior research sheds light on some of the theoretical underpinnings of effective leadership in this context. Effective leaders in the dispersed context are found to exhibit exceptional communication skills, including displays of understanding (empathy) and at the same time, are able to exert their authority without being perceived as rigid or overbearing, all without benefit of face-to-face interaction (Kayworth and Leidner 2002). In a similar vein, research shows that dispersed team leaders can effectively reduce conflict among team members by assuming specific behavioral roles, including that of monitor and coordinator (Wakefield et al. 2008). A more recent study finds that the dispersed context increases the need for inspirational leadership, which involves communicating a compelling vision, expressing confidence in the team and energizing team members (Joshi et al. 2009). This study found that inspirational leadership increases individual commitment to the team and trust in team members, especially as dispersion increases. These findings represent an important step toward a better understanding the function of leadership in the dispersed team context and underscore the need for researchers to more closely examine the unique contextual factors that affect dispersed team member well-being.

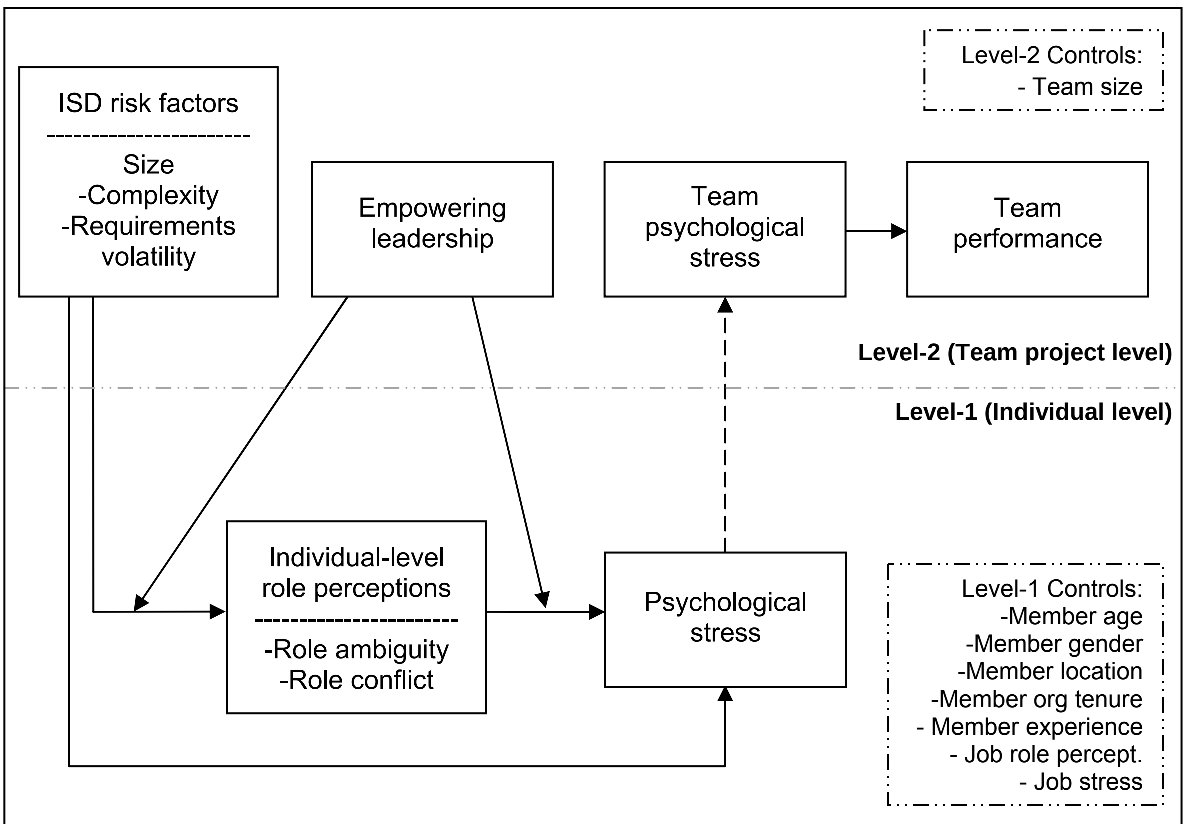

Figure 1. Research Model[a]

[a] *Arrows with solid lines represent formal hypotheses. Arrows with dashed lines represent additive processes by which individual-level phenomena are compiled to form team-level phenomena.*

The ISD literature also provides insight into the role of leadership in enabling team members. Leaders are found to play an integral role in supporting team members and project success (Ewusi-Mensah 1997). One way in which they do so is by helping members to execute team processes. Prior research finds that involved leaders positively influence processes related to interpersonal relationships, production activities, and management of external sources of influence (Guinan et al. 1998). Another way they facilitate project execution is by monitoring and controlling team member behaviors. Recent research shows that agile development methodologies are most effective in helping teams cope with requirements change when leaders employ outcome control and that self control is particularly ineffective in this context (Maruping et al. 2009). In a similar vein, poor leadership is found to contribute to inadequate self control in outsourced projects (Choudhury and Sabherwal 2003). Leaders can also influence team and project outcomes through their personal characteristics. Rai and his colleagues (2009) find that when an offshore project has no client representative, the project leaders' cultural values (specifically, uncertainty avoidance, long-term orientation, and masculinity/femininity) can help explain cost-overruns and decreases in client satisfaction. Taken together, these studies have advanced a variety of leadership factors that play a part in helping or hindering teamwork. However, they do not speak to how ISD project leaders can be effective when their team members are dispersed across multiple geographic locations, nor have they explored the role of psychosocial enablers of team outcomes. Empowering leadership will augment our understanding of ISD project leadership by providing a lens thorough which to explore the potential for a psychosocial enabler to help dispersed team members cope with the challenges they face.

Empowering Leadership

Recent research acknowledges the need for more motivation-based, delegative leadership strategies for dispersed project teams and by extension, the individuals of whom they are composed (Faraj and Sambamurthy 2006, Hertel et al. 2005). This is evidenced by the growing number of studies that report a trend toward self-managed dispersed teams (Tyran et al. 2003), as well as, evidence of the effectiveness of inspirational leadership, a motivation-enhancing leadership style, in positively influencing dispersed teamwork (Joshi et al. 2009). Despite this evidence, entirely self-managed teamwork does not capture the need to motivate team members to work effectively in the absence of monitoring, and neither approach captures the significant measure of oversight that large-scale development projects require. An increasingly prominent leadership concept that has received attention from researchers over the last two decades is that of empowering leadership (Conger and Kanungo 1988, Spreitzer 1995, Spreitzer et al. 1999a, Thomas and Velthouse 1990). Empowering leadership involves both motivation and delegation of responsibility with supervision by a formal team leader (Chen et al. 2007, Faraj and Sambamurthy 2006, Srivastava et al. 2006, Zhang and Bartol 2010).

Empowering leadership has been shown to be a significant predictor of important team outcomes, including team performance effectiveness (Chen et al. 2007, Mathieu et al. 2006, Srivastava et al. 2006, Wageman 2001). It is found to be significantly correlated with manager's ratings of team proactivity, productivity, and customer service, as well as, job satisfaction, and organizational and team commitment (Kirkman and Rosen 1999). It has been observed to influence performance through a variety of factors, including knowledge sharing and team efficacy (Srivastava et al. 2006), as well as, team processes that include goal setting and planning activities, coordinating and monitoring activities, and interpersonal management activities (Mathieu et al. 2006). The concept of empowering leadership has recently been studied in the IS development context to investigate task characteristics that dilute its impact on team performance. A recent study finds that higher task uncertainty and availability of expertise both interact with empowering leadership to enhance its effect on team performance (Faraj and Sambamurthy 2006). These studies point to the important role that empowering leadership may play in alleviating the negative consequences of ISD risk factors.

Boundary Conditions

Before moving to the hypotheses development section, it is important to note some key assumptions that bound the model. First, the model is focused on the behavior of internal, rather than external team leaders. Internal leaders are members of the team who are actively engaged in the team's task cycle, while external leaders are not members of the team and thus uninvolved with the team's day-to-day activities (Morgeson et al. 2010). Research has demonstrated that internal leaders are in a better position to facilitate task execution and guide team member interactions (e.g., Tan et al. 1999), issues that are of central importance in responding to ISD risk factors. Second, the model assumes that team leaders are formally appointed by management, rather than informal leaders that emerge from the team's membership, or leadership that is shared among team members. Formally appointed leaders have the necessary authority and recognition of the organization to impact team members' activities in response to ISD risk factors. Third, it is important to distinguish between team leaders, who are the focus of the model, and project managers. Team leaders have sustained, personal contact with team members and are responsible for the day-to-day oversight of team members' work. In contrast, project managers are generally concerned with the administrative processes that ensure teams are kept on schedule and under budget (Verma and Wideman 2002). The latter typically does not have close contact with team members, or the knowledge of team member expertise that would be required to impact team members' day-to-day activities. This contrast between team leaders and project managers is illustrated by the growing number of organizations centralizing project management activities through a project management office (Santosus 2003). Such centralization eliminates the sustained contact that is key to helping dispersed team members cope with project risk factors.

HYPOTHESES DEVELOPMENT

ISD Project Risk Factors

The extant research on ISD projects has highlighted an abundance of risk factors that contribute to cost overruns, schedule delays and unmet user requirements (for a review, see Barki et al. 1993). Such negative project outcomes are likely to place a great deal of stress on the individual developers whose evaluations and professional reputations are tied to the success of their team's project. Among the most top-cited ISD risk factors are project size, complexity, and requirements volatility (Banker et al. 1998, Barki et al. 1993, Gopal et al. 2002, Griffin 1997, Jiang et al. 2000, Schmidt et al. 2001). P*roject size* refers to the general scope of the project in terms of resources required (Sauer et al. 2007), *project complexity* refers to the degree to which the project consists of varied and interrelated parts (Baccarini 1996) and *requirements volatility* is defined as the extent to which project objectives change after the initial user requirements are obtained (Gemino et al. 2008).

A recent study by Sarker and Sarker (2009) finds that these three factors are the key project characteristics impacting a distributed ISD project. Thus, these ISD risk factors are selected for their prominence in the IS literature, as well as for their theoretical importance to both the dispersed context and leadership behaviors. Project size, complexity, and requirements volatility introduce significant interdependencies in the work to be accomplished (Baccarini 1996). Interdependencies cultivate more complex coordination and communication requirements, both of which have been shown to be particularly problematic in the dispersed context (Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006). For example, larger projects are defined, in part, by their requirement for more people and resources in order to execute project goals (Sauer et al. 2007). This introduces more communication overhead into the project work by requiring developers to coordinate with a larger pool of resources and to manage the multiple dependencies among those resources. Similarly, project complexity is characterized by a need to integrate knowledge and resources from disparate sources (Barki et al. 2001), resulting in greater effort required to track and manage those sources and their inputs. Requirements volatility can introduce changes in needed expertise and team member roles and responsibilities, resulting in shifts in the team members' understanding of the project mission and team structure. Due to their macro-level perspective of the team and close personal contact with team members, leaders are in a unique position to enable team members to cope with and respond to such challenges. While significant advances have been made in our understanding of how formal administrative processes can help to better achieve project objectives, relatively less is known about how project leaders can use social enablers, such as motivating, inspiring and empowering team members to work effectively in responding to the challenges imposed by ISD risk factors (Sarker and Lee 2003, Thite 2000).

Role Perceptions

ISD risk factors are expected to have significant implications for individual-level developer outcomes. This notion is grounded in the wealth of literature demonstrating that task characteristics impact a variety of individual-level outcomes. A well-known example is seen in the work on job characteristics, which identifies tasks with high significance as more motivational and contributing to higher job satisfaction (Hackman and Oldham 1980). Task characteristics are found to influence critical cognitions and psychological states, which in turn influence individual outcomes (Hackman and Oldham 1980). Projects are comprised of tasks, thus projects are expected to have similar implications for individual outcomes. The cognitions of interest in the current study are role perceptions. Role perceptions refer to, "the clarity, congruity and effectiveness of [a team member's] cognition regarding the role to perform" (Wofford 1982, p. 29).

Two specific role perceptions are examined in the current study: role ambiguity and role conflict. *Role ambiguity* refers to, "the lack of clarity and predictability of the outcomes of one's behavior" (Wofford 1982, p. 29), while *role conflict* is defined as "the degree of incongruity or incompatibility of expectations associated with [one's] role" (Wofford 1982, p. 29). These two role perceptions have been linked to stressors such as job dissatisfaction, work overload, and ultimately, turnover intention, (Joseph et al. 2007, Lee 2000, Lee 2001, Moore 2000), and are of particular interest, given the project team context. Clarity and congruity in individual member roles are important if the team is to perform at a high level, as both role ambiguity and role conflict are shown to impact role performance (Beauchamp et al. 2002, Bray and Brawley 2002). Based on the interdependent nature of project teamwork, a member's ability to effectively understand and execute their role will impact the work that is shared among interdependent team members (Bray and Brawley 2002, Thompson 1967). Further, research suggests that leadership can alleviate feelings of role conflict and role ambiguity (Kayworth and Leidner 2002, Peterson et al. 1995).

In interdependent project teams, the performance of each person is a function not only of individual-level processes, but also of the project-level factors that can constrain or enable an individual's behavior, cognitions, or emotions. Multilevel theorizing of top-down effects (i.e., higher-level constructs influencing lower-level constructs) involves consideration of contextual influences that allow researchers to explicate the enablers and constraints imposed by higher-level constructs on lower-level constructs (Kozlowski and Klein 2000). This is especially pronounced when levels are tightly coupled, as with member roles that are tied to or determined by a projects' characteristics (Kozlowski and Klein 2000). Due to this tight coupling and the constraints on individual behavior imposed by project-level factors, ISD project risk factors are theorized to positively contribute to role ambiguity and role conflict at the individual level, for a direct cross-level effect.

Larger projects introduce more people and resources that individuals must coordinate in order to accomplish their objectives (Baccarini 1996). For example, projects larger in size typically have more complex reporting structures (i.e., a top-down constraint), which have been shown to lead to greater role ambiguity (Baroudi 1985). Furthermore, role ambiguity is particularly probable on larger, more complex projects, when multiple individuals may be assisting with the responsibilities of a particular role. This should contribute to a lack of clarity about one's responsibilities, as there may be different interpretations and information about which team members fulfill various duties associated with a role. Compounding this problem, is an individual's diminishing sense of urgency and engagement resulting from increases in a project's size (Zafiropoulos et al. 2005). A lack of urgency or engagement may result in greater ambivalence on the part of team members in understanding their role on the team. This assertion is supported by research showing that a lack of engagement with a project or task is linked to greater role ambiguity (Sonnentag and Kruel 2006). Requirements volatility is also likely to impact role ambiguity, as changes in requirements may alter the responsibilities that a developer has, leading to ambiguity regarding their current role. For example, IS development teams are often structured such that one team member who is most knowledgeable in a particular area is recognized as the 'senior developer' or 'lead programmer'—a technical expert with some authority and responsibility for decisions concerning software or hardware design. A requirements change could involve some functionality being added that requires a new type of technical expertise, say knowledge of a different programming language. In response to this change, a new technical expert may be added to the team, thus obfuscating the role of the original technical expert and resulting in role ambiguity for both team members.

ISD risk factors are also expected to produce role conflict. As with role ambiguity, ISD risk factors place constraints on an individual's behaviors, cognitions, and emotions and thus impact team members' ability to interpret or perform their role. For example, larger and more complex ISD projects may require developers to be assigned multiple tasks, which can lead to conflicts of priority, commitment of resources, as well as, multiple or conflicting reporting structures. Greater project complexity and changes in project requirements result in more significant interdependencies among individuals that may require communication across departmental boundaries in order to access or share resources and gather, update and disseminate new information as changes occur. For example, a team might work on developing a system to serve the needs of several organizational units. Developing such a system would require team members to gather requirements from several sources across the organization. As team members span these intraorganizational boundaries, they are likely to be met with expectations and orientations that differ or conflict with one another. Indeed, the extant literature has consistently supported the link between boundary spanning and role conflict (Baroudi 1985, Bettencourt and Brown 2003, Joseph et al. 2007, Marrone et al. 2007, Speier and Venkatesh 2002). Thus, I hypothesize:

H1: Project-level ISD risk factors will positively influence individual role ambiguity and role conflict.

Empowering leadership is expected to moderate the relationship between ISD project risk factors and role perceptions, for a cross-level interaction. This interaction suggests that the top-down effects of ISD risk factors on role perceptions can be altered to some extent by another project-level factor, empowering leadership. While ISD risk factors are thought to influence role perceptions by way of constraining individuals' behaviors, cognitions, and emotions, empowering leadership is expected to enable team members and provide them with greater latitude in responding to project demands. Collectively, the empowering leadership behaviors described below constitute "situational affordance" that provides individuals with the opportunities and motivation to seek out clarification and make decisions regarding project demands (Chen et al. 2007). In turn, this should reduce the effect of ISD risk factors on individual role perceptions.

Empowering leaders share decision-making authority with the team and delegate responsibility to team members (Manz and Sims 1987). Such leader behaviors should stimulate greater engagement with the project. By sharing leadership with the team, leaders encourage members to actively process project-related information and to make positive contributions, rather than passively observe the team's course of action (Vecchio et al. 2010). As mentioned, cognitive engagement is an important factor in driving individuals to understand and seek clarification regarding their role (Sonnentag and Kruel 2006). Sharing decision-making authority with the team should also stimulate a greater sense of ownership for the project. By participating in requirements definition and making plans for how to design the system to fulfill these requirements, team members will likely have a stronger investment in, and commitment to the software and hardware they ultimately produce. This, in turn, should motivate team members to persist in achieving goals and encourage role coordination and sharing of expertise. Indeed, research on goal-setting theory finds that one of the primary benefits of participative decision-making (i.e., an empowering leadership behavior) is that it stimulates information exchange (Locke et al. 1997). Thus, to the extent that work is impeded by role ambiguity or role conflict, stronger project engagement and ownership should motivate team members to expend more effort to seek out clarification about their role on the project team and resolve inconsistent expectations that interfere with their progress.

Empowering leaders also cultivate a more collaborative environment, and should thus promote better coordination of resources, reducing the impact of ISD risk factors on role perceptions. Research shows that empowering leaders cultivate an environment of open dialog and negotiation, resulting in less dysfunctional resistance (Vecchio et al. 2010). These properties are particularly important in a team-based setting where leadership is shared. This context is likely to require negotiation and consensus-building about team members' roles and responsibilities because research on software development finds that these projects engender more opportunities for conflicts and power struggles to arise (Gemino et al. 2008, Yetton et al. 2000). Empowering leadership is also linked to greater knowledge sharing among team members (Srivastava et al. 2006). By sharing power with the team and expressing confidence in their abilities, team members have greater opportunities to share their technical expertise, as well as, confidence that their knowledge is valuable and will be well-received by their team members (Srivastava et al. 2006). Such activities are likely to play a key part in helping members to identify where expertise is located, where it is needed, and ways by which it can be brought to bear on a problem or task, critical activities in ISD projects (Faraj and Sproull 2000). In this way, empowering leadership helps team members develop a shared knowledge that provides structure to a chaotic environment by facilitating development of more accurate explanations and expectations about task events (Espinosa et al. 2007). This should allow for better management of large, complex, and volatile projects, ultimately reducing the impact of these factors on role ambiguity and role conflict.

Empowering leadership should also result in team members being more proactive and adaptive when resolving role ambiguity and role conflict that may result from ISD risk factors. Research shows that self-determination (i.e., through shared decision-making authority) leads to more initiative in work-related situations (Deci and Ryan 1985). By expressing confidence in the team and delineating the significance of their work, empowering leaders encourage team members to engage in initiating behaviors that can help build team efficacy (Srivastava et al. 2006), resulting greater persistence in task accomplishment (Bandura 1997). For example, because of empowering leadership, ISD team members may be more motivated to persist in clarifying system requirements, such that they are able to help negotiate compromises across intraorganizational boundaries, before they evoke role conflict. Such persistence will be important in ensuring that team members do not abandon efforts to cope with and make sense of the complex development environment. Proactive behaviors are likely to reduce the impact of ISD risk factors on role ambiguity and role conflict by providing team members with greater exposure to information that can be used to structure and manage the many interdependencies inherent in software development. Furthermore, by providing flexibility and self-determination, research shows that empowering leadership promotes higher levels of adaptability (Chebat and Kollias 2000). This adaptability is crucial in a dynamic software development context as requirements can change frequently (Boehm and Papaccio 1988) and there is often a great deal of pressure to take on more work while still completing the project on time (Computerworld 2011). Adaptability allows developers 'room to maneuver' and opportunities to reconfigure the software to meet new user demands (Pulakos et al. 2000). This latitude should help ISD team members more efficiently respond to the intricacies associated with large, complex, and volatile projects, allowing them to resolve inconsistencies or incongruity stemming from these factors early on, before they spiral into difficulties with role clarity. Thus, I hypothesize:

> *H2: Project-level empowering leadership and ISD risk factors will have a cross-level, interactive effect on individual role perceptions, such that, the relationship between ISD risk factors and role perceptions and will be weaker when empowering leadership is high.*

Psychological Stress

Role ambiguity and role conflict are expected to positively contribute to psychological stress among ISD team members. Psychological stress refers to a, "psychophysiological response which deviates from a state of equilibrium" (Weiss 1983, p. 29). A meta-analysis of the correlates of role ambiguity and role conflict find that they are moderately to strongly correlated with a variety of negative affective reactions, including job satisfaction, tension/anxiety, organizational commitment, involvement and propensity to leave (Tubre and Collins 2000). These negative psychological and behavioral reactions have even been observed to have physical manifestations. Several studies have found that role ambiguity and role conflict increase heart rate and blood pressure (e.g., Perrewé et al. 2004). The link between role perceptions and stress is grounded in classical organization theory based on chain-of-command and unity-of-command principles (Cummings et al. 1975, Rizzo et al. 1970). According to these principles, individuals expect, and are more satisfied with a hierarchical relationship in organizations. This hierarchy should have a clear and single flow of authority in which individuals receive direction from only one person, who is above them in the hierarchy (Fayol 1949). These principles allow top management more effective control, reduce uncertainty, increase accountability, and help to ensure systematic and consistent reporting, evaluation and control of work and resources. Role ambiguity and conflict violate these principles by obfuscating the clear and single flow of authority and introducing expectations or direction from multiple sources (Rahim 2011, Rizzo et al. 1970). In the software development context, this principle is frequently violated due to the boundary spanning activities performed by IS developers. Research finds that high levels of role conflict and ambiguity occur among those who have more contact with others (Kahn et al. 1964). Boundary spanning activities are prevalent in ISD work (Guzman et al. 2008) and expose team members to multiple sources of influence regarding their role in the team and project, including users, managers, and vendors (Baroudi 1985). The need to collect and resolve role-related information from these various sources places an additional burden on the developer with respect to role perceptions (Ahuja et al. 2007, Joseph et al. 2007, Moore 2000). When individuals are unclear about their role, they will hesitate in their decision-making and have to rely on trial and error in meeting expectations, which is likely to produce stress (Pettijohn et al. 2001). Thus, I hypothesize:

> *H3: Individual role ambiguity and role conflict will positively influence individual psychological stress.*

Empowering leadership at the project level is also expected to moderate the relationship between individual role perceptions and psychological stress, for a cross-level interaction. Empowering leaders can reduce the impact of role conflict and role ambiguity on stress by delineating the significance of the team's work, for example, by emphasizing how the software will reduce workloads or improve the efficiency of their fellow workers. They can also help by removing hindrances to the team's performance, such as intervening to help negotiate system requirements among conflicting constituencies. When team members understand the role of their work in the larger organization, they should be more tolerant of some level of role ambiguity or role conflict, because they can see the means-end relationship between their work and that of their organization (Baker 2004). In this way, empowering leaders enable team members to tolerate conditions that might otherwise be stressful. Furthermore, the empowering leader's role in helping to remove hindrances to performance, may cultivate a sense of security for team members. Should they be unable to resolve obstacles related to role conflict or ambiguity, knowledge that their leader may take steps to help them positions the leader as a sort 'safety net'. This may provide team members with greater psychological security, reducing the impact of these role perceptions on stress.

Empowering leaders provide team members with greater latitude in determining how to achieve objectives (Faraj and Sambamurthy 2006, Srivastava et al. 2006), which should reduce feelings of helplessness and allow team members to tolerate conditions that might otherwise lead to stress (Carton and Aiello 2009). Indeed, research demonstrates that perceived control has an inverse relationships with psychological stress (Carton and Aiello 2009, O'Driscoll and Beehr 2000). By expressing confidence in the team, particularly as it pertains to their technical competence, empowering leaders can impact developers' expectations about their ability to cope with challenges related to their tasks when role definitions or responsibilities are clarified, or cope with inconsistencies resulting from role conflict. Research shows that beliefs about one's ability to perform a task are linked to the experience of stress (Jex and Gudanowski 1992). More recently, self-efficacy is shown to moderate the relationship between role clarity and stress (Jex et al. 2001). Thus, role ambiguity and conflict are less threatening to team members who are confident in their ability to do their work. In sum, empowering leadership can act as a buffer for team members, allowing them to persist in their belief that they can achieve project objectives despite role ambiguity or conflict. Thus, I hypothesize:

> *H4: Project-level empowering leadership and individual role perceptions will have a cross-level, interactive effect on individual psychological stress, such that, the relationship between role perceptions and stress will be weaker when empowering leadership is high.*

ISD risk factors are also expected to have a direct cross-level impact on individual psychological stress because they introduce demands on individuals' emotions and cognitions with respect to role-related responsibilities. Projects of greater size, complexity and requirements volatility are more demanding of individuals' emotional and cognitive resources as they require individuals to manage more "moving pieces"—i.e., changing knowledge structures, human, and technical resources (Baccarini 1996, Banker et al. 1998). In this way, the top-down influence of ISD risk factors constrains the behavior of an individual by limiting their ability to focus on and perform the task at hand, due to an increased cognitive and emotional load (Pennington and Tuttle 2007). As a result, these project-level ISD risk factors are likely to evoke an imbalance between the demands of the project and the individual role-related capabilities, resources, and needs of developers. ISD risk factors are expected to incur psychological stress through their impact on role perceptions. To the extent that there is ambiguity regarding one's role and accompanying responsibilities, or conflicting demands and expectations placed on a team member, they will less equipped to respond to this imbalance. This is because a lack of clarity about role responsibilities can cause confusion, frustration and the feeling that one is not in control of one's work (O'Driscoll and Beehr 2000). Thus, I hypothesize:

H5: Project-level ISD risk factors will positively influence individual psychological stress.

H6: The influence of project-level ISD risk factors on individual psychological stress will be mediated by individual role perceptions.

Team Performance

Lastly, stress is expected to have implications for team performance. Specifically, teams with a larger proportion of members with high levels of psychological stress should have lower performance. Stress has been identified as a determinant of both individual and team performance (e.g., Ellis 2006, e.g., Ganster and Schaubroeck 1991) and is recognized to have deleterious effects on both because it interferes with the self-regulation of emotions and cognitions (House 1981). This diminished ability to regulate emotions and cognitions impacts team performance by narrowing team members' breadth of attention so that they are more self-focused and less team-focused (Driskell et al. 1999, Ellis 2006, Gladstein and Reilly 1985). Thus, stress is likely to impact team performance because team members become less engaged in ensuring that their contributions are directed towards the team's goals and directives. In the software development context, this might be exhibited when developers under stress narrow their breadth of attention to focus solely on producing high-quality, "elegant" code for a particular software module. This limits the breath of attention they have to focus on the larger system, its functioning, and how their module will integrate with it, thereby reducing the overall quality of the final product and the team's performance. Thus, I hypothesize:

H7: Team psychological stress will negatively influence team performance.

METHODOLOGY

Research Site and Participants

The model is tested via a survey-based field study of ISD project teams. The data collection site is a large, multinational corporation specializing in the development of software and hardware technologies that are used in consumer electronics, networking and telecommunications equipment, and computer systems. The firm has over 4,500 employees with revenue for 2010 exceeding 900 million U.S. dollars. Participants are members of software and hardware development teams, drawn from a variety of locations across the globe, including China, India, and the U.S. The sampling frame is 1,140 individuals in 119 teams working on development projects beginning in 2010 and ending in 2011. From this sampling frame, 350 members (level-1 n) and 73 leaders (level-2 n) provided usable responses. Respondents were fairly evenly distributed across the three locations, with 101 members working in China, 118 in India and 131 in the U.S. The average team size was 10.0, with an average of 4.8 responses per team (48% response rate), which is an acceptable level for statistical representativeness of the team (Faraj and Sproull 2000, Warwick and Lininger 1975). The average age of team members was 32.1 years and for team leaders it was 44.4 years. Approximately 49% of the team members were women and 46% of team leaders were women. Three waves of data were collected, with surveys administered at the beginning, midpoint, and end of the projects' cycles and data collection took approximately 1 year. Response rates over this time were bolstered by support of the study by top management and team leaders.

Measures

All measurement items are taken from previously validated scales. Measurement of the constructs was collected from multiple sources, including individual team members and the project leader. This strategy is recommended as a means to alleviate concerns of common method bias (Spector 1994). ISD risk factors, empowering leadership behaviors, and team performance were captured by responses from the team leader. Role perceptions and psychological stress were collected from individual team members.

ISD risk factors

Project size is a multidimensional construct. It consists of four single-item measures that include project duration, cost, relative size as compared to other projects, and effort as measured in person-months. An example item is, "How much is this project estimated to cost in U.S. dollars?" These measures for assessing project size have been used in the extant ISD project literature (Barki et al. 1993, Gemino et al. 2008). This method of measuring project size allows for a comparison of teams working on projects of different types, such as both hardware and software development projects. *Project complexity* is measured with two items that assess the extent to which the technology is integrated with other systems and must interface with other types of technology (Barki et al. 1993). These items are measured on a 7-point Likert-type scale where 1 represents completely disagree and 7 represents completely agree. These items are averaged to create a project complexity construct. *Requirements volatility* includes changes in the target objectives related to budget, schedule, and scope. The scale consists of three items that assess the number of times these factors have changed over the course of the project. Following Gemino and his colleagues (2008), these items are averaged to create a single measure of requirements volatility.

Empowering leadership

Using three different samples, prior research has empirically validated the existence of five leadership factors that encompass empowering leadership behaviors: leading by example, participative decision-making, coaching, informing and showing concern for/interacting with team members (Arnold et al. 2000). This original study includes between 7 and 12 measures for each factor. Recent research has narrowed this set to three items per factor, significantly decreasing the size of the scale while still retaining strong psychometric properties (Srivastava et al. 2006). Due to constraints on the length of the survey, this 15-item measure was used to assess empowering leadership. The items are measured on a 7-point Likert-type scale where 1 represents complete disagreement and 7 represents complete agreement. A sample measure for assessing leading by example is, "My team leader sets high standards for performance by his/her behavior." The scores for the five factors are averaged to create a measure of empowering leadership, in accordance with prior research (Srivastava et al. 2006).

Individual outcomes: Role perceptions and stress

Role ambiguity and *role conflict* are measured using a scale adapted to the team context from House, Schuler and Levanoni (1983). These measures are composed of 11 items and 7 items, respectively. These scales were developed to address criticism concerning earlier measures that were confounded with stress and comfort and thus represent more rigorously-validated measures. Both role ambiguity and role conflict are measured on 7-point Likert-type scales where 1 represents complete disagreement and 7 represents complete agreement. A sample item for role ambiguity is, "Within this team, I don't know what is expected of me." A sample item for role conflict is, "This team project often involves situations in which there are conflicting requirements."

Psychological stress is assessed with an 8-item measure adapted to the context of the team project (Stanton et al. 2001). It is measured on 7-point Likert-type scale where 1 represents complete disagreement and 7 represents complete agreement. A sample item is, "My work on this project frustrates me." The items for role ambiguity, role conflict, and stress are each averaged to obtain a single score for each measure.

Team outcome variables

Team psychological stress was aggregated from the individual to the team level by calculating the mean within-team scores of psychological stress. Following the additive compositional model logic, it is not necessary to justify aggregation of team compositional variables (Chan 1998). This approach has been used by prior exemplars in team research (e.g., Hirschfeld et al. 2006, Marrone et al. 2007).

Team performance was measured using a 5-item scale that assesses a leader's rating of their teams' efficiency, adherence to budgets and schedules, as well as the production of quality work and ability to resolve conflicts (Ancona and Caldwell 1992). The items are measured on a 7 point Likert-type scale where 1 represents complete disagreement and 7 represents complete agreement. A sample item is, "The team produced high quality technical innovations". The items were averaged to produce a single performance score for each team.

Controls

Control variables are selected for their ability to eliminate alternative interpretations that may account for variability in the dependent variable. A variable that has been established as an important control in team research is group size. Because size may indirectly influence group processes, the efficacy of leadership behaviors and role perceptions, it was included in the analysis. I also capture role perceptions and stress as they pertain to the job, as opposed to the project, to eliminate the possibility that other competing demands outside of the project may account for role perceptions and stress. To control for variability in performance and coping, gender, age, experience of team members, as well as, organizational tenure, are included in the analysis. Finally, to account for differences in how team members may experience stress resulting from unique factors pertaining to their local environment, member location is included in the analysis.

Data Collection Procedure

The surveys were administered by an external market research firm, with each survey bar-coded to maintain anonymity. Team members and leaders were administered virtually identical surveys, with the wording altered for the appropriate constituency. Three waves of data collection are necessary, with measurement points at the beginning, midpoint, and end of the project. The measurement points, respondents, and constructs measured are depicted in Table 1. The first wave captures data that is not dependent on team interaction, and measures individual characteristics that are likely to remain stable over time. Wave 2 captures empowering leadership behaviors, role perceptions, and stress. It is assessed at the midpoint of the project cycle, when teams have had adequate opportunity to establish role perceptions and experience stress, but before the project has started to wind down. Wave 3 captures project characteristics and team performance, as these factors are known only at the end of the project.

Table 1. Measurement Points and Respondents

Wave 1 Project Start	**Wave 2 Project Midpoint**	**Wave 3 Project End**
Team characteristics[2] (e.g., location, size) Individual demographics[1,2] (e.g., age, gender)	Empowering leadership[2] Role perceptions[1] Psychological stress[1]	Team and project characteristics[2] Team Performance[2]

*Note: *Respondent/ Source: [1] = team member; [2] = team leader*

RESULTS

The psychometric properties of the measures were assessed by conducting a confirmatory factor analysis (CFA). CFA allows researchers to determine how well the model fits the data. Two metrics are consistently used in prior literature and accepted as measures of good fit: comparative fit index (CFI) and the standardized root-mean square residual (SRMR) (Bentler 1990, Hu and Bentler 1999). The CFI is found to be a good estimate of the population value for a model, while SRMR reflects the average standardized residual per degree of freedom. For the CFI and SRMR, values larger than .95 and smaller than .08, respectively, are considered indicators of good fit (Hu and Bentler 1999). Convergent validity was assessed by examining the lambda values for the indicators and the average variance extracted (AVE). It is recommended that lambda values should be larger than .70 and AVEs should be larger than .50 to support convergent validity (Kline 2005). Finally, discriminate validity was assessed by comparing the square root of the AVE to the correlations among constructs. Discriminant validity is established if the constructs have more common variance with their corresponding items than with other constructs. This is demonstrated when the AVEs are greater than the inter-construct correlations (Fornell and Larcker 1981). All metrics were within their recommended thresholds, demonstrating acceptable reliability and validity.

Table 2 presents the means, standard deviations, and correlations among constructs. All variables demonstrate moderate variance. In terms of the project characteristics, project size and complexity are positively and significantly correlated, consistent with prior research (e.g., Rai et al. 2009). Project complexity is positively correlated with both role ambiguity and role conflict, while requirements volatility is positively correlated with role ambiguity. Empowering leadership is negatively correlated with project complexity, and both role ambiguity and role conflict. Both project size and role ambiguity are negatively correlated with psychological stress and team psychological stress is negatively correlated with team performance.

Model Testing

Given the hierarchically-nested nature of the model, traditional ordinary least square (OLS) approaches are inappropriate for testing the multilevel relationships in the model. These traditional approaches do not allow for a simultaneous examination of relationships at differing levels of analysis. Thus, the multilevel relationships are tested with a random coefficient modeling (RCM) technique using the software package R (version 2.6.2). This technique allows for an examination of relationships that cross levels of analysis and partitions the variance in the dependent variable into lower-level and unit-level components (Hofmann 1997). RCM also accounts for the nested structure of the data and accounts for non-independence of the observations (Bliese and Hanges 2004), which is particularly important in the current model in which individuals are nested within teams and observations at the project/team level are not independent for members of the same team. This is crucial, as failure to account for non-independence can result in inflated variance in the standard errors, which increases the likelihood of Type II errors. Furthermore, the assumption of no between-unit variance can lead to poorly estimated standard errors, thus increasing the likelihood of Type I error. RCM accounts for both between-unit variance in the dependent variable and non-independence of observations, making this approach particularly well-suited for testing the model. RCM approaches have been used extensively in the management literature and are beginning to be used in IS research, as well (Ko and Dennis 2011, Rai et al. 2009).

Table 2. Descriptive Statistics and Correlations

	M	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Member age	32.08	6.43	-																
2. Member gender	0.49	0.51	-.08																
3. Member location	1.05	0.79	.06	.08															
4. Org. Tenure	4.00	1.78	-.03	.08	-.01														
5. Member experience	3.92	1.73	.12*	.14**	-.05	.01													
6. Job role ambiguity	3.83	1.67	.04	.00	.04	.00	.01												
7. Job role conflict	3.94	1.70	.03	-.10	-.09	.01	-.20*	.06											
8. Job stress	4.12	1.70	-.03	-.03	-.09	.00	.09	-.13*	.05										
9. Team size	10.00	1.52	-.05	.00	-.08	.02	.06	-.03	.03	-.04									
10. Empowering Leadership	3.99	1.83	-.06	-.02	.06	.00	.07	.02	-.05	-.06	-.08								
11. Project Size	3.91	1.73	.00	-.03	.17**	.03	.00	-.03	.02	-.03	.05	-.05							
12. Project Complexity	4.23	1.43	-.03	-.09	.09	-.04	-.07	.00	.04	-.06	-.03	-.14**	.17**						
13. Project Volatility	4.13	1.71	.07	-.04	-.05	.04	.00	.02	-.08	.00	.01	.06	.03	-.03					
14. Role ambiguity	4.19	1.62	.00	.00	-.01	-.02	.01	-.02	-.07	-.06	.09	-.17**	-.07	.11*	.15**				
15. Role conflict	4.19	1.62	-.03	-.01	.03	.04	-.04	-.07	.04	.00	.06	-.14**	.06	.22**	-.06	.14**			
16. Stress	3.90	1.60	-.05	-.06	-.01	.06	.09	.03	.00	-.01	.02	.00	-.12*	-.08	.06	-.15**	-.03		
17. Team stress	3.86	1.01	.15	.03	-.11	-.10	.19	-.31**	-.11	-.05	.25*	-.09	.00	.16	.04	.01	.02	-.11	
18. Team performance	4.12	1.75	.16	-.21	.20	.15	-.04	.16	-.09	-.19	-.07	-.14	.10	.30**	.05	.05	.13	.00	-.34**

*Notes: 1. Member location is a dummy variable representing where team members work. 0 = China, 1 = U.S. and 2 = India; 2. Level-1 n = 350; Level-2 n = 73; 3. **p < .01; *p < .05*

Before estimating the model, empowering leadership, project size, complexity, requirements volatility, role ambiguity and role conflict were grand mean-centered. This approach is recommended for cross-level moderational models to reduce collinearity (Chen et al. 2004, Hofmann and Gavin 1998). Consistent with prior research, OLS is used to estimate effect sizes (Hofmann et al. 2003). Although nested models violate the assumption of independence required for OLS approaches, the overall R^2 values provide unbiased estimates of the variance accounted for by the models (Hofmann et al. 2003).

Direct Effects and Moderation Hypotheses Tests

H1 predicted that ISD risk factors would positively influence role ambiguity and role conflict. Models 1 and 3 of Table 3 show the direct effects of ISD risk factors on role ambiguity and role conflict. Project volatility positively influences role ambiguity ($\gamma = .15$, $p <.05$), while project complexity positively influences role conflict ($\gamma = .21$, $p <.01$). Thus, H1 is partially supported. These models explain 9% of the variance in role ambiguity and 7% of the variance in role conflict. H2 predicted that empowering leadership would reduce the negative impact of ISD risk factors on individual role perceptions. In the interaction model shown in Model 2 of Table 3, empowering leadership interacts with project size ($\gamma = -.08$, $p <.05$) and volatility ($\gamma = -.15$, $p <.01$), explaining 18% of the variance in role ambiguity ($\Delta R^2 = .09$). In the interaction model shown in Model 4 of Table 3, empowering leadership interacts with project size ($\gamma = .07$, $p <.05$), complexity ($\gamma = -.13$, $p <.01$) and requirements volatility ($\gamma = -.09$, $p <.01$) to influence role conflict. The interaction model explains 13% of the variance in role conflict ($\Delta R^2 = .06$). Thus, H2 is partially supported. H3 predicted that role ambiguity and role conflict would positively influence stress. Model 6 of Table 3 shows that only role ambiguity influences stress and that this effect is opposite of the direction predicted ($\gamma = -.15$, $p <.01$). Interestingly, as role ambiguity increases, stress decreases. This model explains 6% of the variance in stress; however, H3 is not supported. H4 predicted that empowering leadership would also reduce the negative impact of role ambiguity and role conflict on psychological stress. In the interaction model shown in Model 7 of Table 3, empowering leadership interacts with role ambiguity ($\gamma = -.09$, $p <.01$), explaining 9% of the variance in stress ($\Delta R^2 = .03$). H4 is partially supported. H5 predicted that ISD risk factors would positively impact stress. Model 5 of Table 3 shows that none of the ISD risk factors significantly impact stress at the .05 level of significance. Thus, H5 is not supported.

Table 3. Results of HLM Analysis

Dependent Variable:	**Role Ambiguity**		**Role Conflict**		**Stress**		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
R^2	.09	.18	.07	.13	.04	.06	.09
Adj. R^2	.06	.15	.04	.10	.00	.02	.05
AIC	1376.57	1371.09	1399.87	1398.71	1388.65	1385.71	1374.83
BIC	1437.64	1443.45	1472.23	1459.78	1457.24	1445.78	1439.67
Member age	-.01 (.01)	-.01 (.01)	-.01 (.01)	-.01 (.01)	-.02 (.01)	-.02 (.01)	-.01 (.01)
Member gender	.12 (.17)	.10 (.17)	-.09 (.18)	-.08 (.17)	-.10 (.17)	-.11 (.17)	-.14 (.17)
Member location	.06 (.11)	.06 (.10)	.10 (.11)	.08 (.11)	.07 (.11)	.07 (.11)	.07 (.10)
Org. tenure	-.05 (.05)	-.06 (.04)	-.00 (.05)	.00 (.05)	-.02 (.05)	-.02 (.05)	-.01 (.05)
Member experience	-.07 (.05)	-.06 (.05)	.03 (.05)	.04 (.05)	.02 (.05)	.03 (.05)	.03 (.05)
Job role ambiguity	-.02 (.05)	-.01 (.05)	.03 (.05)	.05 (.05)	.04 (.05)	.05 (.05)	.04 (.05)
Job role conflict	.04 (.05)	.05 (.05)	-.02 (.05)	-.03 (.05)	.09 (.05)†	.09 (.05)†	.09 (.05)†
Job stress	-.02 (.05)	-.04 (.05)	-.07 (.05)	-.07 (.05)	.03 (.05)	.01 (.05)	.02 (.05)
Team size	-.02 (.07)	-.05 (.06)	.01 (.07)	-.05 (.06)	-.02 (.07)	-.01 (.07)	.02 (.07)
E.Leadership	-.14 (.06)*	-.13 (.05)*	-.10 (.06)	-.02 (.05)	-.02 (.06)	-.04 (.06)	-.04 (.06)
P.Size	-.11 (.06)†	-.17 (.06)**	.01 (.06)	-.02 (.06)	-.11 (.06)†	-.11 (.06)†	-.10 (.06)†
P.Complexity	.14 (.08)†	.03 (.07)	.21 (.07)**	.09 (.07)	-.05 (.07)	-.02 (.07)	-.01 (.07)
P.Volatility	.15 (.06)*	.08 (.06)	-.03 (.06)	-.09 (.05)	.07 (.06)	.07 (.06)	.06 (.06)
E.Leadership*Size		-.08 (.03)*		.07 (.03)*			
E.Leadership*Complexity		-.02 (.04)		-.13 (.04)**			
E.Leadership *Volatility		-.15 (.03)**		-.09 (.03)**			
Role ambiguity						-.15 (.05)**	-.03 (.05)
Role conflict						-.03 (.06)	.18 (.05)**
E.Leadership*Ambiguity							-.09 (.03)**
E.Leadership*Conflict							-.05 (.03)†

*Notes: 1. Italicized variables are controls; E.Leadership = Empowering leadership, P.Size = Project size, P.Complexity = Project complexity; P.Volatility = Project requirements volatility; 2. Level-1 n = 350; Level-2 n = 73; Level-1 variables include role ambiguity and role conflict and all controls except team size. Level-2 variables include team size, empowering leadership, project size, project complexity, and project requirements volatility; 3. Standard errors are in parentheses; 4. **p < .01, *p < .05, $^{\dagger}p < .10$*

In the results described above, the interaction models account for an additional 9%, 6%, and 3% of the variance explained in role ambiguity, role conflict, and stress, respectively, above and beyond the direct effects models. While this additional variance explained might appear trivial, according to prior research these effect sizes are actually rather large, especially for field research. In their study of the difficulties of detecting interaction effects, McClellend and Judd (1993, p. 377) note, "…reduction in model error due to adding the product term is often disconcertingly low. Evans (1985), for example, concluded that moderator effects are so difficult to detect that even those explaining as little as 1% of the total variance should be considered important. Champoux and Peters (1987) and Chaplin (1991) reviewed much of the social science literature and reported that field study interactions typically account for about l%-3% of the variance." To further allay concerns about the appropriateness of the model, Table 3 also reports deviance statistics to help assess model fit: the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). These statistics allow for a comparison between the direct effects and interaction models by demonstrating the tradeoff between model accuracy (fit) and complexity (Akaike 1974, Schwarz 1978). Both measures penalize models with superfluous parameters by adding to their measure of deviance, though the BIC takes sample size into account and thus is a more conservative measure (Akaike 1974, Schwarz 1978). The lower both AIC and BIC values are, the better the model fits the data. As can be seen in Table 3, the interaction models (Model 2, 4, and 7) have lower AIC and BIC values than their direct-effects counterparts (Model 1, 3, and 6, respectively) and thus better fit the data.

To further probe the interaction effects, the significant interactions were plotted following the guidelines of Aiken and West (1991). Figures 2a-2f illustrate these plots. For the dependent variables, role ambiguity and role conflict, the plots are fairly similar. When empowering leadership is high, ISD risk factors generally have a negative relationship with role ambiguity and role conflict. One exception to this is seen in Figure 2c, which shows the interaction between project size and empowering leadership on role conflict. This plot shows that when empowering leadership is high, project size has a positive relationship with role conflict, indicating that empowering leadership is not effective in reducing the impact of project size on role conflict. Figure 2f shows the plot for the interaction between empowering leadership and role ambiguity on psychological stress. When empowering leadership is high, role ambiguity has a negative relationship with stress. Finally, I conducted a test of the simple slopes to determine whether they differ

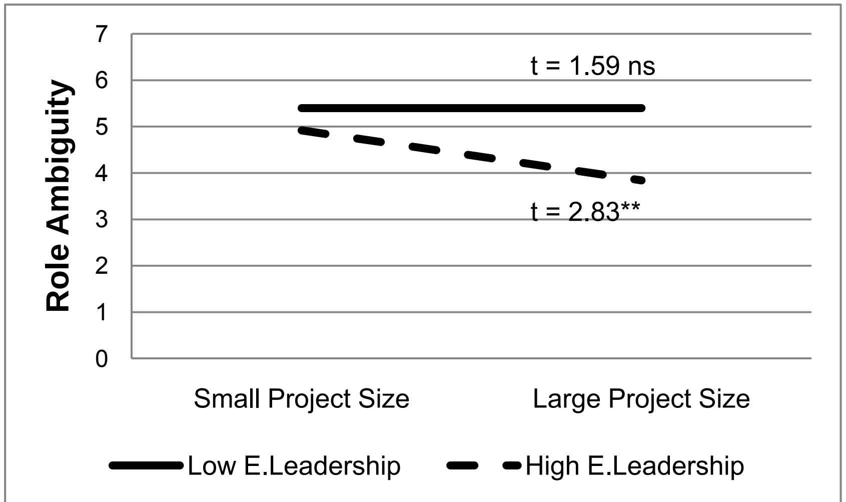

Figure 2a. Interaction Plot for Role Ambiguity (Size * Emp Leadership)

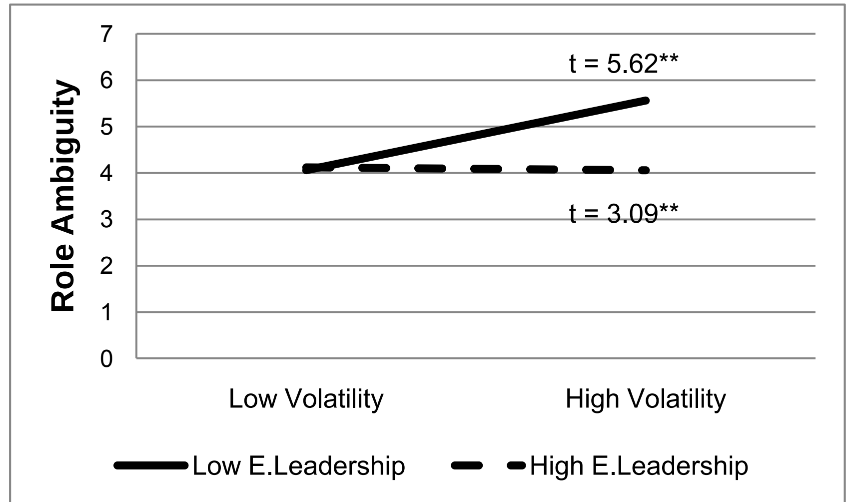

Figure 2b. Plot for Role Ambiguity (Volatility * Emp Leadership)

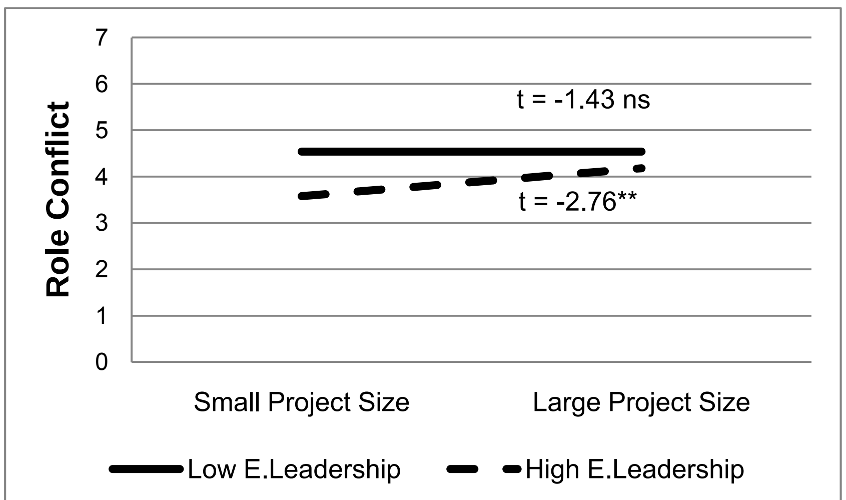

Figure 2c. Interaction Plot for Role Conflict (Size * Emp Leadership)

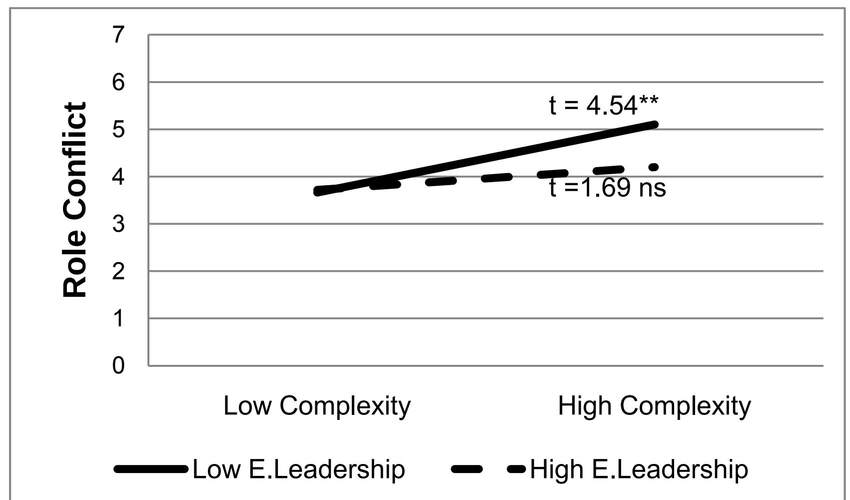

Figure 2d. Plot for Role Conflict (Complexity * Emp Leadership)

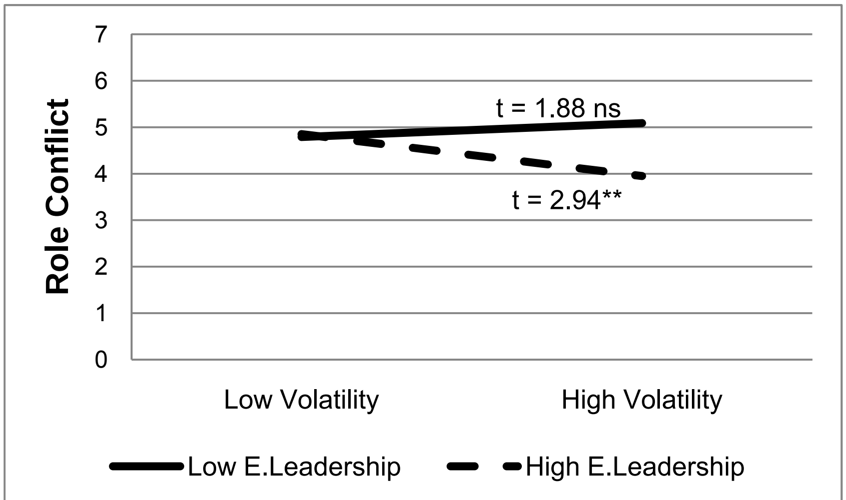

Figure 2e. Plot for Role Conflict (Volatility * Emp Leadership)

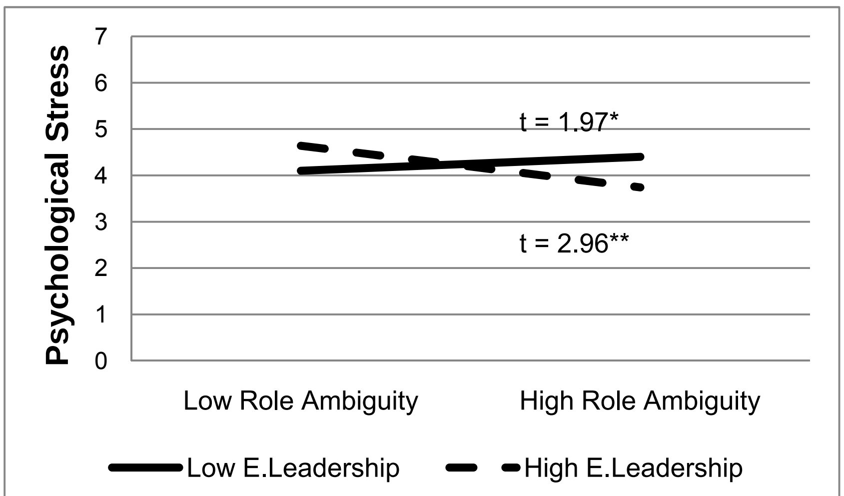

Figure 2f. Plot for Stress (Ambiguity * Emp Leadership)

*Notes on Figures 2a-2f: 1. The t-values listed on the plots represent the test statistic for the simple slope. The top value is the statistic for low empowering leadership and the bottom value is for high empowering leadership; 2. **p < .01, *p < .05*

significantly from zero. The t-values representing the test of significance for the simple slopes are given on the plots shown in Figures 2a-2f.

Mediation Hypothesis Tests

Table 4 presents the results of the model testing for H6, which predicted that role perceptions would mediate the effect of ISD risk factors on psychological stress. Following prior research (Zohar and Luria 2005), Baron and Kenny's (1986) three-step procedure to test for mediation was used. First, the ISD risk factor variables must be significantly related to stress (Model 1 of Table 4). Second, the ISD risk factor variables must be related to the mediators, role ambiguity and role conflict (Models 2 and 4 of

Table 4). Third, the ISD risk factor variables must be related to stress in the presence of the mediators, role ambiguity, and role conflict (Models 3 and 5 of Table 4). As seen in Model 1 (and in Model 4 of Table 3, the test of H5), none of the ISD risk factors were significantly related to stress at the .05 level of significance, thus all three variables fail the first step of the mediation test. Project size was significant at the .10 level, but fails the second step of the mediation test requiring a significant relationship with the mediator. Table 5 shows the results of Sobel tests (Sobel 1982) to determine the cross-level indirect effects of ISD risk factors on psychological stress. These results do not provide evidence of any significant indirect effects. Thus, H6 is not supported.

Table 4. Results of Mediation Analysis

	Model 1: Stress	**Model 2: R.ambiguity**	**Model 3: Stress**	**Model 4: R.conflict**	**Model 5: Stress**
P.Size	-.11 (.06)†	.07 (.07)	-.11 (.05)*	.05 (.06)	-.10 (.05)†
Role ambiguity	-	-	-.04 (.05)	-	-
Role conflict	-	-	-	-	.15 (.05)**
R^2	.01	.02	.00	.00	.03
ΔR^2	.01	.01	.00	.00	.03
F (1,348)	4.77*	2.66†	1.54	1.11	6.20**
P.Complexity	-.08 (.07)	.13 (.08)†	-.04 (.07)	.23 (.07)**	-.07 (.07)
Role ambiguity	-	-	-.15 (.05)**	-	-
Role conflict	-	-	-	-	-.03 (.05)
R^2	.01	.01	.03	.05	.01
ΔR^2	.00	.00	.02	.04	.01
F (1,348)	2.15	1.17	16.98**	4.46**	4.52*
P.Volatility	.07 (.06)	.14 (.07)*	.06 (.06)	-.03 (.06)	.08 (.06)
Role ambiguity	-	-	-.16 (.05)**	-	-
Role conflict	-	-	-	-	-.04 (.05)
R^2	.00	.02	.03	.00	.01
Adj. R^2	.00	.02	.02	.00	.00
F (1,348)	1.39	7.71**	4.59**	1.15	0.99

*Notes: 1. P.Size = Project Size, P.Complexity = Project Complexity; P.Volatility = Project Requirements Volatility; R.ambiguity = Role ambiguity; R.conflict = Role conflict; 2. Level-1 n = 350; Level-2 n = 73; Level-1 variables include role ambiguity, role conflict and stress. Level-2 variables include project size, project complexity and project requirements volatility; 3. Standard errors are in parentheses; 4. **p < .01; *p < .05; †p < .10*

Table 5. Sobel Tests of Indirect Effect of ISD Risk Factors on Psychological Stress, Mediated Through Role Perceptions		
Independent Variable	Indirect Effect	
	Role Ambiguity	Role Conflict
P.Size	.00	-.01
P.Complexity	.01	-.04
P.Volatility	-.01	.01

*Notes: 1. P.Size = Project Size, P.Complexity = Project Complexity; P.Volatility = Project Requirements Volatility; 2. Level-1 n = 350; Level-2 n = 73; Level-1 variables include role ambiguity, role conflict, and stress. Level-2 variables include project size, project complexity, and project requirements volatility; 3. **p < .01; *p < .05; †p < .10*

Direct Effect Test at Team Level of Analysis

Because H7 concerns a relationship at the team level of analysis, it was tested using an ordinary least squares approach. Table 6 shows the result of this analysis. H7 predicted that team psychological stress would negatively influence team performance and this was supported ($\beta = -.39$, $p < .01$). Together, with the control variables (all were aggregated to the team level and none were significant in influencing performance), the model explains 16% of the variance in team performance.

Table 6. Results of Regression Analysis		
Dependent Variable:	**Team Performance**	
	Model 1	**Model 2**
R^2	.03	.16
Adj. R^2	.02	.11
F	.20	3.57**
ΔF	-	5.63**
Member age	.12 (.06)	.09 (.05)
Member gender diversity	-.07 (1.08)	-.20 (1.02)
Member location diversity	-.07 (.75)	-.18 (.72)
Member org. tenure	.10 (.24)	.07 (.23)
Member experience	.07 (.27)	.16 (.26)
Job role ambiguity	-.02 (.25)	.06 (.24)
Job role conflict	.00 (.23)	.03 (.22)
Job stress	.02 (.22)	-.01 (.21)
Team size	.01 (.13)	.03 (.12)
Team psychological stress	-	-.39** (.22)

*Notes: 1. Italicized variables are controls. All controls are calculated as within team averages, excepting member gender and member location, which are within team standard deviations; 2. Standard errors are in parentheses; 3. n = 7; 4. **p < .01; *p < .05; †p < .10*

DISCUSSION

The cognitive and emotional well-being of IS developers is critical to producing functioning and high-quality information systems. In addition, research shows that team members' perception of their role on the team is a key driver of team success (Spreitzer et al. 1999b). Drawing from the literature on leadership, dispersed teamwork, and ISD risk factors, I hypothesized that empowering leadership would reduce the negative impact of ISD risk factors on the well-being of software developers in dispersed teams. The objective of this research was to identify whether and how empowering leadership might be a means to mitigate the effects of project size, complexity, and requirements volatility on IS developers' role ambiguity and role conflict, and ultimately lower their stress and improve their team performance. The multilevel model was tested among 73 dispersed teams composed of 350 members and their leaders working on ISD projects, with members located in China, India, and the U.S. The results show that, when project size and requirements volatility are high, empowering leadership reduces their impact on role ambiguity. When project size, complexity, and requirements volatility are high, empowering leadership can also reduce their impact on role conflict. In terms of psychological stress, empowering leadership mitigates the negative impact of role ambiguity on psychological stress. Unexpectedly, in the direct effects model, role ambiguity was observed to have a negative relationship with psychological stress. In other words, higher role ambiguity is associated with lower stress. However, results show that stress is lowest among teams where role ambiguity and empowering leadership are both high, further highlighting the positive implications of empowering leadership for dispersed ISD teams. With respect to team stress, those teams with members who reported higher levels of stress exhibited lower performance than those reporting lower levels of stress.

Theoretical Contributions

This work makes several contributions to the literature. First, it contributes to the information systems literature on dispersed ISD teams by shedding light on how leaders can help teams cope with the challenges due to project size, complexity, and requirements volatility. This is important because, while the literature has explored a number of process control techniques for managing project outcomes, there is evidence to suggest that the dispersed context requires different strategies for success (Faraj and Sambamurthy 2006, Hertel et al. 2005). The assumptions that underlie prior research on the effectiveness of process control measures are not always valid in the dispersed context (e.g., Cusumano 2008). Dispersion severs ties between leaders and their teams, resulting in a need for contextualized theories exploring the mechanisms by which dispersed team leaders can help teams to cope with the challenges they face. The results of this research show that the motivational and delegative leadership strategies embodied by the empowering leadership approach are effective mechanisms for reducing the impact of ISD risk factors on role ambiguity, role conflict, and stress. Thus, the current study unites the empowering leadership literature with that of dispersed teamwork to shed light on the theoretical mechanisms by which leadership behaviors can enhance the well-being and performance of IS developers working in dispersed teams. In doing so, this work contributes to both the information systems literature on dispersed teams and that of empowering leadership by situating it within the context of dispersion and ISD risk factors.

Second, this research contributes to the information systems literature on dispersed teams by examining the implications of role perceptions. Role perceptions have not been widely-studied in the dispersed team literature (Sutanto et al. 2005). Prior research has demonstrated difficulty on the part of dispersed team members in developing a shared understanding of the team and its structure (Hinds and Weisband 2003) and consequently, team member roles and responsibilities. Yet, little is known about how these role perceptions are formed, what impacts them, and how they can be shaped. In this research, project size, complexity, and requirements volatility do play an important part in influencing role perceptions and empowering leadership can reduce their negative effects. Clearly, future research is needed to better understand the theoretical mechanisms that underlie role perceptions in the dispersed context. One potential area for future research is the relationship between role ambiguity and stress in the dispersed context. The results of this study indicate a negative relationship between role ambiguity and psychological stress. This finding runs counter to some prior research (see Kahn et al. 1964), however, other research has found no correlation between role ambiguity and stress (e.g., Van Sell et al. 1981). However, these studies have not examined role perceptions in dispersed teams. Context may play a crucial role in terms of the effect of role ambiguity. One possibility is that empowering leadership, which engenders greater self-determination (Conger and Kanungo 1988, Kirkman and Rosen 1997, Kirkman and Rosen 1999, Spreitzer 1995), compounds the diffusion of responsibility that accompanies dispersed teamwork (Dennis and Williams 2003). Perhaps dispersed team members feel justified in shirking work or engaging in social loafing when role definitions are unclear because individual responsibility is less salient when it is diffused across a team where member presence is also less salient. Empowering leadership may be an effective mechanism for transferring and sharing responsibility with the team by delegating authority to them, thus suppressing shirking behaviors, and lowering stress. Future research is needed to investigate such possibilities.

Third, the multilevel nature of this research contributes a deeper and more holistic understanding of the higher-order project effects of ISD risk factors and leadership on individuals embedded in dispersed teams. Extant research has tended to ignore how higher-level variables influence the individual-level (Cohen and Bailey 1997, Klein and Kozlowski 2000). The current study's multilevel focus on the social enablers of individual coping augments prior work in the IS literature which has focused on the organizational or project-level factors that influence ISD projects (e.g., Banker et al. 1998, Barki et al. 2001, Beath and Orlikowski 1994, Gemino et al. 2008, Kirsch 1996, Kirsch 1997). Results show that the individual-level impacts of ISD risk factors are also important to understand as they have implications for how individuals understand their role in the team. By opening up the "black box" and examining project-level impacts on individual-level outcomes, this work provides insight into the underlying nature of leadership interventions and represents a point of departure for future research addressing team performance.

Finally, this research contributes to the empowering leadership literature by shedding light on whether and how empowering leadership can help individuals cope with the context of their project. By grounding this exploration through consideration of the effects of dispersion and project characteristics, this study offers insight into the contextual factors that bound the efficacy of empowering leadership. In a dispersed context, when certain ISD risk factors are high, empowering leadership is effective in reducing role ambiguity and role conflict. However, in the case of role ambiguity, when project volatility is low, empowering leadership is not effective in reducing role ambiguity. Similarly, when project complexity and volatility are low, empowering leadership is not effective in reducing role conflict. Not only is empowering leadership found to be ineffective in reducing role ambiguity and conflict under certain project conditions, the results show that it may be detrimental to team members when roles are clearly defined, as a high degree of empowering leadership actually leads to greater stress when role ambiguity is low. Understanding the limits of leadership approaches and the boundary conditions that govern theories is important and responds to calls for greater contextualization in both IS and management research (Avgerou 2001, Johns 2006, Rousseau 2011, Rousseau and Fried 2001).

Limitations and Future Research Directions

While the findings of this work may stimulate further research, so too, will its limitations. In particular, I note three key limitations. First, the survey was cross-sectional, prompting concerns of common method variance (CMV). This concern is alleviated to some degree by following steps recommend to reduce CMV (Podsakoff et al. 2003). The constructs were measured from different sources (members and leaders), and the survey was structured so as to proximally separate the predictor and criterion variables. Steps were taken to communicate to respondents that their anonymity would be protected (the surveys were administered by an external market research firm) to reduce evaluation apprehension and threats of social desirability bias. Finally, statistical analyses that minimize concerns related to CMV were conducted and results show that it was not a concern (Podsakoff et al. 2003). Still, longitudinal research is needed to completely rule out the possibility of CMV. Longitudinal analysis may also prove fruitful in shedding light on the effectiveness of empowering leadership throughout the team's life cycle.

Second, data were collected from only one company. Although respondents spanned several different countries, the organizational culture, work climate, or practices of this particular organization may have some influence on the results observed. In addition, the demographic profile of this organization is somewhat unique in that a large percentage of the team members and leaders are women. Prior research finds that supervisor-employee relationships may be different for men versus women (e.g., Wayne et al. 1994). For the purpose of generalizability, it will be important to examine this model not only in other organizations and cultures, but also with different gender compositions.

Third, only three ISD risk factors were studied. A variety of other project characteristics have been identified as potential risk factors, including team composition, availability of expertise, and top management support (Banker et al. 1998, Barki et al. 1993, Gopal et al. 2002, Griffin 1997, Jiang et al. 2000, Schmidt et al. 2001). To fully explore the conditions under which empowering leadership is an effective mechanism to help dispersed teams cope, future research should consider other important project characteristics.

Practical Implications

The results of this also work provide important implications for the management of dispersed ISD teams. Despite their lack of direct connection to team members, leaders of dispersed teams can have an important influence on the well-being of their team members. Organizations should give careful consideration to how team leaders are trained and imbue them with the tools necessary to help them adjust to this complex leadership environment. The contemporary approach to IS development, in addition to the rapid evolution of technology and development tools, requires expertise that is highly specialized and increasingly dispersed. This reality means that traditional leadership approaches that are centralized or directive in nature are likely to be ineffective and that different leadership approaches are warranted. In dispersed teams, research shows that it is particularly important that individuals demonstrate a high level of initiative and proactivity (Blackburn et al. 2003) and that these behaviors can be encouraged though empowering leadership (Kirkman et al. 2004). The results offered here build on this work and suggest that, for organizations to help teams lower their stress and improve performance, they should encourage team leaders to engage in empowering leadership behaviors. Empowering leadership behaviors include leading by example, fostering participative decision-making, coaching, keeping the team informed and showing concern for/interacting with team members (Arnold et al. 2000). Such behaviors are shown to increase individual initiative and proactivity and can help individuals cope with ISD risk factors by reducing the impact they have on role ambiguity and role conflict. Furthermore, such behaviors help to reduce the impact that role ambiguity has on psychological stress, which ultimately improves performance. Team leaders will want to assess the characteristics of a project to determine if it warrants an empowerment approach. If a project is not large, complex and volatile, empowering leadership may not be effective, and in some cases, may be detrimental to the well-being of team members.

CONCLUSIONS

In this research, I present a multilevel model of empowering leadership and ISD risk factors with the objective of understanding how these forces influence the well-being and performance of IS developers working in dispersed teams. Based on an empirical study of 350 individuals embedded in 73 globally-dispersed teams, results show that empowering leadership is effective in reducing the influence of ISD risk factors (size, complexity, and requirements volatility) on role ambiguity and role conflict. Furthermore, empowering leadership can help mitigate the negative impact of role ambiguity on psychological stress. Lower stress levels among team members helps to improve team performance. The findings have implications for future research on leadership interventions in the dispersed context and shed light on the factors that shape the efficacy of empowering leadership.

REFERENCES

Ahuja, M. K., Chudoba, K. M., Kacmar, C. J., McKnight, D. H., and George, J. F. 2007. "ICT Road Warriors: Balancing Work-Family Conflict, Job Autonomy, and Work Overload to Mitigate Turnover Intentions," *MIS Quarterly* (31:1), pp. 1-17.

Aiken, L. S., and West, S. G. 1991. *Multiple Regression: Testing and Interpreting Interactions*, Newbury Park, CA: Sage Publications.

Akaike, H. 1974. "A New Look at the Statistical Model Identification," *IEEE Transactions on Automatic Control* (19:6), pp. 716-723.

Ancona, D. G., and Caldwell, D. F. 1992. "Demography and Design: Predictors of New Product Team Performance," *Organization Science* (3:3), pp. 321-341.

Arnold, J. A., Arad, S., Rhoades, J. A., and Drasgow, F. 2000. "The Empowering Leadership Questionnaire: The Construction and Validation of a New Scale for Measuring Leader Behaviors," *Journal of Organizational Behavior* (21:3), pp. 249-269.

Avgerou, C. 2001. "The Significance of Context in Information Systems and Organizational Change," *Information Systems Journal* (11:1), pp. 43-63.

Baccarini, D. 1996. "The Concept of Project Complexity—a Review," *International Journal of Project Management* (14:4), pp. 201-204.

Baker, S. R. 2004. "Intrinsic, Extrinsic, and Amotivational Orientations: Their Role in University Adjustment, Stress, Well-Being, and Subsequent Academic Performance," *Current Psychology* (23:3), pp. 189-202.

Bandura, A. 1997. *Self-Efficacy: The Exercise of Control*, New York, NY: Freeman.

Banker, R. D., Davis, G. B., and Slaughter, S. A. 1998. "Software Development Practices, Software Complexity, and Software Maintenance Performance: A Field Study," *Management Science* (44:4), pp. 433-450.

Barki, H., Rivard, S., and Talbot, J. 1993. "Toward an Assessment of Software Development Risk," *Journal of Management Information Systems* (10:2), pp. 203-225.

Barki, H., Rivard, S., and Talbot, J. 2001. "An Integrative Contingency Model of Software Project Risk Management," *Journal of Management Information Systems* (17:4), pp. 37-69.

Barling, J., Kelloway, E. K., and Frone, M. R. 2005. *Handbook of Work Stress*, Thousand Oaks, CA: Sage Publications.

Baron, R. M., and Kenny, D. A. 1986. "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Journal of Personality and Social Psychology* (51:6), pp. 1173-1182.

Baroudi, J. J. 1985. "The Impact of Role Variables on IS Personnel Work Attitudes and Intentions," *MIS Quarterly* (9:4), pp. 341-356.

Beath, C. M., and Orlikowski, W. J. 1994. "The Contradictory Structure of Systems Development Methodologies: Deconstructing the IS-User Relationship in Information Engineering," *Information Systems Research* (5:4), pp. 350-377.

Beauchamp, M. R., Bray, S. R., Eys, M. A., and Carron, A. V. 2002. "Role Ambiguity, Role Efficacy, and Role Performance: Multidimensional and Mediational Relationships within Interdependent Sport Teams," *Group Dynamics: Theory, Research, and Practice* (6:3), pp. 229-242.

Bentler, P. M. 1990. "Comparative Fit Indexes in Structural Models," *Psychological Bulletin* (107:2), pp. 238-246.

Bettencourt, L. A., and Brown, S. W. 2003. "Role Stressors and Customer-Oriented Boundary-Spanning Behaviors in Service Organizations," *Journal of the Academy of Marketing Science* (31:4), pp. 394-408.

Blackburn, R. S., Furst, S. A., and Rosen, B. 2003. "Building a Winning Virtual Team," in *Virtual Teams That Work: Creating the Conditions for Virtual Team Effectiveness,* C. Gibson, and S.G. Cohen (eds.), San Francisco, CA: Jossey-Bass, pp. 95–120.

Bliese, P. D., and Hanges, P. J. 2004. "Being Both Too Liberal and Too Conservative: The Perils of Treating Grouped Data as Though They Were Independent," *Organizational Research Methods* (7:4), pp. 400-417.

Boehm, B. W., and Papaccio, P. N. 1988. "Understanding and Controlling Software Costs," *IEEE Transactions on Software Engineering* (14:10), pp. 1462-1477.

Brandel, M. 2011. *IT Workers: Under Pressure and Underpaid*, Computerworld (http://www.computerworld.com/s/article/355313/Under_Pressure_Underpaid).

Bray, S. R., and Brawley, L. R. 2002. "Role Efficacy, Role Clarity, and Role Performance Effectiveness," *Small Group Research* (33:2), pp. 233-253.

Carton, A. M., and Aiello, J. R. 2009. "Control and Anticipation of Social Interruptions: Reduced Stress and Improved Task Performance," *Journal of Applied Social Psychology* (39:1), pp. 169-185.

Chan, D. 1998. "Functional Relations among Constructs in the Same Content Domain at Different Levels of Analysis: A Typology of Composition Models," *Journal of Applied Psychology* (83:2), pp. 234-246.

Chebat, J. C., and Kollias, P. 2000. "The Impact of Empowerment on Customer Contact Employees' Roles in Service Organizations," *Journal of Service Research* (3:1), pp. 66-81.

Chen, G., Kirkman, B. L., Kanfer, R., Allen, D., and Rosen, B. 2007. "A Multilevel Study of Leadership, Empowerment, and Performance in Teams," *Journal of Applied Psychology* (92:2), pp. 331-345.

Chen, G., Mathieu, J. E., and Bliese, P. D. 2004. "A Framework for Conducting Multi-Level Construct Validation," in *Research in Multi-Level Issues: Multi-Level Issues in Organizational Behavior and Processes,* F.J. Yammarino, and F. Dansereau (eds.), Oxford, England: Elsevier, pp. 273-303.

Choudhury, V., and Sabherwal, R. 2003. "Portfolios of Control in Outsourced Software Development Projects," *Information Systems Research* (14:3), pp. 291-314.

Cohen, S. G., and Bailey, D. E. 1997. "What Makes Teams Work: Group Effectiveness Research from the Shop Floor to the Executive Suite," *Journal of Management* (23:3), pp. 239-290.

Computerworld. 2011. *Employees Rate Satisfaction, Security and Stress*, (http://www.computerworld.com/s/article/9214742/Employees_Rate_Satisfaction_Security_and_Stress).

Conger, J. A., and Kanungo, R. N. 1988. "The Empowerment Process: Integrating Theory and Practice," *Academy of Management Review* (13:3), pp. 471-482.

Cummings, L. L., Hinton, B. L., and Gobdel, B. C. 1975. "Creative Behavior as a Function of Task Environment: Impact of Objectives, Procedures, and Controls," *Academy of Management Journal* (18:3), pp. 489-499.

Cusumano, M. A. 2008. "Managing Software Development in Globally Distributed Teams," *Communications of the ACM* (51:2), pp. 15-17.

Deci, E. L., and Ryan, R. M. 1985. *Intrinsic Motivation and Self-Determination in Human Behavior*, New York, NY: Plenum.

Dennis, A., and Williams, M. 2003. "Electronic Brainstorming: Theory, Research, and Future Directions," in *Group Creativity: Innovation through Collaboration,* P.B. Paulus, and B.A. Nijstad (eds.), New York, NY: Oxford University Press, pp. 160-178.

Driskell, J. E., Salas, E., and Johnston, J. 1999. "Does Stress Lead to a Loss of Team Perspective?," *Group Dynamics* (3:4), pp. 291-302.

Ellis, A. P. J. 2006. "System Breakdown: The Role of Mental Models and Transactive Memory in the Relationship between Acute Stress and Team Performance," *Academy of Management Journal* (49:3), pp. 576-589.

Espinosa, J. A., Slaughter, S. A., Kraut, R. E., and Herbsleb, J. D. 2007. "Team Knowledge and Coordination in Geographically Distributed Software Development," *Journal of Management Information Systems* (24:1), pp. 135-169.

Ewusi-Mensah, K. 1997. "Critical Issues in Abandoned Information Systems Development Projects," *Communications of the ACM* (40:9), pp. 74-80.

Faraj, S., and Sambamurthy, V. 2006. "Leadership of Information Systems Development Projects," *IEEE Transactions on Engineering Management* (53:2), pp. 238-249.

Faraj, S., and Sproull, L. 2000. "Coordinating Expertise in Software Development Teams," *Management Science* (46:12), pp. 1554-1568.

Fayol, H. 1949. *General and Industrial Management (Constance Storrs, Trans.)*, London, England: Pitman and Sons, Ltd.

Fornell, C., and Larcker, D. F. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18:1), pp. 39-50.

Ganster, D. C., and Schaubroeck, J. 1991. "Work Stress and Employee Health," *Journal of Management* (17:2), pp. 235-271.

Gemino, A., Reich, B. H., and Sauer, C. 2008. "A Temporal Model of Information Technology Project Performance," *Journal of Management Information Systems* (24:3), pp. 9-44.

Gerwin, D., and Moffat, L. 1997. "Withdrawal of Team Autonomy During Concurrent Engineering," *Management Science* (43:9), pp. 1275-1287.

Gladstein, D. L., and Reilly, N. P. 1985. "Group Decision Making under Threat: The Tycoon Game," *Academy of Management Journal* (28:3), pp. 613-627.

Gopal, A., Mukhopadhyay, T., and Krishnan, M. S. 2002. "The Role of Software Processes and Communication in Offshore Software Development," *Communications of the ACM* (45:4), pp. 193-200.

Griffin, A. 1997. "The Effect of Project and Process Characteristics on Product Development Cycle Time," *Journal of Marketing Research* (34:1), pp. 24-35.

Guinan, P. J., Cooprider, J. G., and Faraj, S. 1998. "Enabling Software Development Team Performance During Requirements Definition: A Behavioral Versus Technical Approach," *Information Systems Research* (9:2), pp. 101-125.

Guzman, I. R., Stam, K. R., and Stanton, J. M. 2008. "The Occupational Culture of IS/IT Personnel within Organizations," *DATA BASE for Advances in Information Systems* (39:1), pp. 33-50.

Hackman, J. R., and Oldham, G. R. 1980. *Work Redesign*, Reading, MA: Addison-Wesley Publishing Company.

Hertel, G., Geister, S., and Konradt, U. 2005. "Managing Virtual Teams: A Review of Current Empirical Research," *Human Resource Management Review* (15:1), pp. 69-95.

Hinds, P. J., and Weisband, S. P. 2003. "Knowledge Sharing and Shared Understanding in Virtual Teams," in *Virtual Teams That Work: Creating Conditions for Virtual Team Effectiveness,* C.B. Gibson, and S.G. Cohen (eds.), San Francisco, CA: Jossey-Bass, pp. 21-36.

Hirschfeld, R. R., Jordan, M. H., Feild, H. S., Giles, W. F., and Armenakis, A. A. 2006. "Becoming Team Players: Team Members' Mastery of Teamwork Knowledge as a Predictor of Team Task

Proficiency and Observed Teamwork Effectiveness," *Journal of Applied Psychology* (91:2), pp. 467-474.

Hofmann, D. A. 1997. "An Overview of the Logic and Rationale of Hierarchical Linear Models," *Journal of Management* (23:6), pp. 723-744.

Hofmann, D. A., and Gavin, M. B. 1998. "Centering Decisions in Hierarchical Linear Models: Implications for Research in Organizations," *Journal of Management* (24:5), pp. 623-641.

Hofmann, D. A., Morgeson, F. P., and Gerras, S. J. 2003. "Climate as a Moderator of the Relationship between Leader-Member Exchange and Content Specific Citizenship: Safety Climate as an Exemplar," *Journal of Applied Psychology* (88:1), pp. 170-178.

House, J. S. 1981. *Work Stress and Social Support*, Reading, MA: Addison-Wesley Publishing Company.

House, R. J., Schuler, R. S., and Levanoni, E. 1983. "Role Conflict and Ambiguity Scales: Reality or Artifacts," *Journal of Applied Psychology* (68:2), pp. 334-337.

Hu, L., and Bentler, P. M. 1999. "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives," *Structural Equation Modeling* (6:1), pp. 1-55.

Jex, S. M., Bliese, P. D., Buzzell, S., and Primeau, J. 2001. "The Impact of Self-Efficacy on Stressor-Strain Relations: Coping Style as an Explanatory Mechanism," *Journal of Applied Psychology* (86:3), pp. 401-409.

Jex, S. M., and Gudanowski, D. M. 1992. "Efficacy Beliefs and Work Stress: An Exploratory Study," *Journal of Organizational Behavior* (13:5), pp. 509-517.

Jiang, J. J., Klein, G., and Means, T. L. 2000. "Project Risk Impact on Software Development Team Performance," *Project Management Journal* (31:4), pp. 19-26.

Johns, G. 2006. "The Essential Impact of Context on Organizational Behavior," *Academy of Management Review* (31:2), pp. 386-408.

Joseph, D., Ng, K., Koh, C., and Ang, S. 2007. "Turnover of IT Professionals: A Narrative Review, Meta-Analytic Structural Equation Modeling, and Model Development," *MIS Quarterly* (31:3), pp. 1–31.

Joshi, A., Lazarova, M. B., and Liao, H. 2009. "Getting Everyone on Board: The Role of Inspirational Leadership in Geographically Dispersed Teams," *Organization Science* (20:1), pp. 240-252.

Kahn, R. L., Wolfe, D., Quinn, R., Snoek, J., and Rosenthal, R. 1964. *Organizational Stress: Studies in Role Conflict and Ambiguity*, New York, NY: John, Wiley & Sons, Inc.

Kayworth, T. R., and Leidner, D. E. 2002. "Leadership Effectiveness in Global Virtual Teams," *Journal of Management Information Systems* (18:3), pp. 7-40.

Keil, M., Tiwana, A., and Bush, A. 2002. "Reconciling User and Project Manager Perceptions of IT Project Risk: A Delphi Study," *Information Systems Journal* (12:2), pp. 103-119.

Kirkman, B. L., and Rosen, B. 1997. "A Model of Work Team Empowerment," in *Research in Organizational Change and Development,* R.W. Woodman, and W.A. Pasmore (eds.), Greenwich, CT: JAI Press, pp. 131-167.

Kirkman, B. L., and Rosen, B. 1999. "Beyond Self-Management: Antecedents and Consequences of Team Empowerment," *Academy of Management Journal* (42:1), pp. 58-74.

Kirkman, B. L., Rosen, B., Tesluk, P. E., and Gibson, C. B. 2004. "The Impact of Team Empowerment on Virtual Team Performance: The Moderating Role of Face-to-Face Interaction," *Academy of Management Journal* (47:2), pp. 175-192.

Kirsch, L. J. 1996. "The Management of Complex Tasks in Organizations: Controlling the Systems Development Process," *Organization Science* (7:1), pp. 1-21.

Kirsch, L. S. 1997. "Portfolios of Control Modes and IS Project Management," *Information Systems Research* (8:3), pp. 215-239.

Klein, K. J., and Kozlowski, S. W. 2000. "From Micro to Meso: Critical Steps in Conceptualizing and Conducting Multilevel Research," *Organizational Research Methods* (3:3), pp. 211-236.

Kline, R. B. 2005. *Principles and Practice of Structural Equation Modeling*, New York, NY: The Guilford Press.

Ko, D. G., and Dennis, A. R. 2011. "Profiting from Knowledge Management: The Impact of Time and Experience," *Information Systems Research* (22:1), pp. 134-152.

Kozlowski, S. W., and Bell, B. S. 2003. "Work Groups and Teams in Organizations," in *Comprehensive Handbook of Psychology: Vol. 12 Industrial and Organizational Psychology,* W.C. Borman, D.R. Ilgen, and R.J. Klimoski (eds.), New York, NY: John, Wiley & Sons, Inc., pp. 333-375.

Kozlowski, S. W., and Klein, K. J. 2000. "A Multilevel Approach to Theory and Research in Organizations: Contextual, Temporal, and Emergent Processes," in *Multilevel Theory, Research and Methods in Organizations: Foundations, Extensions, and New Directions,* K.J. Klein, and S.W. Kozlowski (eds.), San Francisco, CA: Jossey-Bass, pp. 3-90.

Lee, G., and Xia, W. 2005. "The Ability of Information Systems Development Project Teams to Respond to Business and Technology Changes: A Study of Flexibility Measures," *European Journal of Information Systems* (14:1), pp. 75-92.

Lee, P. C. B. 2000. "Turnover of Information Technology Professionals: A Contextual Model," *Accounting, Management and Information Technology* (10:2), pp. 101-124.

Lee, P. C. B. 2001. "The Impact of Role Variables on Turnover Intentions of Information Technology Professionals: An Examination of Moderating Effects," in *Proceedings of the 7th Americas Conference on Information Systems*, Boston, MA, pp. 1483-1489.

Locke, E. A., Alavi, M., and Wagner, J. A. 1997. "Participation in Decision Making: An Information Exchange Perspective," in *Research in Personnel and Human Resources Management,* G.R. Ferris (ed.), Greenwich, CN: JAI Press, pp. 293-331.

MacCormack, A., Verganti, R., and Iansiti, M. 2001. "Developing Products On "Internet Time": The Anatomy of a Flexible Development Process," *Management Science* (47:1), pp. 133-150.

Manz, C. C., and Sims, H. P. 1987. "Leading Workers to Lead Themselves: The External Leadership of Self-Managing Work Teams," *Administrative Science Quarterly* (32:1), pp. 106-128.

Marrone, J. A., Tesluk, P. E., and Carson, J. B. 2007. "A Multilevel Investigation of Antecedents and Consequences of Team Member Boundary-Spanning Behavior," *Academy of Management Journal* (50:6), pp. 1423-1439.

Martins, L. L., Gilson, L., L., and Maynard, M. T. 2004. "Virtual Teams: What Do We Know and Where Do We Go from Here?," *Journal of Management* (30:6), pp. 805-835.

Maruping, L. M., Venkatesh, V., and Agarwal, R. 2009. "A Control Theory Perspective on Agile Methodology Use and Changing User Requirements," *Information Systems Research* (20:3), pp. 377-399.

Mathieu, J. E., Gilson, L. L., and Ruddy, T. M. 2006. "Empowerment and Team Effectiveness: An Empirical Test of an Integrated Model," *Journal of Applied Psychology* (91:1), pp. 97-108.

McClelland, G. H., and Judd, C. M. 1993. "Statistical Difficulties of Detecting Interactions and Moderator Effects," *Psychological Bulletin* (114:2), pp. 376-390.

Meglino, B. M. 1977. "Stress and Performance: Are They Always Incompatible?," *Supervisory Management* (22:3), pp. 2-12.

Moore, J. E. 2000. "One Road to Turnover: An Examination of Work Exhaustion in Technology Professionals," *MIS Quarterly* (24:1), pp. 141-168.

Morgeson, F. P., DeRue, D. S., and Karam, E. P. 2010. "Leadership in Teams: A Functional Approach to Understanding Leadership Structures and Processes," *Journal of Management* (36:1), pp. 5-39.

O'Driscoll, M. P., and Beehr, T. A. 2000. "Moderating Effects of Perceived Control and Need for Clarity on the Relationship between Role Stressors and Employee Affective Reactions," *Journal of Social Psychology* (140:2), pp. 151-159.

Pennington, R., and Tuttle, B. 2007. "The Effects of Information Overload on Software Project Risk Assessment," *Decision Sciences* (38:3), pp. 489-526.

Perrewé, P. L., Zellars, K. L., Ferris, G. R., Rossi, A. M., Kacmar, C. J., Ralston, D. A., and Rossi, A. M. 2004. "Neutralizing Job Stressors: Political Skill as an Antidote to the Dysfunctional Consequences of Role Conflict," *Academy of Management Journal* (47:1), pp. 141-152.

Peterson, M. F., Smith, P. B., Akande, A., Ayestaran, S., Bochner, S., Callan, V., Cho, N. G., Jesuino, J. C., D'Amorim, M., Francois, P. H., Hofman, K., Koopman, K., Lim, T. K., Mortazavi, S., Munene, J., Radford, M., Ropo, A., Savage, G., Setiadi, B., Sinha, T. N., Sorenson, R., and Viedge, C. 1995. "Role Conflict, Ambiguity, and Overload: A 21-Nation Study," *Academy of Management Journal* (38:2), pp. 429-452.

Pettijohn, C., Pettijohn, L. S., Taylor, A. J., and Keillor, B. D. 2001. "Are Performance Appraisals a Bureaucratic Exercise or Can They Be Used to Enhance Sales Force Satisfaction and Commitment?," *Psychology and Marketing* (18:4), pp. 337-364.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology* (88:5), pp. 879-902.

Powell, A., Piccoli, G., and Ives, B. 2004. "Virtual Teams: A Review of Current Literature and Directions for Future Research," *DATA BASE for Advances in Information Systems* (35:1), pp. 6-36.

Pulakos, E. D., Arad, S., Donovan, M. A., and Plamondon, K. E. 2000. "Adaptability in the Workplace: Development of a Taxonomy of Adaptive Performance," *Journal of Applied Psychology* (85:4), pp. 612-624.

Rahim, M. A. 2011. *Managing Conflict in Organizations*, New Brunswick, NJ: Transaction Publishers.

Rai, A., Maruping, L. M., and Venkatesh, V. 2009. "Offshore Information Systems Project Success: The Role of Social Embeddedness and Cultural Characteristics," *MIS Quarterly* (33:3), pp. 617-641.

Rizzo, J. R., House, R. J., and Lirtzman, S. I. 1970. "Role Conflict and Ambiguity in Complex Organizations," *Administrative Science Quarterly* (15:2), pp. 150-163.

Rousseau, D. M. 2011. "Reinforcing the Micro/Macro Bridge: Organizational Thinking and Pluralistic Vehicles," *Journal of Management* (37:2), pp. 429-442.

Rousseau, D. M., and Fried, Y. 2001. "Location, Location, Location: Contextualizing Organizational Research," *Journal of Organizational Behavior* (22:1), pp. 1-13.

Santosus, M. 2003. *Why You Need a Project Management Office (PMO)*, CIO Magazine (http://www.cio.com/article/29887/Why_You_Need_a_Project_Management_Office_PMO_).

Sarker, S., and Lee, A. S. 2003. "Using a Case Study to Test the Role of Three Key Social Enablers in ERP Implementation," *Information & Management* (40:8), pp. 813-829.

Sarker, S., and Sarker, S. 2009. "Exploring Agility in Distributed Information Systems Development Teams: An Interpretive Study in an Offshoring Context," *Information Systems Research* (20:3), pp. 440-461.

Sauer, C., Gemino, A., and Reich, B. H. 2007. "The Impact of Size and Volatility on I.T. Project Performance," *Communications of the ACM* (50:11), pp. 79-84.

Schmidt, R., Lyytinen, K., Keil, M., and Cule, P. 2001. "Identifying Software Project Risks: An International Delphi Study," *Journal of Management Information Systems* (17:4), pp. 5-36.

Schwarz, G. 1978. "Estimating the Dimension of a Model," *The Annals of Statistics* (6:2), pp. 461-464.

Sobel, M. E. 1982. "Asymptotic Confidence Intervals for Indirect Effects in Structural Equation Models," in *Sociological Methodology,* S. Leinhardt (ed.), Washington, DC: pp. 290-312.

Sonnentag, S., and Kruel, U. 2006. "Psychological Detachment from Work During Off-Job Time: The Role of Job Stressors, Job Involvement, and Recovery-Related Self-Efficacy," *European Journal of Work and Organizational Psychology* (15:2), pp. 197-217.

Spector, P. E. 1994. "Using Self-Report Questionnaires in O.B. Research: A Comment on the Use of a Controversial Method," *Journal of Organizational Behavior* (15:5), pp. 385-392.

Speier, C., and Venkatesh, V. 2002. "The Hidden Minefields in the Adoption of Sales Force Automation Technologies," *Journal of Marketing* (66:3), pp. 98-111.

Spreitzer, G. M. 1995. "Psychological Empowerment in the Workplace: Dimensions, Measurement, and Validation," *Academy of Management Journal* (38:5), pp. 1442-1466.

Spreitzer, G. M., De Janasz, S. C., and Quinn, R. E. 1999a. "Empowered to Lead: The Role of Psychological Empowerment in Leadership," *Journal of Organizational Behavior* (20:4), pp. 511-526.

Spreitzer, G. M., Noble, D. S., Mishra, A. K., Cooke, W. N., and Wageman, R. 1999b. "Predicting Process Improvement Team Performance in an Automotive Firm: Explicating the Roles of Trust and Empowerment," in *Research on Managing Groups and Teams,* E.A. Mannix, and M.A. Neale (eds.), Greenwich, CT: JAI Press, pp. 71-92.

Srivastava, A., Bartol, K. M., and Locke, E. A. 2006. "Empowering Leadership in Management Teams: Effects of Knowledge Sharing, Efficacy, and Performance," *Academy of Management Journal* (49:6), pp. 1239-1251.

Stanton, J. M., Balzer, W. K., Smith, P. C., Parra, L. F., and Ironson, G. 2001. "A General Measure of Work Stress: The Stress in General Scale," *Educational and Psychological Measurement* (61:5), pp. 866-888.

Stellman, A., and Greene, J. 2005. *Applied Software Project Management*, Sebastopol, CA: O'Reilly Media Inc.

Sutanto, J., Phang, C. W., Kuan, H. H., Kankanhalli, A., and Tan, B. C. Y. 2005. "Vicious and Virtuous Cycles in Global Virtual Team Role Coordination," in *Proceedings of the 38th Annual Hawaii International Conference on System Sciences*, Hawaii, pp. 1-10.

Tan, B. C. Y., Wei, K. K., and Lee-Partridge, J. E. 1999. "Effects of Facilitation and Leadership on Meeting Outcomes in a Group Support System Environment," *European Journal of Information Systems* (8:4), pp. 233-246.

Thite, M. 2000. "Leadership Styles in Information Technology Projects," *International Journal of Project Management* (18:4), pp. 235-241.

Thomas, K. W., and Velthouse, B. A. 1990. "Cognitive Elements of Empowerment: An 'Interpretive' Model of Intrinsic Task Motivation," *Academy of Management Review* (15:4), pp. 666-681.

Thompson, J. D. 1967. *Organizations in Action*, New York. NY: McGraw-Hill.

Tubre, T. C., and Collins, J. M. 2000. "Jackson and Schuler (1985) Revisited: A Meta-Analysis of the Relationships between Role Ambiguity, Role Conflict, and Job Performance," *Journal of Management* (26:1), pp. 155-169.

Tyran, K. L., Tyran, C. K., and Shephard, M. 2003. "Exploring Emerging Leadership in Virtual Teams," in *Virtual Teams That Work: Creating Conditions for Virtual Team Effectiveness,* C.B. Gibson, and S.G. Cohen (eds.), San Francisco, CA: Jossey-Bass, pp. 183-195.

Van Sell, M., Brief, A. P., and Schuler, R. S. 1981. "Role Conflict and Role Ambiguity: Integration of the Literature and Directions for Future Research," *Human Relations* (34:1), pp. 43-71.

Vecchio, R. P., Justin, J. E., and Pearce, C. L. 2010. "Empowering Leadership: An Examination of Mediating Mechanisms within a Hierarchical Structure," *The Leadership Quarterly* (21:3), pp. 530-542.

Verma, V. K., and Wideman, R. M. 2002. "Project Manager to Project Leader? And the Rocky Road Between," in *Proceedings of the Project Management Institute's 25th Annual Seminar & Symposium*, Vancouver, British Columbia, pp. 627-633.

Wageman, R. 2001. "How Leaders Foster Self-Managing Team Effectiveness: Design Choices Versus Hands-on Coaching," *Organization Science* (12:5), pp. 559-577.

Wakefield, R. L., Leidner, D. E., and Garrison, G. 2008. "A Model of Conflict, Leadership, and Performance in Virtual Teams," *Information Systems Research* (19:4), pp. 434-455.

Wallace, L., Keil, M., and Rai, A. 2004. "How Software Project Risk Affects Project Performance: An Investigation of the Dimensions of Risk and an Exploratory Model," *Decision Sciences* (35:2), pp. 289-321.

Warwick, D. P., and Lininger, C. A. 1975. *The Sample Survey: Theory and Practice*, New York, NY: McGraw-Hill.

Wayne, S. J., Liden, R. C., and Sparrowe, R. T. 1994. "Developing Leader-Member Exchanges: The Influence of Gender and Ingratiation," *American Behavioral Scientist* (37:5), pp. 697-714.

Webster, J., and Staples, D. S. 2006. "Comparing Virtual Teams to Traditional Teams: An Identification of New Research Opportunities," in *Research in Personnel and Human Resources Management,* J.J. Martocchio (ed.), San Diego, CA: Elsevier, pp. 183-218.

Weiss, M. 1983. "Effects of Work Stress and Social Support on Information Systems Managers," *MIS Quarterly* (29:1), pp. 29-43.

Wofford, J. C. 1982. "An Integrative Theory of Leadership," *Journal of Management* (8:1), pp. 27-47.

Yetton, P., Martin, A., Sharma, R., and Johnston, K. 2000. "A Model of Information Systems Development Project Performance," *Information Systems Journal* (10:4), pp. 263-289.

Zafiropoulos, I., Metaxiotis, K., and Askounis, D. 2005. "Dynamic Risk Management System for the Modeling, Optimal Adaptation and Implementation of an ERP System," *Information Management & Computer Security* (13:3), pp. 212–234.

Zhang, X., and Bartol, K. M. 2010. "Linking Empowering Leadership and Employee Creativity: The Influence of Psychological Empowerment, Intrinsic Motivation, and Creative Process Engagement," *Academy of Management Journal* (53:1), pp. 1-58.

Zohar, D., and Luria, G. 2005. "A Multilevel Model of Safety Climate: Cross-Level Relationships between Organization and Group-Level Climates," *Journal of Applied Psychology* (90:4), pp. 616-628.

APPENDIX

Table 1. Essay 1 Survey Items

Construct	#	Item	Source	Scale*
Empowering leadership (leading by example)	-	As a team leader I…	Srivastava et al. 2006	1
	1	Set high standards for performance by my behavior		
	2	Work as hard as I can		
	3	Work as hard as anyone in my team		
Empowering leadership (participative decision-making)	4	Encourage team members to express ideas/suggestions		
	5	Listen to my team's ideas and suggestions		
	6	Use my team's suggestions to make decisions that affect them		
Empowering leadership (coaching)	7	Help my team see areas in which they need more training		
	8	Suggest ways to improve my team's performance		
	9	Encourage team members to solve problems together		
Empowering leadership (informing)	10	Explain decisions related to the project		
	11	Explain project goals		
	12	Explain how the team fits into the company		
Empowering leadership (showing concern/interacting w/team)	13	Care about team members' personal problems		
	14	Show concern for team members' well-being		
	15	Treat team members as equals		
Project complexity	1	The application was required to integrate with other applications.	Gemino et al. 2008	2
	2	The technology was required to interface with other types of technology.		
Project size	1	How does the size of this project compare with others undertaken by your organization over the past three years?		0
	2	How long is this project expected to take in months/years?		
	3	How much is this project estimated to cost in U.S. dollars?		
	4	How many person-months is this project expected to take?		
Requirements volatility	1	How many times has the project schedule changed during the course of the project?		0
	2	How many times has the project budget changed during the course of the project?		
	3	How many times has the project scope changed during the course of the project?		
Role ambiguity (project-related)	1	My authority matches the responsibilities assigned to me within this team. [R]	House et al. 1983	1
	2	Within this team, I don't know what is expected of me.		
	3	My responsibilities in the team are clearly defined. [R]		
	4	I feel certain about how much authority I have within this team. [R]		
	5	Within this team, I know what my responsibilities are. [R]		
	6	I have clear planned goals and objectives for my work in this team. [R]		
	7	The planned goals and objectives for my work in this team are not clear.		

Table 1 Continued. Essay 1 Survey Items				
Construct	**#**	**Item**	**Source**	**Scale***
[continued] Role ambiguity (project-related)	8	I don't know how I will be evaluated according to my work in this team.	House et al. 1983	1
	9	Within this team, I know what is expected of me. [R]		
	10	Explanations are clear of what has to be done on this team project.		
	11	My boss makes it clear how she/he will evaluate my performance on this team. [R]		
Role conflict (project-related)	1	This team project often involves in situations in which there are conflicting requirements.	House et al. 1983	1
	2	There are unreasonable pressures for better performance in this team.		
	3	Within this team, I am asked to do things that are against my better judgment.		
	4	Within this team, I receive assignments without adequate resources and materials to execute it.		
	5	Within this team, I have to buck a rule or policy in order to carry out an assignment.		
	6	Within this team, I receive incompatible requests from two or more people.		
	7	Within this team, I have to do things that should be done differently under different conditions		
Psychological stress (project-related)	1	Problems associated with this project have kept me awake at night.	Stanton et al. 2001	1
	2	My work on this project is emotionally exhausting.		
	3	I feel burnt out because of my work on this project.		
	4	My work on this project frustrates me.		
	5	I feel worn out at the end of a working day.		
	6	I have felt fidgety or nervous as a result of working on this project.		
	7	I am exhausted in the morning at the thought of another day on this project.		
	8	I feel that every working hour in this project is tiring for me.		
Team performance	-	Please rate your team on the following dimensions:	Ancona & Caldwell 1992	1
	1	The team works efficiently		
	2	The team produces high quality technical innovations.		
	3	The team adheres to schedules.		
	4	The team adheres to budgets.		
	5	The team demonstrates an ability to resolve conflicts.		

*Scale Legend: [0 = Open ended] [1 = 7 pt. Likert, Strong Disagree - Strongly Agree]
[2 = 7 pt. Likert, None/Not at all - a large extent] [3 = 7 pt. Likert, Never - Several times a day]

CHAPTER 3

ESSAY 2: BRIDGE THE GAP OR MIND THE GAP? THE ROLE OF TECHNOLOGY AND LEADERS IN CONFIGURATIONALLY-DISPERSED TEAMS

ABSTRACT

While prior research on geographically dispersed teams has typically focused on the spatial and temporal aspects of dispersed teamwork, recent research has begun to explore the implications of configurational dispersion. Configurational dispersion describes the distribution of team members across locations or sites and includes how unevenly team members are distributed across sites (configurational-imbalance), and the extent to which members work in isolation from other team members (configurational-isolation). Recent work on these two forms of dispersion demonstrates that they have significant implications for interpersonal relationships among team members, independent of spatial or temporal distances; however, the boundaries governing their effects are not yet well understood. While there are many potential factors that can affect relationships among team members, the current study examines two specific forces: leadership and information and communication technologies (ICTs). These factors are of particular interest because they embody a means of managing the psychological distance between dispersed team members as both leaders and ICTs enable and manage the communication that underlies interpersonal interaction. I theorize that whether it is appropriate to bridge the gap between team members and reduce their psychological distance, or mind the gap and protect their psychological distance, depends on the type of configurational-dispersion teams experience, the synchronicity of their ICT capabilities, and their leaders' coaching behaviors. To test the extent to which ICT capabilities and leader behaviors moderate the effects of configurational-dispersion on interpersonal outcomes, I conducted a field study of 86 software and hardware development teams with members distributed among China, India, and the U.S. Results show that both leadership and ICT capabilities do have important implications for configurationally-dispersed teams. Leader coaching is beneficial for teams experiencing configurational-isolation when asynchronous ICTs are used and for teams experiencing configurational-imbalance when synchronous ICTs are used. However, it is not beneficial when teams experience configurational-isolation and employ synchronous ICTs or when teams experience configurational-imbalance and employ asynchronous ICTs.

INTRODUCTION

In recent years, geographically dispersed teams (GDTs) have become increasingly popular (Sarker and Sarker 2009) as organizations look to reduce expenses (Rickman 2009), gain access to diverse expertise (Holmström et al. 2006), and employ follow-the-sun strategies (Sarker and Sahay 2004) in response to an increasingly competitive global market. While prior research on GDTs has clearly shown that team dispersion has significant impacts on a variety of outcomes, it has typically focused on spatial (i.e., physical distance) or temporal (i.e., overlapping work hours) dispersion (Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006). This literature has made great strides in uncovering mechanisms by which dispersion impacts teams, however recent research acknowledges that, in the field, GDTs embody more complex structures (O'Leary and Cummings 2007).

In addition to spatial and temporal dispersion, GDTs are also affected by their *configurational-dispersion*—the “arrangement of members across sites independent of the spatial and temporal distances among them” (O'Leary and Cummings 2007, p. 439). Two forms of configurational-dispersion have received recent attention in the literature: configurational-isolation and configurational-imbalance (O'Leary and Cummings 2007, O'Leary and Mortensen 2010, O’Leary and Mortensen 2005, Polzer et al. 2006, Upadhyaya and Krishna 2007). *Configurational-isolation* captures a form of dispersion in which one or more team members work in isolation from other members and *configurational-imbalance* is the uneven distribution of members across sites (O'Leary and Cummings 2007). In a study of one Fortune 500 company, Cummings (2004) found that of 115 GDTs, 68 (59%) were unevenly dispersed across sites. Another study of a different Fortune 500 company revealed that of 214 teams, 193 (90%) experienced configurational-imbalance and configurational-isolation (Cummings 2005). Studies that fail to account for configurational-dispersion are at odds with the reality of modern team-based structures. Thus, it behooves researchers to more carefully examine how configurational-isolation and configurational-imbalance affect GDTs.

Research on configurational-dispersion suggests that it has important implications for teams, particularly as it pertains to failures in interpersonal processes. Cramton (2001) found that configurational-dispersion triggers ingroup/outgroup behaviors that contribute to subgroup competition, restricted information flow, and negative attributions about the integrity of outgroup members. Other research finds that teams with larger subgroups dispersed across a few sites experience greater conflict and less trust than teams with smaller subgroups dispersed across more sites (Polzer et al. 2006). Fewer members at a site reduced the power of any one subgroup and thus diffused the competitive, coalitional mentality between subgroups. More recently, O'Leary and Mortensen (2010) found that configurational-imbalance lowers team identification and increases conflict. Surprisingly, teams experiencing configurational-isolation did not experience these ill effects and were less likely to experience conflict than even completely collocated teams. In sum, this line of research shows that configurational-dispersion can contribute to subgroup formation, ingroup/outgroup dynamics, and coalitional behaviors. Furthermore, not all forms of configurational-dispersion are necessarily detrimental and any benefits afforded are predicated on a specific balance between the subgroups (O'Leary and Mortensen 2010).

Despite this progress, the boundaries governing when and how configurational-dispersion results in positive or negative outcomes are not well understood. The literature on teams suggests that elements in a team's environment can affect the social psychological distance between members (Cramton and Hinds 2005, Duck and Fielding 2003, Maruping and Agarwal 2004). Psychological distance refers to the extent to which someone is perceived or experienced as being far away from the self (Liberman et al. 2007) and has implications for interpersonal relationships among team members by way of affecting social integration, awareness of, and identification with other members (Wilson et al. 2008). The nascent literature on configurational-dispersion has not yet considered how environmental factors interact with different forms of configurational-dispersion to influence interpersonal relationships, or how these factors can be leveraged to manage psychological distance. While there are many potential factors that can affect relationships among subgroups, the current study seeks to address this gap in the literature by examining two specific forces: leadership and information and communication technologies (ICTs). These factors are of particular interest because they embody a means of managing the psychological distance between GDT members as both leaders and ICTs enable and manage the communication that underlies interpersonal interaction (Hertel et al. 2005). It is not clear how ICTs or leadership play a role in configurationally-dispersed teamwork. Do a leader's attempts to facilitate team relationships always have positive outcomes when teams are configurationally-dispersed? How should ICTs be leveraged to support configurationally-dispersed teams under different leadership conditions, and vice versa? To explore such questions, I draw from the literature on team dispersion, ICT capabilities, and leadership in pursuit of two primary research objectives: (1) to explore the implications of configurational-isolation and configurational-imbalance for interpersonal process failures and performance; and (2) to explore the interactive effects of configurational-dispersion, ICTs, and leadership on interpersonal process failures. I theorize that whether it is appropriate to *bridge the gap* (i.e., reduce psychological distance between subgroups through leadership and ICTs) or *mind the gap* (i.e., tend or protect their psychological distance) depends on type of configurational-dispersion teams experience.

Team leaders perform a variety of behaviors in support of teams (Bass and Bass 2008). While there are many potential leadership behaviors to examine, of recent interest to researchers is coaching (Hackman and Wageman 2005, Kozlowski et al. 1996, Woolley 1998), defined as “direct interaction with a team intended to help members make coordinated and task-appropriate use of their collective resources in accomplishing the team’s work” (Hackman and Wageman 2005, p. 269). This definition underscores the importance of examining coaching in the dispersed context. GDTs are uniquely challenged with managing interpersonal relationships due to their technical, temporal, and process needs (Cramton 2001, Cramton and Orvis 2003, Espinosa et al. 2007). These needs are further impeded by problems due to configurational-dispersion (e.g., restricted information flows) (Cramton 2001). Thus, the very behaviors that underlie coaching are well-suited to addressing the particular needs of configurationally-dispersed GDTs. Moreover, coaching is one of a leader’s primary tools for managing team member relationships (Burke et al. 2006). In their meta-analysis of leadership behaviors, Burke and his colleagues (2006, p. 293) note that coaching is a key avenue through which leaders impact performance because “it is the means via which team coherence (i.e., shared affect, behavior, cognition) is developed and maintained.” Given the difficulty that GDTs have with shared affect, behavior, and cognition (Powell et al. 2004), coaching is expected to play an important role in shaping the influence of dispersion on interpersonal process failures.

As with leadership, several facets of ICT capabilities have been explored in the literature. In the late 80’s and early 90’s, the predominant view of ICT capabilities centered around the richness of an ICT and its ability to support language variety, multiple cues, greater personalization, and rapid feedback (Daft and Lengel 1986, Dennis and Kinney 1998). In response to weak empirical results built on this view of communication media, particularly as it pertains to new forms of computer-mediated communication, recent work on ICT capabilities has redirected media richness arguments to focus on the synchronicity of the medium (Dennis et al. 2008). Media synchronicity theory focuses on how ICTs enable information conveyance and convergence through the capabilities of that medium to support synchronous and asynchronous communication. ICTs that are more synchronous, such as video conferencing software, promote a shared focus and greater interaction between communication partners (Ballard and Seibold 2004, Cummings et al. 2009, Dennis et al. 2008). ICTs that are more asynchronous, such as email, are associated with a decreased level of interaction between communication partners (Cummings et al. 2009, Dennis et al. 2008). Varying levels of interaction, shared focus, and communication processing are important to managing interpersonal relationships (Maruping and Agarwal 2004) and thus are key mechanisms I draw on to theorize how and why ICT synchronicity, together with coaching, play an interactive role with configurational-dispersion to influence interpersonal process failures. The research model is shown in Figure 1.

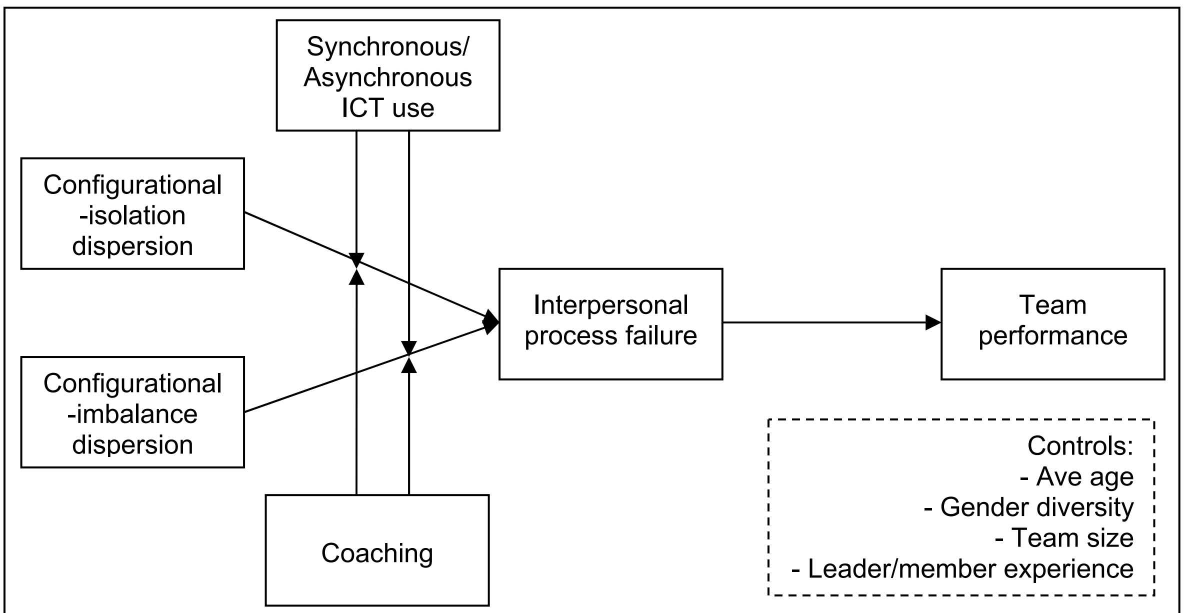

Figure 1. Research Model

THEORETICAL BACKGROUND

Interpersonal Processes and Team Dispersion

Interpersonal processes are those activities that teams engage in to manage their interpersonal relationships and include conflict management, motivation and confidence building, and affect management (Marks et al. 2001). The importance of interpersonal processes cannot be ignored, as they "lay the foundation for the effectiveness of other processes [i.e., action and transition processes]" (Marks et al. 2001, p. 368). Process failure occurs when the team does not engage in team activities, or only some members engage in these activities, as even one member's behavior can cause negative interpersonal repercussions that ripple through the team, disrupting unity (Adams and Anantatmula 2010). Thus, interpersonal process failure is defined as the lack of congruence in the interdependent team activities used to manage interpersonal relationships.

Compared to other forms of team dispersion, configurationally-dispersed teams experience unique interpersonal dynamics. Research shows that various subgroup dynamics are triggered when team members are distributed differently across sites, or when some team members are isolated from others (Cramton 2001, O'Leary and Mortensen 2010, Polzer et al. 2006). To explicate how these dynamics occur, prior work leverages social categorization theory. Social categorization is the tendency of individuals to classify themselves and others according to context-dependent, salient characteristics (Turner 1985). Those who share a salient characteristic(s) are regarded as the "ingroup", while others are classified as the "outgroup". One strives to maintain a positive perception of one's group (the ingroup), while discriminating against the outgroup (Tajfel and Turner 1986). As a result, people tend to maximize the similarities within and differences between ingroups and outgroups (Brewer 1979). This tendency explains the formation of negative stereotypes and competitive coalitions. It also underlies research on faultlines—hypothetical dividing lines that split a team into subgroups based on one or more attributes (Lau and Murnighan 1998, Polzer et al. 2006).

Building on this foundation, research on configurational-dispersion finds that the activation and intensity of these behaviors is influenced by the distribution of members across sites. For example, Polzer et al. (2006) found that subgroups with more collocated members at one site experienced greater conflict and less trust. In teams of six members, those teams that were split between two sites with three members at each site experienced the most conflict and least trust. Teams with members dispersed among three locations, with two team members at each site experienced moderate levels of conflict and trust, while teams with members dispersed across 6 different sites experienced the least conflict and most trust. O'Leary and Mortensen (2010) extended Polzer et al.'s (2006) work to examine teams with isolates and teams that were imbalanced across sites. Configurational-imbalance intensified negative subgroup dynamics, due to majority-minority struggles, while configurational-isolation did not provoke ingroup/outgroup behaviors. Interestingly, this was not due to the exclusion of isolated team members by the collected subgroup. On the contrary, isolated team members reported high team identification, on par with completely collocated teams. Moreover, the presence of an isolated member on the team prompted the collocated members to be more explicit about how they (the entire team) would work together, thus enhancing the team's coordination activities. Building on this work, I explore the boundaries governing how and when configurational-isolation and configurational-imbalance result in interpersonal process failures by examining the interactive effects of coaching and ICT synchronicity.

Team Coaching

While a substantial body of research has theoretically and empirically linked coaching behaviors with team performance, the refinement of the particular behaviors and mechanisms by which coaching impacts team outcomes are only recently beginning to receive attention (Mathieu et al. 2008). Furthermore, the bulk of research examining team coaching behaviors is found in the literature on training and individual skill acquisition, while relatively little research has examined coaching behaviors in task-performing teams, let alone dispersed teams (Hackman and Wageman 2005). Hackman and Wageman (2005) identify three categories of coaching behaviors: (1) motivational, which is aimed at compelling effort by minimizing free-riding or social loafing and by building a shared commitment to the group and its work; (2) consultative, which is aimed at developing appropriate performance strategies by identifying ways to align members' work with task requirements; and (3) educational, which is aimed at fostering team knowledge and skill by ensuring alignment between members' talent and their contributions, in order to further develop team knowledge and skills (Hackman and Wageman 2005). Together, these three dimensions of coaching encompass a range of behaviors that coaches engage in to help teams perform their work.

Through such behaviors, coaches can have significant impacts on teams' interpersonal processes. Burke et al. (2006) showed that coaching is characterized by consideration for developing social relationships among group members. Coaching also fosters a sense of psychological safety within the team, making members feel more comfortable with one another as they take risks to develop new ideas and learn from their mistakes (Edmondson 1999). Coaches motivate teams for a common purpose and in doing so, promote team identity, cohesion, and team learning (van Woerkom 2001). These factors become particularly important when negative subgroup dynamics threaten team unity. Research also shows that one of the ways leaders build shared commitment is by fostering an environment of inclusiveness, particularly when there are status differences among members, thereby giving a voice to less powerful team members (Nembhard and Edmondson 2006). In GDTs, coaching is particularly important in supporting team members who are isolated from the rest of the team. In their study of best practices in virtual team management, Kirkman and his colleagues (2002) found that effective leaders perform coaching behaviors such as communicating frequently with isolated team members to help keep them in the loop and to gather information from them about work-related issues. In these ways, coaches increase the salience of other team members and their contributions though coaching behaviors aimed at motivating effort, and aligning member contributions with task requirements and member talents. This salience or awareness of other team members and their contributions is expected to play an important role in how ICTs can be used to manage psychological distances.

ICT Synchronicity

Media synchronicity theory proposes five functionalities of ICTs that underlie the degree to which a medium supports synchronous communication: transmission velocity, symbol variety, parallelism, rehearsability, and reprocessability (Dennis et al. 2008, Dennis and Valacich 1999). Transmission velocity describes how quickly a communication partner is able to receive and respond to a message, while symbol variety describes the degree to which the medium allows for multiple communication cues and language variety. ICTs that are high in transmission velocity and symbol variety support more synchronous communication because they engender greater shared focus on the interaction (Dennis et al. 2008). Parallelism refers to whether the medium allows for multiple simultaneous messages, rehearsability refers to the extent to which a communicator can rehearse or fine tune a message before sending it, and reprocessability describes the extent to which the medium allows for a message to be reexamined and processed multiple times. Parallelism, rehearsability, and reprocessability minimize shared focus on the interaction between communication partners and thus characterize asynchronous mediums (Dennis et al. 2008). ICTs higher in synchronicity, by way of higher transmission velocity and symbol variety, include video/desktop conferencing, telephone, and chat/instant messaging programs. ICTs that are more asynchronous in nature include voicemail, email, and group support systems that enable document or work sharing (Carte and Chidambaram 2004, Dennis et al. 2008, Maruping and Agarwal 2004).

Prior research in information systems has examined how the synchronicity of ICTs support the transmission of social cues that are important to human interactions. Maruping and Agarwal (2004) suggest that synchronicity plays a critical role in managing interpersonal relationships and provide suggestions for how ICTs synchronicity can be leveraged at different points in a team's lifecycle to facilitate interpersonal processes such as conflict management, motivation/confidence building, and affect management. One of the primary theoretical mechanisms they employ in their theorizing, and which Dennis et al. (2008) also employ in proposing media synchronicity theory, is the sense of sharedness that highly synchronous ICTs enable. Sharedness refers to a range of constructs that can exemplify a shared context, such as shared affect, behavior, cognitions, focus, and presence (Tindale and Kameda 2000). A sense of sharedness increases the saliency of other team members and their contributions (Sarker and Sahay 2000). Thus, similar to coaching, synchronous technologies increase the saliency of other group members, while asynchronous technologies, by virtue of minimizing a sense of sharedness, decrease the saliency of other, dispersed members and increase the psychological distances among them (Sarker and Sahay 2000). At the same time, increasing member saliency draws attention to the alignment of team member characteristics [in this case, location] fostering conditions for faultlines and negative subgroup dynamics to arise. Herein lies a dilemma. As Pratt and his colleagues (2000) put it, "Increasing information richness [i.e., through synchronous interaction] in order to enhance experienced psychological proximity (and thereby increase members' identification with, engagement, and commitment to the group) runs the risk of eliciting faultline effects that will polarize and politicize the group's interaction" (Pratt et al. 2000, p. 247). Given their role in facilitating psychological proximity, awareness of other members, and sharedness, should coaches and ICTs be leveraged to bridge the gap (psychological distance) or mind the gap? The answer, as I will theorize, lies in the relative composition of configurational-dispersion, extent of coach involvement, and ICT use.

HYPOTHESES DEVELOPMENT

Configurational-dispersion and Interpersonal Process Failures

Before presenting the hypotheses, I provide theoretical justification for how and why configurational-dispersion impacts interpersonal process failures and how interpersonal process failures impact performance. This sets the stage for the development of the hypothesized interactive effects of configurational-dispersion, coaching, and ICT use. Configurational-isolation is thought to reduce interpersonal process failures, while configurational-imbalance is thought to contribute to interpersonal process failures.

While configurational-isolation might be considered an extreme form of imbalance, potentially evoking the same dynamics as configurational-imbalance, research shows that this is not the case. In their study of configurational-isolation, O'Leary and Mortensen (2010) note that isolates are not afforded the face-to-face interaction that small subgroups experience. This weakens the distinctiveness that serves as a basis for collocated subgroup identity and undermines the basis on which ingroups and outgroups are formed. Furthermore, isolates have a stronger desire for inclusiveness with the superordinate group because they have no other ingroup to align with (Ashforth and Johnson 2001). Thus, they are more motivated to identify and seek integration with the group (O'Leary and Mortensen 2010). Their desire to integrate with the superordinate group prompts isolates to engage in prosocial team behaviors (Hogg 2001). As O'Leary and Mortensen (2010, p. 119) argue, "to the extent that these behaviors are perceived by the rest of the team, they are likely to engender a reciprocal response yielding greater identification and inclusiveness." Their results bear this out. Isolates report higher identification with the team and lower levels of conflict. They also report that they do not feel socially isolated. In fact, due to reciprocal prosocial behaviors, majority groups report feeling motivated to ensure that they include isolated group members in teamwork. This has benefits for collaboration, as it forces the group as a whole to be more explicit and mindful about their coordination activities. These prosocial behaviors, mutual desire for integration between the majority subgroup and isolated members, and more explicit communication, should reduce the occurrence of interpersonal process failures.

Research on configurational-dispersion finds that subgroup formation serves as a basis for ingroup/outgroup dynamics and that imbalance in the number of members across subgroups exacerbates these effects (O'Leary and Mortensen 2010). While balanced configurations evoke some measure of ingroup/outgroup tension, there is an inherent equilibrium that keeps these tensions in check as no one subgroup can “out voice” another. Thus, teams with balanced configurations are more likely to take care in coordinating their activities and maintaining their relationships (O'Leary and Mortensen 2010). Imbalance in the number of members across sites disrupts this equilibrium by introducing majority-minority dynamics. Several consequences of this dynamic explain resulting interpersonal process failures. This disruption is manifested in terms of power struggles between minority subgroups (who desire more power) and majority subgroups (who attempt to protect their power). Not only does this lead to interpersonal breakdowns between majority and minority subgroups as they struggle for power, status, and recognition, it also contributes to competitiveness among minority subgroup members. This is due to minority members seeing potential advantages in distancing themselves from the outgroup (minority subgroup), and emphasizing their uniqueness in an attempt to avoid being categorized by the majority as part of the outgroup (Phillips and Loyd 2006). Minority subgroups are also more sensitive to inequities and more likely to be defensive, while majority subgroups perceive that minority subgroups often willfully impede progress (Mannix 1993). Exacerbating these effects, research on social impact theory finds that, within larger groups, social loafing or free riding is more common place (Alnuaimi et al. 2010, Latane et al. 1979). Such behaviors are likely to cause resentment in minority subgroups whose contributions are more visible to the group, ultimately resulting in interpersonal process failures. Other resentment may stem from the majority group perceiving that they have more influence, regardless of whether this is justified. This is likely to further increase the resentment felt by minority subgroup members, and contribute to interpersonal process failures.

Interactive Effects: Configurational-isolation

Both coaching (Burke et al. 2006, Nembhard and Edmondson 2006, van Woerkom 2001) and ICT synchronicity (Dennis et al. 2008, Maruping and Agarwal 2004, Sarker and Sahay 2004) have been linked to interpersonal processes. Building on this prior literature and the work of O’Leary and Mortensen (2010) I hypothesize the interactive effects of configurational-dispersion, ICT synchronicity, and coaching on interpersonal process failures. Given the various configurations of dispersion, coaching, and ICT synchronicity, Table 1 provides a summary of the theoretically optimal configuration of these factors and a brief description of the arguments (detailed below) that support the following hypotheses.

With respect to configurational-isolation, when asynchronous technologies are used, teams high in configurational-isolation are expected to experience fewer interpersonal process failures when the level of coaching is high. As discussed, configurationally-isolated teams should have fewer interpersonal process failures because they are more inclined toward integration and engage in reciprocal prosocial behaviors (O'Leary and Mortensen 2010). However, when asynchronous technologies are used by these teams, they are likely to face difficulty integrating because they lack the means to develop a strong sense of sharedness or coherence (Bell and Kozlowski 2002, Dennis et al. 2008, Maruping and Agarwal 2004). Thus, these teams are expected to benefit from coaching as a means to bridge the divide between the collocated subgroup and isolated members. In effect, coaches can facilitate positive intragroup interactions to bypass the need for synchronous interaction, thus compensating for the lack of sharedness brought about by asynchronous interaction. For example, through motivational coaching, coaches can enhance the team’s commitment to the group or engage in consultative behaviors designed to ensure that team member efforts are aligned with the task (Hackman and Wageman 2005). This should elevate the saliency of isolated members and their contributions and by extension, contribute to the team’s sense of sharedness. Such behaviors on the part of the coach should bolster the inverse relationship between configurational-isolation and interpersonal process failures when asynchronous technologies are used. Thus, I hypothesize:

> *H1: Configurational-isolation dispersion, coaching, and ICT synchronicity will have an interactive effect on interpersonal process failure, such that when asynchronous ICTs are used, and coaching is high, configurational-isolation will reduce interpersonal process failures.*

Conversely, when synchronous technologies are used, coaching is not expected to be beneficial to configurationally-isolated teams. Under conditions of configurational-isolation and synchronous technology use, teams are both inclined toward integration and positive interpersonal interaction (O'Leary and Mortensen 2010) and they have the tools necessary (through synchronous ICTs) to develop a sense of sharedness (Bell and Kozlowski 2002, Dennis et al. 2008, Maruping and Agarwal 2004). Synchronous ICT use should bolster the reductive effects of configurational-isolation on interpersonal process failure.

Table 1. Summary of Interaction Hypotheses

Optimal Configuration of Dispersion, Coaching, and ICT			Detailed Summary of Theoretical Mechanisms	Summary of Core Ideas	
CONFIGURATIONAL-ISOLATION	Coaching High	Asynchronous ICT	*Hypothesis 1* 1. Due to configurational-isolation, teams are inclined toward integration and positive interpersonal processes. 2. Due to asynchronous technology use, teams lack the tools needed to develop sharedness. 3. Coaches can bridge the divide between team members by acting as an intermediary and monitor of the team's actions, helping them to achieve shared focus. **Core idea: *Bridge the gap*. Coaches *facilitate* interpersonal interaction that is hampered by asynchronous technology.**	Bridge the gap	Coach facilitates
	Coaching Low	Synchronous ICT	*Hypothesis 2* 1. Due to configurational-isolation, teams are inclined toward integration and positive interpersonal processes. 2. Due to synchronous technology use, teams have the tools needed to develop sharedness. 3. Greater involvement by coach would interfere with the balance between majority and isolates by increasing the salience of the isolate, thus coaching should be minimized. **Core idea: *Mind the gap*. Synchronous technology *facilitates* interpersonal interaction, while lower coach involvement avoids disrupting the inherent balance between majority and isolate.**	Mind the gap	Technology facilitates
CONFIGURATIONAL-IMBALANCE	Coaching Low	Asynchronous ICT	*Hypothesis 3* 1. Due to configurational-imbalance, teams are not inclined toward integration and positive interpersonal processes. 2. Due to asynchronous technology use, teams lack the tools needed to develop sharedness, however, inclination toward disintegration is weakened by the decreased salience of subgroups. 3. Asynchronous communication affords greater opportunities for careful deliberation of other subgroups' input, less knee-jerking, etc. Coaching increases the salience of subgroups, reducing the regulatory effects of the technology, and disrupting this balance. **Core idea: *Mind the gap*. Asynchronous technology helps *regulate* interpersonal interaction. Coaching interferes with this process.**	Mind the gap	Technology regulates
	Coaching High	Synchronous ICT	*Hypothesis 4* 1. Due to configurational-imbalance, teams are not inclined toward integration and positive interpersonal processes. 2. Due to synchronous technology use, subgroups and power inequalities are highly salient. 3. Coaches can bridge the divide between team members, fostering inclusiveness and motivating positive interpersonal relationships, helping to regulate interaction. **Core idea: *Bridge the gap*. Coaches help *regulate* interpersonal interaction when synchronous technologies are used.**	Bridge the gap	Coach regulates

This is because teams have an appropriate balance or psychological proximity between subgroup and isolates that affords an inclination toward positive interpersonal interaction, along with the tools needed to effectively support that interaction. In this scenario, coaches should protect the psychological proximity between team members (i.e., mind the gap) and allow technology to facilitate the development of sharedness. Interfering with psychological proximity among team members (e.g., through coaching involvement) may elicit faultlines that can polarize the group (Pratt et al. 2000). Research suggests that involvement of a coach may be disruptive to the balance of power between team members. Coaches may increase the saliency of isolated team members by advocating for their inclusion and amplifying their voice in the team (Kirkman et al. 2002, Nembhard and Edmondson 2006). These behaviors may serve to increase the power or influence of the isolated team members, and cause them to be more threatening to the collocated members, activating the subgroup dynamics observed in configurationally-imbalanced subgroups. Research on the interindividual-intergroup discontinuity effect shows that relationships between groups are more competitive than relationships with individuals because individuals have less power than do groups (Insko et al. 1990). By acting as a conduit for isolated team members and increasing their saliency and influence within the team, coaches may serve to imbue an isolated team member with the power of a small subgroup. Thus, when synchronous technologies are used, coach involvement should be minimized in order to maintain the natural balance afforded by configurational-isolation. Thus, I hypothesize:

> *H2: Configurational-isolation dispersion, coaching, and ICT synchronicity will have an interactive effect on interpersonal process failure, such that when synchronous ICTs are used, and coaching is high, configurational-isolation will increase interpersonal process failures.*

Interactive Effects: Configurational-imbalance

Configurationally-imbalanced teams are expected to experience interpersonal process failures due to negative subgroup dynamics including competitive power struggles, social loafing, and resentment on the part of minority subgroups. Thus, they are disinclined toward integration and prosocial behaviors (O'Leary and Mortensen 2010). In contrast to configurationally-isolated teams that are inclined toward integration and thus benefit from coaching or ICT characteristics that *facilitate* their interactions, configurationally-imbalanced teams will benefit from interventions that help to *regulate* their interactions.

Asynchronous technologies represent a means to both help regulate interaction and decrease the saliency of other subgroups, potentially reducing the competitiveness that occurs when subgroups are highly salient (Cramton 2001, O'Leary and Mortensen 2010). Asynchronous technologies help regulate interaction by slowing the speed of transmission and allowing individuals more time for information processing and careful deliberation of other subgroups' input (Robert and Dennis 2005). They also allow individuals to take their time composing and refining a message before transmission (Kock 1998). Such capabilities help team members avoid knee jerk reactions that can occur when there is increased pressure to respond quickly, as in a synchronous exchange. Indeed, research shows that lower immediacy of feedback (analogous to transmission velocity in media synchronicity theory) can be an effective form of controlling interpersonal conflicts, particularly in later stages of team development (Maruping and Agarwal 2004). Other research finds that "leaner" communication mediums (characterized by asynchronous exchange), can reduce the salience of referent groups and lead to less polarization among team members (Pratt et al. 2000). Thus, asynchronous technologies are posited to weaken imbalanced teams' inclination toward extreme ingroup/outgroup behaviors, bringing them closer to a more productive psychological proximity. With imbalance and asynchronous ICTs, as with hypothesis 2, I suggest that it is appropriate to "mind the gap" and protect the psychological distance between subgroups by minimizing the involvement of the coach. Because coaching increases the salience of subgroups (Nembhard and Edmondson 2006, van Woerkom 2001), it may offset the beneficial, regulatory effects of asynchronous ICTs and disrupt the balance afforded by asynchronous communication. Thus, I hypothesize:

> *H3: Configurational-imbalance dispersion, coaching, and ICT synchronicity will have an interactive effect on interpersonal process failure, such that when asynchronous ICTs are used, and coaching is high, configurational-imbalance will increase interpersonal process failures.*

Conversely, when synchronous technologies are used, coaching is expected to benefit configurationally-imbalanced teams. Synchronous technologies serve to promote a sense of sharedness that is likely to be beneficial when teams are inclined toward integration. When they are not so inclined, synchronous technologies increase the salience of ingroups and outgroups and may draw attention to power inequalities. Synchronous ICTs also enable communication that is far less careful, deliberate, or regulated (Dennis et al. 2008, Robert and Dennis 2005). Moreover, the competitive, majority-minority dynamics that imbalanced teams experience may be compounded by the use of synchronous technologies. Research suggests that, by nature of multiple social cues, majority status is more salient with synchronous technologies and allows majorities to exert greater dominance over minority subgroups (Montoya-Weiss et al. 2001). Asynchronous technologies are found to mitigate perceptions of competitive behaviors because aggressive emotions or competitive dominance is more ambiguous and may not be interpreted as such with fewer social cues (Montoya-Weiss et al. 2001). Under conditions that are ripe for animosity and greater psychological distance, coaches can serve to bridge the gap between team members by helping them to regulate their interaction, thus minimizing the impact that configurational-imbalance has on interpersonal process failure. Coaches may intervene to oversee the team's interaction, ensure that minority subgroups are not overpowered by the majority, and engage in motivational behaviors designed to build shared commitment to the team and its work (Hackman and Wageman 2005, Nembhard and Edmondson 2006, van Woerkom 2001). Thus, I hypothesize:

> *H4: Configurational-imbalance dispersion, coaching, and ICT synchronicity will have an interactive effect on interpersonal process failure, such that when synchronous ICTs are used, and coaching is high, configurational-imbalance will decrease interpersonal process failures.*

Direct Effect

Interpersonal process failures should negatively influence performance. A wealth of literature on dispersed teams supports this assertion (Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004). Failure to effectively manage conflict, affect, and to build motivation and confidence has deleterious effects on performance because it impacts teams' ability to effectively execute tasks that are necessary for performance (Marks et al. 2001). Interpersonal process failures can cause teams to spiral into a debilitating cycle that drags down team confidence and performance (Lindsley et al. 1995). For example, when there is incongruence in the motivation of team members, not all team members may contribute and some may engage in social loafing or free-riding (Kidwell and Bennett 1993, Latane et al. 1979). This generally results in resentment on the part of those who do contribute, and subsequent withholding of effort and a general sense of dissatisfaction with the team (Latane et al. 1979). Such behaviors detract from team goals and those activities that are critical for performance effectiveness. Thus, consistent with prior research, I hypothesize:

H5: Interpersonal process failure will negatively influence team performance.

Mediated-Moderated Effects

The preceding hypotheses suggest that configurational-dispersion, coaching, and synchronous or asynchronous ICT use will have an interactive effect on interpersonal process failures and that interpersonal process failures will directly impact performance. Beyond this, the interactive effects of configurational-dispersion, coaching, and ICT synchronicity are expected to impact team performance through their influence on interpersonal process failures, for a mediated-moderated effect (Muller et al. 2005). Coaching and ICT use have been found to improve the performance of dispersed teams under varying conditions (Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006). As theorized in the preceding section, these conditions include the nature of the team's dispersion, extent of coaching, and whether ICT use involves asynchronous or synchronous technologies. In brief, my theorizing hinges on how coaches or technology affect the psychological distance between team members, and how they can be employed to facilitate or regulate interpersonal interaction that is critical to effective performance. Through these mechanisms, I suggest that coaching and ICT use will enhance team performance by interacting with configurational-dispersion to reduce interpersonal process failure. In line with this theorizing, coaching is expected to enhance team performance when teams experience configurational-isolation and use asynchronous ICTs and when teams are configurationally-imbalanced and use synchronous ICTs. More formally, I hypothesize:

H6a. Coaching and ICT use enhance team performance by interacting with configurational-isolation to decrease interpersonal process failure when asynchronous technologies are used.

H6b. Coaching and ICT use enhance team performance by interacting with configurational-imbalance to decrease interpersonal process failure when synchronous technologies are used.

METHODOLOGY

Research Site and Participants

The model is tested via a survey-based field study of IS development teams. The data collection site is a large, multinational corporation specializing in the development of software and hardware technologies that are used in consumer electronics, networking and telecommunications equipment, and computer systems. The firm has over 4,500 employees with revenue for 2010 exceeding 900 million U.S. dollars. Participants are members of software and hardware development teams, drawn from a variety of locations across the globe, including China, India, and the U.S. The sampling frame is 1,140 team members working in 119 teams on development projects beginning in 2010 and ending in 2011. From this sampling frame, 883 members from 86 teams, and their leaders, provided usable responses, for a response rate of 77%. Respondents were fairly evenly distributed across the three locations, with 278 members working in China, 296 in India, and 309 in the U.S. The average team size was 10.3, and the average age was 32.4 years for team members and 46.0 years for team leaders. Approximately 49% of the team members were women and 47% of team leaders were women. Three waves of data were collected, with surveys administered at the beginning, midpoint, and end of the projects' cycles and data collection took approximately 1 year. Response rates over this time were bolstered by support of the study from top management and team leaders.

Measures

All measurement items are taken from previously validated scales. Measurement of the constructs is collected from multiple sources, including individual team members and the project leader. This strategy is recommended as a means to alleviate concerns of common method bias (Spector 1994). Configurational-dispersion measures were calculated from location data provided by team members (leader location data was not included in this calculation). Data related to ICT use and interpersonal processes were also provided by team members. Coaching behaviors and team performance were assessed by each team's leader.

Configurational-dispersion

Configurational-isolation and configurational-imbalance were measured using O'Leary and Cummings' (2007) isolation and imbalance indices. The isolation index is calculated as the percent of members with no other team members at their site. Low values of the index indicate low levels of isolation and values range from 0, representing no isolated team members, to 1, which indicates that all team members are alone at their site. The imbalance index is calculated as the standard deviation of members per site, divided by the size of the team. For example, a ten-member team spread across three locations with two members located in the U.S., five members located in China, and three members located in India would have an imbalance index of: .15, per: standard deviation (2,5,3) = 1.5/10.

Interpersonal process failure

Interpersonal processes were measured using a scale developed by Mathieu, Gilson and Ruddy (2006). The scale consists of 3 items measured on a 7 point Likert-type scale where 1 represents complete disagreement and 7 represents complete agreement. A sample item for interpersonal processes is, “Members of my team work to create an environment of openness and trust.” The three items were then averaged to obtain an individual-level measure of interpersonal processes. To create the team-level measure of interpersonal process failure I computed the within-team standard deviation of members’ assessment of interpersonal processes, with greater deviation representing less congruence in team interpersonal processes.

Coaching behaviors

Coaching was measured using a recently developed scale (Liu et al. 2009) that builds on Hackman and Wageman’s (2005) theory of team coaching. The scale is based on the Team Diagnostic Survey developed by Wageman, Hackman, and Lehman (2005), adding two additional items to bolster the robustness of the scales, which were originally comprised of only two items. The leader-rated scale consists of 12 items representing a range of coaching behaviors and is measured on a 7 point Likert-type scale where 1 represents complete disagreement and 7 represents complete agreement. A sample item representing motivational coaching behavior is, “I help the team build a high shared commitment to its purposes.”

ICT use: Synchronous and asynchronous technologies

Following Cummings et al.’s (2009) work on dispersion and ICT synchronicity, ICT use was assessed by asking team members to rate the extent to which they used a particular ICT to communicate with fellow team members in the past month. The scale ranged from 1 to 7, with 1 representing “Never” and 7 representing “Daily”. Individual ratings of these items were summed to create a team-level score of the extent to which the team used these particular technologies to communicate with one another. In line with prior research that has classified several contemporary ICTs as being high or low in synchronicity (e.g., Carte and Chidambaram 2004, Dennis et al. 2008, Maruping and Agarwal 2004), email and group support systems were chosen to represent asynchronous ICTs and text-based chat and desktop conferencing software to represent synchronous technologies. These particular ICTs were also chosen because they were extensively used by the teams in this sample.

Performance effectiveness

Performance effectiveness was assessed by the leader and measured using a 5-item scale that assesses a leader's rating of their team's efficiency, adherence to budgets and schedules, as well as the production of quality work and ability to resolve conflicts (Ancona and Caldwell 1992). The items are measured on a 7 point Likert-type scale where 1 represents complete disagreement and 7 represents complete agreement. A sample item is, "The team produced high quality technical innovations."

Controls

Control variables are selected for their ability to eliminate alternative interpretations that may account for variability in team performance. A variable that has been established as an important control in team research is group size. Since size may indirectly influence group processes and the efficacy of leadership behaviors, it was included in the analysis. To control for variability in leadership efforts, the experience of team leaders leading similar projects was captured. To control for variability in team performance, I also account for the experience of team members working on other similar projects, as well as gender diversity and the average age of team members.

Data Collection Procedure

Surveys were administered by an external market research firm, with each survey bar-coded to maintain anonymity. Three waves of data collection were necessary, with measurement points at the beginning, midpoint, and end of the project. The measurement points, respondents, and constructs measured are depicted in Table 2. The first wave captures data that is not dependent on team interaction, and measures individual characteristics that are likely to remain stable over time. Wave 2 captures coaching, ICT use, and interpersonal process failures and is assessed at the midpoint of the project cycle, when teams have had adequate opportunity to perform these behaviors and develop perceptions related to their interactions, but before the project has started to wind down. Wave 3 captures team performance, as this is known only at the end of the project.

Table 2. Measurement Points and Respondents		
Wave 1 **Project Start**	**Wave 2** **Project Midpoint**	**Wave 3** **Project End**
Team characteristics[1,2] (e.g., location, size) Individual demographics[1,2] (e.g., age, gender)	Coaching behaviors[2] ICT use[1] Interpersonal processes[1]	Team performance[2]

Note: Respondent/ Source: [1] = team member; [2] = team leader

Analysis

A partial least squares (PLS; SmartPLS v.2.0) approach was used to test the model (Ringle et al. 2005). One of the advantages of using PLS is the ability to model and test complex relationships simultaneously, particularly when sample sizes are small (Chin 1998), as was the case with this research. With respect to sample size, Falk and Miller (1992) indicate that PLS can be used in cases where there are but 5 data points for each path leading to the dependent variable with the most incoming paths. Thus, the minimum sample size for the current study is 30, as there are six paths leading to team performance. PLS has been used extensively in the information systems literature, and recently in the case of dispersed team performance (Gemino et al. 2008, Premkumar 2004). PLS allows for a simultaneous examination of the model fit, as well as, model testing. Thus, the psychometric properties of the model were examined first, to assess the reliability and validity of the model, followed by the structural analysis. The items were shown to be reliable by examining the internal consistency reliability values (ICR), which were greater than .70, as recommended by prior research (Chin 1998). To establish convergent validity, which represents the extent to which the indicators are related to the appropriate latent variables, item loadings must be greater than .7, while communalities and the average variance extracted (AVE) should be greater than .5 (Fornell and Larcker 1981), and this was the case, providing support for convergent validity. In order to establish discriminant validity, which represents the extent to which measures of a given construct differ from measures of other constructs in the model, communality measures should be greater than the variance shared between constructs in the model (Fornell & Larker 1981). This was assessed by comparing the square root of the variance shared between constructs and their measures (AVEs) to the correlations among constructs. The square root of the AVE was greater than the correlations among constructs, providing support for discriminant validity.

RESULTS

After ensuring the measurement model was sound, the structural models were tested. Two models were tested: one using a subsample of teams reporting high use of synchronous ICTs (SYNC sample) and one using a subsample of teams reporting high use of asynchronous ICTs (ASYNC sample). Each subsample was composed of teams who scored above the mean on their use of synchronous or asynchronous ICTs, respectively. Teams tended to favor either synchronous ICT use or asynchronous technology use. For the SYNC sample, the mean value representing synchronous ICT use was 50.43, and the mean for asynchronous ICT use was 35.70. For the ASYNC sample, the mean for asynchronous ICT use was 49.61, and the mean for synchronous ICT use was 34.92. The descriptive statistics and correlations are shown in Tables 3a-3b.

Table 3a. Descriptive Statistics and Correlations: SYNC sample (n = 43)

	M	S.D.	1	2	3	4	5	6	7	8	9
1. Gender diversity	0.44	0.09	-								
2. Ave. age (team)	32.52	2.65	-.07								
3. Team size	9.05	1.36	.00	.08							
4. Member experience	3.40	1.44	-.17	.19	.11						
5. Leader experience	7.28	2.56	.16	-.21	.16	.19					
6. Config-isolation	0.12	0.05	.05	-.07	-.50**	.11	-.09				
7. Config-imbalance	0.13	0.07	-.02	-.13	-.19	.02	-.02	.50**			
8. Coaching	4.05	1.74	.20	-.08	.33*	.03	-.01	-.11	.16		
9. Inter. process failure	1.69	0.38	.20	.23	.26†	.03	-.25†	-.21	.10	.06	
10. Team performance	3.32	1.62	-.21	.23	-.07	.02	.18	-.14	-.17	.11	-.25†

*Note: **p < .01, *p < .05,* †*p < .10*

Table 3b. Descriptive Statistics and Correlations: ASYNC Sample (n = 43)

	M	S.D.	1	2	3	4	5	6	7	8	9
1. Gender diversity	0.44	0.10	-								
2. Ave. age (team)	32.52	2.06	-.06								
3. Team size	11.58	1.71	.09	-.09							
4. Member experience	3.98	0.50	-.14	.25†	.11						
5. Leader experience	7.74	3.41	.11	-.33*	.16	.22					
6. Config-isolation	0.12	0.03	.14	.09	-.32*	-.09	-.03				
7. Config-imbalance	0.15	0.09	.07	-.10	-.17	-.18	.06	.51**			
8. Coaching	4.50	1.73	.04	.02	.13	-.03	.10	-.20	.17		
9. Inter. process failure	1.79	0.36	.13	.29*	.12	.10	-.19	-.28*	.23	-.02	
10. Team performance	3.61	1.61	-.17	.14	-.04	.00	.20	-.16	-.22	-.03	-.17

*Note: * p < .05; **p < .01;* † *p < .10*

A bootstrap procedure, using 1,000 iterations was employed to estimate the t-values used to determine significance of the structural paths. This procedure is recommended for models that combine mediation and moderation (Edwards and Lambert 2007). Before conducting the analysis, main effect predictors (dispersion and coaching) were mean-centered to reduce the threat of multicollinearity. In terms of explanatory power, both models explain 15% of the variance in interpersonal process failure. While at first glance these values appear small, they are actually quite large in the context of field research. In their study of the difficulties of detecting interaction effects, McClellend and Judd (1993, p. 377) note, "…reduction in model error due to adding the product term is often disconcertingly low. Evans (1985), for example, concluded that moderator effects are so difficult to detect that even those explaining as little as 1% of the total variance should be considered important. Champoux and Peters (1987) and Chaplin (1991) reviewed much of the social science literature and reported that field study interactions typically account for about 1%-3% of the variance." Finally, the model for the SYNC sample explains 16% of the variance in team performance, while the model using the ASYNC sample explains 8% of the variance in performance.

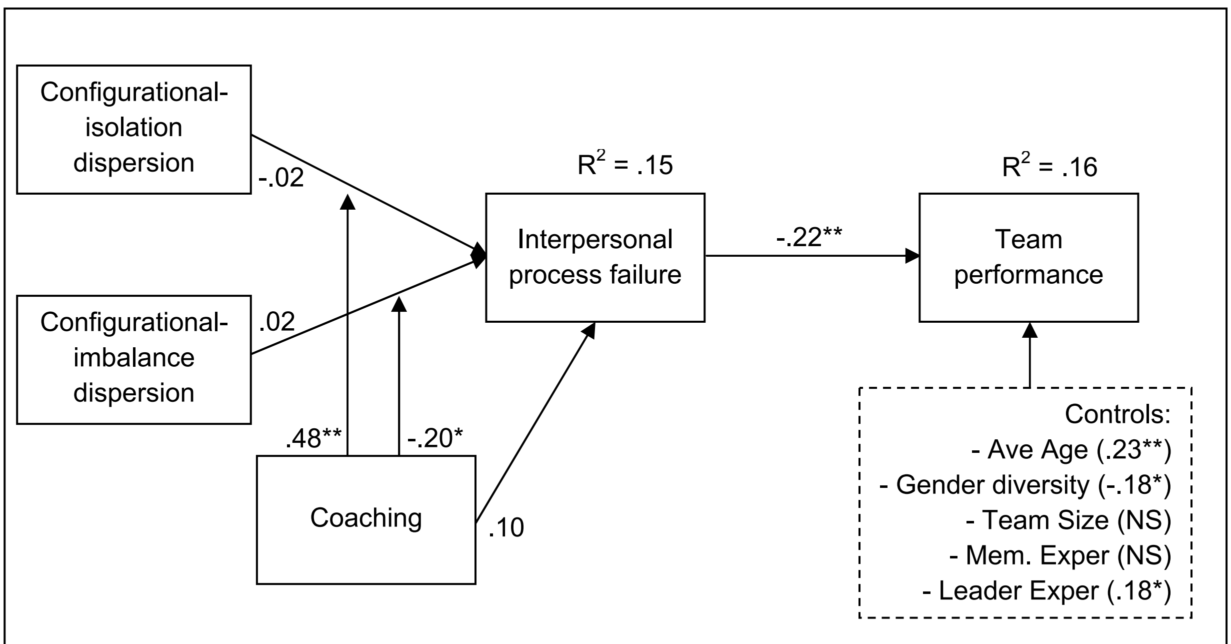

Figure 2a. Results for Sample with High *Synchronous* ICT Use (n = 43) *p < .05, **p < .01

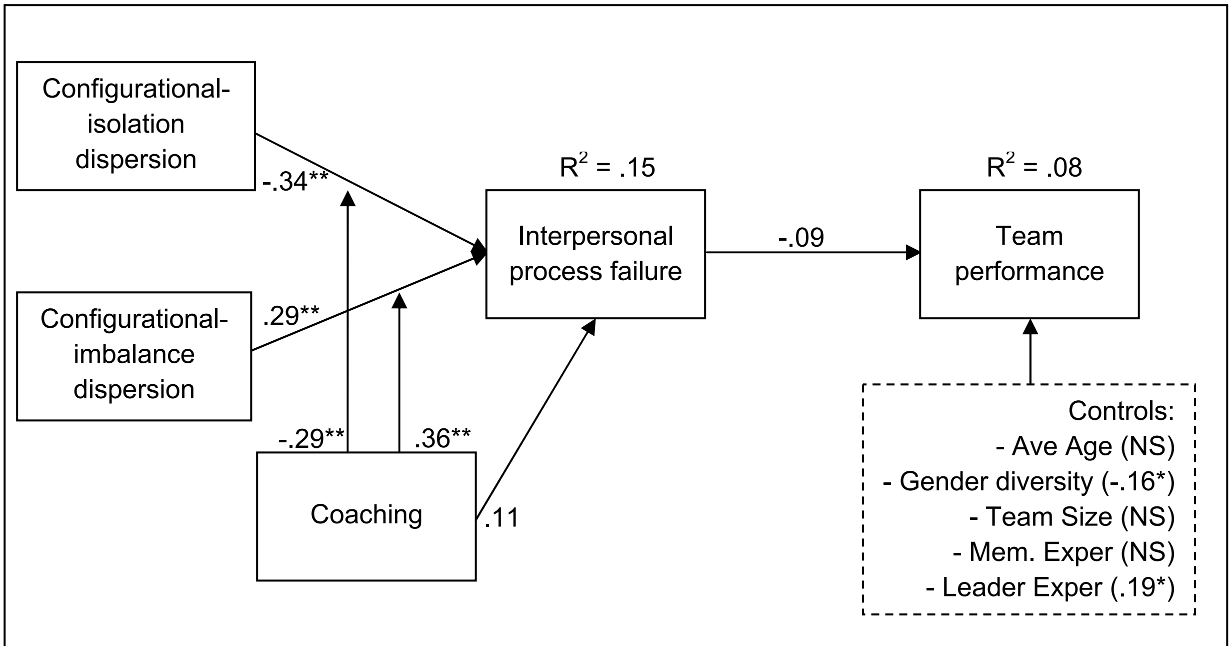

**Figure 2b. Results for Sample with High *Asynchronous* ICT Use (n = 43) ***$p < .05$, **$p < .01$

Figures 2a and 2b depict the results of the structural model tests. Hypotheses 1-4 suggested that coaching, ICT use and configurational-dispersion would have interactive effects on interpersonal process failure. As can be seen in the path coefficients for each model, the interaction between coaching and configurational-isolation and configurational-imbalance are significant. H1 predicted that when coaching is high and asynchronous ICTs are used by configurationally-isolated teams, interpersonal process failures would be decreased. This was supported by way of a significant, negative coefficient for the interaction term representing coaching and configurational-isolation for the ASYNC sample ($\beta = -.29$, $p < .01$). H2 predicted that when coaching is high and synchronous ICTs are used by configurationally-isolated teams, interpersonal process failures would be increased. This was supported by way of a significant, positive coefficient for the interaction term representing coaching and configurational-isolation for the SYNC sample ($\beta = .48$, $p < .01$). H3 predicted that when coaching is high and asynchronous ICTs are used by configurationally-imbalanced teams, interpersonal process failures would be increased. This was supported by way of a significant, positive coefficient for the interaction term representing coaching and configurational-imbalance for the ASYNC sample ($\beta = .35$, $p < .01$). H4 predicted that when coaching is high and synchronous ICTs are used by configurationally-imbalanced teams, interpersonal process failures would be decreased. This was supported by way of a significant, negative coefficient for the interaction term representing coaching and configurational-imbalance for the SYNC sample ($\beta = -.20$, $p < .05$). Thus, the interaction hypotheses, H1-H4, are supported. H5 predicted that interpersonal process failures would reduce team performance. This is partially supported. The path coefficient is significant and negative for the SYNC sample ($\beta = -.22$, $p < .01$), but not significant for the ASYNC sample ($\beta = -.09$, NS).

To further probe the nature of the interactions, the interaction effects were plotted, following the guidelines of Aiken and West (1991). Figures 3a-3d illustrate these plots. In line with the hypotheses, interpersonal process failures are lowest for configurationally-isolated teams when coaching is low and synchronous ICTs are used, or when coaching is high and asynchronous ICTs are used. Conversely, interpersonal process failures are lowest for configurationally-imbalanced teams when coaching is low and asynchronous ICTs are used or when coaching is high and synchronous ICTs are used.

H6 proposed a mediated-moderated relationship whereby the interactive effects of configurational-dispersion and coaching would impact team performance through their influence on interpersonal process failures for the SYNC and ASYNC subsamples. Testing this relationship requires a multistep process outlined by Edwards and Lambert (2007). The steps are as follows: (a) the effect of configurational-isolation and configurational-imbalance on interpersonal process failure must be moderated by coaching, (b) the effect of the interaction terms on team performance must be mediated by interpersonal process failures, and (c) the direct effect of coaching on interpersonal process failures must decrease in the presence of the interaction terms. Following prior exemplars (e.g., Tiwana and Konsynski 2010), I first added the main effect of coaching on team performance to the preceding models. The main effect was not significant in either sample (SYNC: $\beta = .14$, $t = 1.45$; ASYC: $\beta = -.02$, $t = .25$). Thus, the analysis fails at the first step. As an additional check for step (a), I conducted a Sobel test (Sobel 1982) to determine whether the interactive effect of coaching and configurational-imbalance or coaching and configurational-isolation influence performance through interpersonal process failures. The Sobel test statistics were not significant (SYNC/isolation = .96, $p > .05$; SYNC/imbalance = -1.02, $p > .05$; ASYNC/isolation = -1.89, $p > .05$; ASYNC/imbalance = 1.31, $p > .05$). Thus H6, predicting mediated-moderation, is not supported.

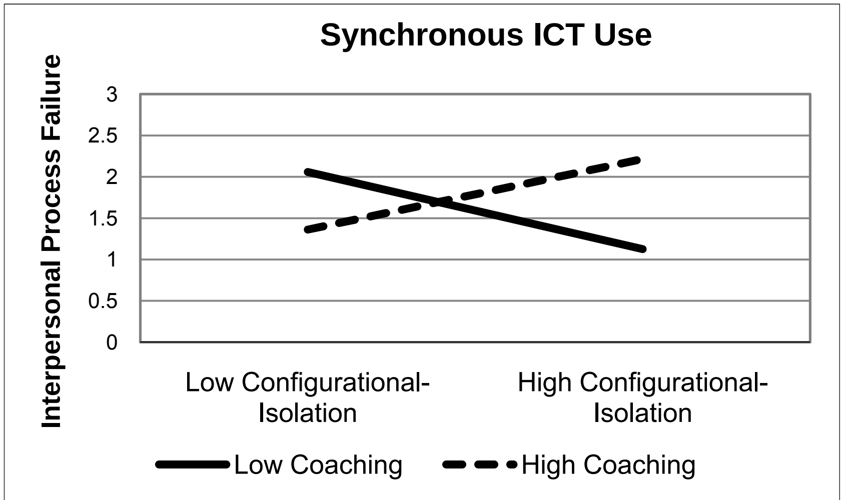

Figure 3a. Plot for Configurational-isolation with Synchronous ICT Use

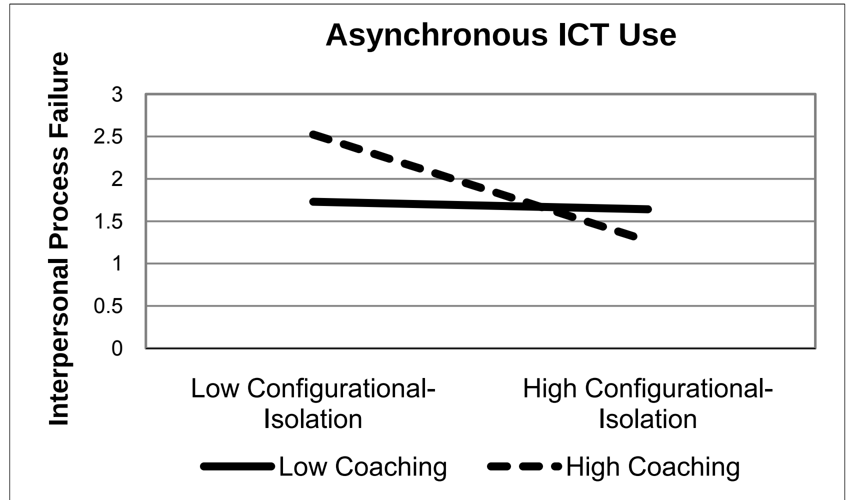

Figure 3b. Plot for Configurational-isolation with Asynchronous ICT Use

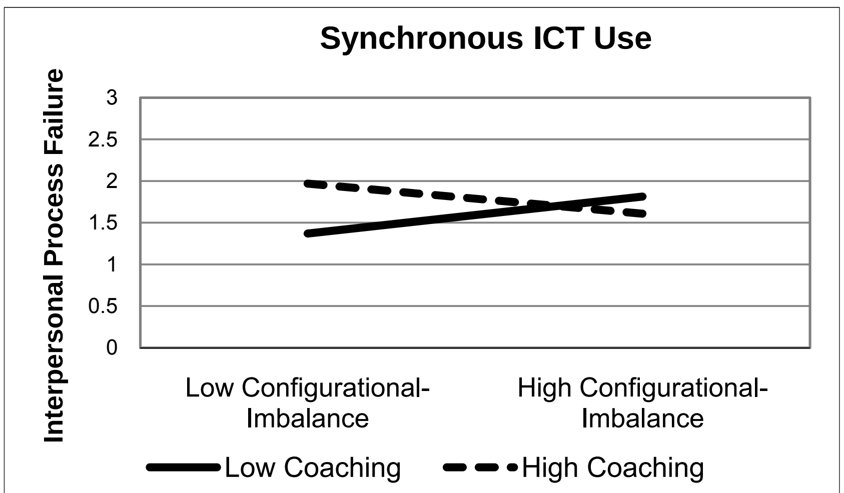

Figure 3c. Plot for Configurational-imbalance with Synchronous ICT Use

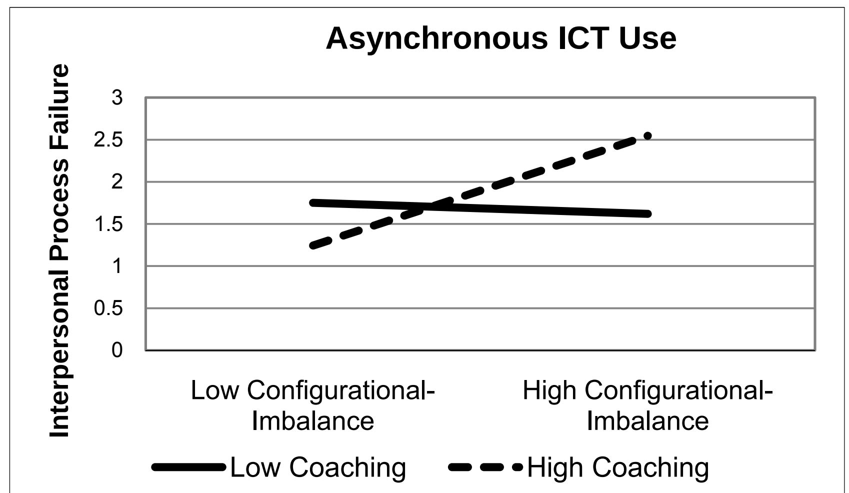

Figure 3d. Plot for Configurational-imbalance with Asynchronous ICT Use

Notes: 1. t-tests show that all slopes are significantly different from zero, excepting Figure 3b. The slope representing low coaching is not different from zero; 2. Per Keil et al. (2000), all slopes are significantly different at p<.05.

DISCUSSION

The objective of this research was to determine if, how, and why coaching and ICT synchronicity would alleviate or enhance the effects of configurational-dispersion on interpersonal process failures. Understanding the boundary conditions by which configurational-dispersion impacts interpersonal processes in teams is critical if we are to fully understand the complexity of modern team-based structures. Drawing from the literature on team dispersion, leadership, and ICT capabilities, I put forth a model to test the conditions under which configurational-imbalance and configurational-isolation help or hurt teams. The model was tested among 86 configurationally-dispersed teams and their leaders, composed of 883 team members working on systems development projects, with members located in China, India, and the U.S. The results show that both coaching and ICT synchronicity do have important implications for how configurational-isolation and configurational-imbalance contribute to interpersonal process failures. Specifically, I found that coaching is beneficial for teams experiencing configurational-isolation when asynchronous ICTs are used and for teams experiencing configurational-imbalance when synchronous ICTs are used. Coaching is not beneficial when teams experience configurational-isolation and employ synchronous ICTs or when teams experience configurational-imbalance and employ asynchronous ICTs. Interpersonal process failures are found to decrease team performance for those teams using synchronous ICTs.

Theoretical Contributions

This work contributes to the literature in several ways. First, it contributes to the literature on dispersed teamwork by extending our understanding of the effects of configurational-dispersion on interpersonal process failures. Owing to recent developments in our understanding of differing forms of dispersion and their distinct effects (O'Leary and Cummings 2007), the relative effects of configurational-dispersion are not yet well understood. By extending O’Leary and Mortensen’s (2010) work to encompass important factors in the teams’ environment that can that influence the effects of configurational-isolation and configurational-imbalance, this work adds to the growing literature on how these forms of dispersion impact team outcomes. This is important given the paucity of research on configurational-dispersion and the unexpected positive impact of configurational-isolation (O'Leary and Mortensen 2010). The current study both supports these findings and extends them by uncovering additional mechanisms that govern the impact of configurational-dispersion on teams.

Second, this research contributes to the literature on coaching and ICT capabilities. The results show that neither coaching nor the richer, synchronous technologies that promote sharedness, are a panacea for interpersonal processes. Perhaps counter-intuitively, both coaching and synchronous technologies can have deleterious impacts on team outcomes, given the “right” conditions. With few exceptions, the literature on both coaching and ICT synchronicity has generally supported the idea that leadership and synchronous technologies have positive influences on team outcomes by way of enhancing the sense of sharedness that dispersed teams tend to lack (Burke et al. 2006, Cummings et al. 2009, Dennis et al. 2008, Hertel et al. 2005, Martins et al. 2004, van Woerkom 2001). I argue that this sharedness does not always engender positive outcomes and the results bear this out. In doing so, this research responds to calls in the literature on dispersed teams to incorporate the role of leadership and ICT capabilities in theorizing about team dispersion (Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006). This call to examine the confluence between leadership and technology in the context of team dispersion, is succinctly summarized by Maruping and Agarwal (2004, p. 987), who note, “Further, an understanding of the ability of team leaders…to recognize how to use technology to facilitate critical interpersonal processes would be invaluable.”

Third, this study contributes to the literature on team dispersion by offering a look at the functioning of teams as they occur naturally, in the field. Empirical field research of dispersed teams has not kept pace with theorizing and lab studies on the effects of dispersion (Mark 2002). While prior research has made important contributions to the literature on team dispersion, lab studies are limited in their ability to capture the complexity of naturally-occurring teams (Dennis et al. 1990). In fact, all prior empirical research on configurational-dispersion has occurred in the lab, using student samples (Cramton 2001, O'Leary and Mortensen 2010, O’Leary and Mortensen 2005, Polzer et al. 2006). The current work represents the first empirical study of configurational-dispersion in naturally-occurring teams. In line with this research, the results presented here do provide evidence that teams experiencing configurational-isolation suffer from fewer interpersonal process failures than configurationally-imbalanced teams. However, results also show that configurationally-isolated teams can experience a level of interpersonal process failure that is on par with configurationally-imbalanced teams, under certain conditions (i.e., high coaching and synchronous technology use). These results thus suggest that the psychological distance between subgroups may involve a more delicate balance than previously thought (Pratt et al. 2000) and this bears further testing.

Limitations and Future Research Directions

While the results of this work may stimulate future research, so too, will its limitations. In particular, I note three key limitations that provide an opportunity to extend and improve on this work. First, the survey was cross-sectional, prompting concerns of common method variance (CMV). Several steps were taken to minimize this threat, as suggested by Podsakoff et al. (2003). First, the constructs were measured from different sources (members and leaders) to reduce the possibility of source bias. Second, the survey was structured so as to proximally separate any predictor and criterion variables and in the case of team performance, measurement of the predictor variables was temporally separated from the criterion variables. Third, steps were taken to assure respondents that their responses would be kept strictly anonymous by using an external firm to administer and collect the surveys and by tracking responses across measurement points with anonymous barcodes. Despite these precautions, longitudinal research is needed to completely rule out CMV. Moreover, longitudinal research may reveal some additional interesting effects or boundaries to the model. Prior research suggests that the timing of deployment and use of technologies with particular capabilities (Carte and Chidambaram 2004, Maruping and Agarwal 2004), as well as timing of leadership interventions (Hackman and Wageman 2005) can affect their efficacy in managing team collaborations. Longitudinal analysis may help to determine the appropriate point at which coaching and ICTs can be leveraged for maximum impact.

Second, while the collection of field data represents a strength of the study in terms of enhancing its external validity, data were collected from only one company. Although the sample spanned several different countries and nationalities, the work practices, culture and climate of the participating organization may be somewhat unique. One potentially unique aspect of this company is that a large percentage of employees are women, which may not be reflective of other companies. Research finds that relationships between supervisors and employees can be impacted by the gender of both the supervisor and the employee (Wayne et al. 1994). Future research with other samples will be needed to tease out any such effects related to gender or organizational culture/climate.

Third, only two forms of geographic dispersion and one type of team process was studied. Other potential configurations of dispersion, such as configurational-site dispersion (i.e., the number of sites across which members are located) (O'Leary and Cummings 2007) or examination of balanced subgroups provide opportunities to study how leadership and technology interact with other team configurations. Moreover, while interpersonal processes have been identified as particularly challenging for dispersed teams, action and transition processes also present challenges (Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006). For example, recent research finds that synchronous and asynchronous ICTs can be leveraged by teams experiencing different types of dispersion to reduce coordination delay (Cummings et al. 2009). Extending this line of research to examine coordination delay with other types of geographic dispersion, or to examine other team processes, and other leadership and technology interventions is needed to push forward our understanding of dispersed teamwork.

Practical Implications

This research also provides important implications for organizations and those who manage dispersed teams. First, is the need to consider the configuration of members dispersed across sites. Dispersed teams are not all created equally, not just as it pertains to the composition of member characteristics, but also as it pertains to how they are distributed across geographic locations. Complementing the work of O'Leary and Mortensen (2010), the findings suggest that the negative dynamics related to subgroup formation can be mitigated, provided configurational-dispersion is taken into account.

Second, the findings suggest that, in addition to consideration of the form of dispersion, organizations should give careful thought to the support mechanisms in a dispersed team's environment. In particular, GDT leaders will want to take stock of the level and type of involvement they have with dispersed teams, as well as the collaborative technologies that may be available to them. In this regard, the results presented here provide some encouraging recommendations, as they suggest two "knobs" that can be adjusted in order to enhance interpersonal team processes: coaching and ICTs. This is likely to be particularly helpful in organizations where either ICT use or leader involvement is constrained in some way. For instance, in organizations where use of a particular ICT is mandated or prescribed, leaders can “dial up” or “dial down”, the extent of their coaching according to their team’s type of configurational-dispersion. Alternatively, when leaders are required to be highly involved in coaching their team (e.g., through performance evaluations tied to their coaching behaviors), they may opt to have their team use a particular type of ICT with predominantly synchronous or asynchronous capabilities, according to their team’s configurational-dispersion.

Third, this research highlights the need for leaders to think critically about how physical distances are tied to psychological distances. My theorizing suggests that whether these psychological distances should be altered, and how they are altered, can have significant impacts on teams’ interpersonal functioning, and ultimately, on their performance. Based on this work, I would encourage leaders to think beyond the effects of coaching and ICT use, to consider how their involvement with the team and how other factors in the team’s environment would contribute to whether it is appropriate to “bridge the gap” or “mind the gap” between team members.

CONCLUSIONS

Collaborative technologies have enabled organizations to cultivate the use of dispersed teams that transcend the traditional spatial, temporal, and configurational boundaries of organizations (O’Leary and Cummings 2007). Despite increasing interest and investment in dispersed teams (Rickman 2009), this type of team structure is not without unique challenges, particularly as it pertains to managing increasingly complex configurations of dispersion. This study of 86 naturally-occurring, configurationally-dispersed teams steps away from traditional GTD issues related to spatial and temporal dispersion to uncover the complex effects that occur when team leaders and ICTs are brought to bear on the management of dispersed teams. The findings have important implications for future research on leadership and technology-based interventions in the dispersed context and advocate consideration for when and how it might be appropriate to bridge the gap, or mind the gap that is created when teams are configurationally-dispersed.

REFERENCES

Adams, S. L., and Anantatmula, V. 2010. "Social and Behavioral Influences on Team Process," *Project Management Journal* (41:4), pp. 89-98.

Aiken, L. S., and West, S. G. 1991. *Multiple Regression: Testing and Interpreting Interactions*, Newbury Park, CA: Sage Publications.

Alnuaimi, O., Robert, L. P., and Maruping, L. M. 2010. "Team Size, Dispersion, and Social Loafing in Technology-Supported Teams: A Theory of Moral Disengagement Perspective," *Journal of Management Information Systems* (27:1), pp. 203-230.

Ancona, D. G., and Caldwell, D. F. 1992. "Demography and Design: Predictors of New Product Team Performance," *Organization Science* (3:3), pp. 321-341.

Ashforth, B. E., and Johnson, S. A. 2001. "Which Hat to Wear? The Relative Salience of Multiple Identities in Organizational Contexts," in *Social Identity Processes in Organizational Contexts,* M.A. Hogg, and D.J. Terry (eds.), Philadelphia, PA: Psychology Press, pp. 31–48.

Ballard, D. I., and Seibold, D. R. 2004. "Communication-Related Organizational Structures and Work Group Temporal Experiences: The Effects of Coordination Method, Technology Type, and Feedback Cycle on Members Construals and Enactments of Time," *Communication Monographs* (71:1), pp. 1-27.

Bass, B. M., and Bass, R. 2008. *The Bass Handbook of Leadership: Theory, Research, and Managerial Applications*, New York, NY: Free Press.

Bell, B. S., and Kozlowski, S. W. 2002. "A Typology of Virtual Teams: Implications for Effective Leadership," *Group & Organization Management* (27:1), pp. 14-49.

Brewer, M. B. 1979. "In-Group Bias in the Minimal Intergroup Situation: A Cognitive-Motivational Analysis," *Psychological Bulletin* (86:2), pp. 307-324.

Burke, C. S., Stagl, K. C., Klein, C., Goodwin, G. F., Salas, E., and Halpin, S. M. 2006. "What Type of Leadership Behaviors Are Functional in Teams? A Meta-Analysis," *The Leadership Quarterly* (17:3), pp. 288-307.

Carte, T. A., and Chidambaram, L. 2004. "A Capabilities-Based Theory of Technology Deployment in Diverse Teams: Leapfrogging the Pitfalls of Diversity and Leveraging Its Potential with Collaborative Technology," *Journal of the Association for Information Systems* (5:11-12), pp. 17.

Chin, W. W. 1998. "The Partial Least Squares Approach to Structural Equation Modeling," in *Modern Methods for Business Research,* G.A. Marcoulides (ed.), Mahwah, NJ: Lawrence Erlbaum Associates, pp. 295-336.

Cramton, C. D. 2001. "The Mutual Knowledge Problem and Its Consequences for Dispersed Collaboration," *Organization Science* (12:3), pp. 346-371.

Cramton, C. D., and Hinds, P. J. 2005. "Subgroup Dynamics in Internationally Distributed Teams: Ethnocentrism or Cross-National Learning?," *Research in Organizational Behavior* (26), pp. 231-263.

Cramton, C. D., and Orvis, K. L. 2003. "Overcoming Barriers to Information Sharing in Virtual Teams," in *Virtual Teams That Work: Creating Conditions for Virtual Team Effectiveness,* C.B. Gibson, and S.G. Cohen (eds.), San Francisco, CA: Jossey-Bass, pp. 214–230.

Cummings, J. N. 2004. "Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization," *Management Science* (50:3), pp. 352-364.

Cummings, J. N., Espinosa, J. A., and Pickering, C. K. 2009. "Crossing Spatial and Temporal Boundaries in Globally Distributed Projects: A Relational Model of Coordination Delay," *Information Systems Research* (20:3), pp. 420-439.

Daft, R. L., and Lengel, R. H. 1986. "Organizational Information Requirements, Media Richness and Structural Design," *Management Science* (32:5), pp. 554-571.

Dennis, A. R., Fuller, R. M., and Valacich, J. S. 2008. "Media, Tasks, and Communication Processes: A Theory of Media Synchronicity," *MIS Quarterly* (32:3), pp. 575-600.

Dennis, A. R., and Kinney, S. T. 1998. "Testing Media Richness Theory in the New Media: The Effects of Cues, Feedback, and Task Equivocality," *Information Systems Research* (9:1), pp. 256-274.

Dennis, A. R., Nunamaker, J. F., and Vogel, D. R. 1990. "A Comparison of Laboratory and Field Research in the Study of Electronic Meeting Systems," *Journal of Management Information Systems* (7:3), pp. 107-135.

Dennis, A. R., and Valacich, J. S. 1999. "Rethinking Media Richness: Towards a Theory of Media Synchronicity," in *Proceedings of the 32nd Hawaii International Conference on System Sciences*, Hawaii, pp. 1-10.

Duck, J. M., and Fielding, K. S. 2003. "Leaders and Their Treatment of Subgroups: Implications for Evaluations of the Leader and the Superordinate Group," *European Journal of Social Psychology* (33:3), pp. 387-401.

Edmondson, A. 1999. "Psychological Safety and Learning Behavior in Work Teams," *Administrative science quarterly* (44:2), pp. 350-383.

Edwards, J. R., and Lambert, L. S. 2007. "Methods for Integrating Moderation and Mediation: A General Analytical Framework Using Moderated Path Analysis," *Psychological Methods* (12:1), pp. 1-22.

Espinosa, J. A., Slaughter, S. A., Kraut, R. E., and Herbsleb, J. D. 2007. "Team Knowledge and Coordination in Geographically Distributed Software Development," *Journal of Management Information Systems* (24:1), pp. 135-169.

Falk, R. F., and Miller, N. B. 1992. *A Primer for Soft Modeling*, Akron, OH: University of Akron Press.

Fornell, C., and Larcker, D. F. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18:1), pp. 39-50.

Gemino, A., Reich, B. H., and Sauer, C. 2008. "A Temporal Model of Information Technology Project Performance," *Journal of Management Information Systems* (24:3), pp. 9-44.

Hackman, J. R., and Wageman, R. 2005. "A Theory of Team Coaching," *Academy of Management Review* (30:2), pp. 269-287.

Hertel, G., Geister, S., and Konradt, U. 2005. "Managing Virtual Teams: A Review of Current Empirical Research," *Human Resource Management Review* (15:1), pp. 69-95.

Hogg, M. A. 2001. "Social Categorization and Group Behavior," in *Group Processes,* M.A. Hogg, and R.S. Tindale (eds.), Malden, MA: Blackwell Publishers, pp. 56-85.

Holmström, H., Fitzgerald, B., Ågerfalk, P. J., and Conchuir, E. O. 2006. "Agile Practices Reduce Distance in Global Software Development," *Information Systems Management* (23:3), pp. 7-18.

Insko, C. A., Schopler, J., Hoyle, R. H., Dardis, G. J., and Graetz, K. A. 1990. "Individual-Group Discontinuity as a Function of Fear and Greed," *Journal of Personality and Social Psychology* (58:1), pp. 68-79.

Keil, M., Tan, B. C. Y., Wei, K. K., Saarinen, T., Tuunainen, V., and Wassenaar, A. 2000. "A Cross-Cultural Study on Escalation of Commitment Behavior in Software Projects," *MIS Quarterly* (24:2), pp. 299-325.

Kidwell, R. E., and Bennett, N. 1993. "Employee Propensity to Withhold Effort: A Conceptual Model to Intersect Three Avenues of Research," *Academy of Management Review* (18:3), pp. 429-456.

Kirkman, B. L., Rosen, B., Gibson, C. B., Tesluk, P. E., and McPherson, S. O. 2002. "Five Challenges to Virtual Team Success: Lessons from Sabre, Inc.," *Academy of Management Executive* (16:3), pp. 67-79.

Kock, N. 1998. "Can Communication Medium Limitations Foster Better Group Outcomes? An Action Research Study," *Information & Management* (34:5), pp. 295-305.

Kozlowski, S. W. J., Gully, S. M., McHugh, P. P., Salas, E., and Cannon-Bowers, J. A. 1996. "A Dynamic Theory of Leadership and Team Effectiveness: Developmental and Task Contingent Leader

Roles," in *Research in Personnel and Human Resources Management,* G.R. Ferris (ed.), Greenwich, CT: JAI Press, pp. 253-306.

Latane, B., Williams, K., and Harkins, S. 1979. "Many Hands Make Light the Work: The Causes and Consequences of Social Loafing," *Journal of Personality and Social Psychology* (37:6), pp. 822-832.

Lau, D. C., and Murnighan, J. K. 1998. "Demographic Diversity and Faultlines: The Compositional Dynamics of Organizational Groups " *Academy of Management Review* (23:2), pp. 325-340.

Liberman, N., Trope, Y., and Stephan, E. 2007. "Psychological Distance," in *Social Psychology: Handbook of Basic Principles,* A.W. Kruglanski, and E.T. Higgins (eds.), New York, NY: Guilford Press, pp. 353-383.

Lindsley, D. H., Brass, D. J., and Thomas, J. B. 1995. "Efficacy-Performance Spirals: A Multilevel Perspective," *Academy of Management Review* (20:3), pp. 645-678.

Liu, C., Pirola-Merlo, A., Yang, C., and Huang, C. 2009. "Disseminating the Functions of Team Coaching Regarding Research and Development Team Effectiveness: Evidence from High-Tech Industries in Taiwan," *Social Behavior and Personality* (37:1), pp. 41-58.

Mannix, E. A. 1993. "Organizations as Resource Dilemmas: The Effects of Power Balance on Coalition Formation in Small Groups," *Organizational Behavior and Human Decision Processes* (55:1), pp. 1-22.

Mark, G. 2002. "Conventions for Coordinating Electronic Distributed Work: A Longitudinal Study of Groupware Use," in *Distributed Work,* P. Hinds, and S. Kiesler (eds.), Cambridge, MA: MIT Press, pp. 259-280.

Marks, M. A., Mathieu, J. E., and Zaccaro, S. J. 2001. "A Temporally Based Framework and Taxonomy of Team Processes," *Academy of Management Review* (26:3), pp. 356-376.

Martins, L. L., Gilson, L., L., and Maynard, M. T. 2004. "Virtual Teams: What Do We Know and Where Do We Go from Here?," *Journal of Management* (30:6), pp. 805-835.

Maruping, L. M., and Agarwal, R. 2004. "Managing Team Interpersonal Processes through Technology: A Task-Technology Fit Perspective," *Journal of Applied Psychology* (89:6), pp. 975-990.

Mathieu, J., Maynard, M. T., Rapp, T., and Gilson, L. 2008. "Team Effectiveness 1997-2007: A Review of Recent Advancements and a Glimpse into the Future," *Journal of Management* (34:3), pp. 410-476.

Mathieu, J. E., Gilson, L. L., and Ruddy, T. M. 2006. "Empowerment and Team Effectiveness: An Empirical Test of an Integrated Model," *Journal of Applied Psychology* (91:1), pp. 97-108.

McClelland, G. H., and Judd, C. M. 1993. "Statistical Difficulties of Detecting Interactions and Moderator Effects," *Psychological Bulletin* (114:2), pp. 376-390.

Montoya-Weiss, M. M., Massey, A. P., and Song, M. 2001. "Getting It Together: Temporal Coordination and Conflict Management in Global Virtual Teams," *Academy of Management Journal* (44:6), pp. 1251-1262.

Muller, D., Judd, C. M., and Yzerbyt, V. Y. 2005. "When Moderation Is Mediated and Mediation Is Moderated," *Journal of Personality and Social Psychology* (89:6), pp. 852-863.

Nembhard, I. M., and Edmondson, A. C. 2006. "Making It Safe: The Effects of Leader Inclusiveness and Professional Status on Psychological Safety and Improvement Efforts in Health Care Teams," *Journal of Organizational Behavior* (27:7), pp. 941-966.

O'Leary, M. B., and Cummings, J. N. 2007. "The Spatial, Temporal, and Configurational Characteristics of Geographic Dispersion in Work Teams," *MIS Quarterly* (31:3), pp. 433-452.

O'Leary, M. B., and Mortensen, M. 2010. "Go (Con)Figure: Subgroups, Imbalance, and Isolates in Geographically Dispersed Teams," *Organization Science* (21:1), pp. 115-131.

O'Leary, M., and Mortensen, M. 2005. "Subgroups with Attitude: Imbalance and Isolation in Geographically Dispersed Teams," in *Proceedings of the Academy of Management Conference* Hawaii, pp. 1-46.

O'Leary, M. B., and Cummings, J. N. 2007. "The Spatial, Temporal, and Configurational Characteristics of Geographic Dispersion in Work Teams," *MIS Quarterly* (31:3), pp. 433-452.

Phillips, K. W., and Loyd, D. L. 2006. "When Surface and Deep-Level Diversity Collide: The Effects on Dissenting Group Members," *Organizational Behavior and Human Decision Processes* (99:2), pp. 143-160.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology* (88:5), pp. 879-902.

Polzer, J. T., Crisp, C. B., Jarvenpaa, S. L., and Kim, J. W. 2006. "Extending the Faultline Model to Geographically Dispersed Teams: How Colocated Subgroups Can Impair Group Functioning," *Academy of Management Journal* (49:4), pp. 679-692.

Powell, A., Piccoli, G., and Ives, B. 2004. "Virtual Teams: A Review of Current Literature and Directions for Future Research," *DATA BASE for Advances in Information Systems* (35:1), pp. 6-36.

Pratt, M. G., Fuller, M. A., and Northcraft, G. B. 2000. "Media Selection and Identification in Distributed Groups the Potential Costs of “Rich” Media," in *Technology: Research on Managing Groups and Teams,* E.A. Mannix, and M.A. Neale (eds.), Stamford, CT: JAI Press, pp. 231-255.

Premkumar, G. 2004. "Understanding Changes in Belief and Attitude toward Information Technology Usage: A Theoretical Model and Longitudinal Test," *MIS Quarterly* (28:2), pp. 229-254.

Rickman, J. 2009. *How-to Guide for Building a Virtual Team*, (http://buildingsustainablevirtualteams.wordpress.com/).

Ringle, C. M., Wende, S., and Alexander, W. 2005. "SmartPLS (Version 2.0 (Beta))." Hamburg, Germany.

Robert, L. P., and Dennis, A. R. 2005. "Paradox of Richness: A Cognitive Model of Media Choice," *IEEE Transactions on Professional Communication* (48:1), pp. 10-21.

Sarker, S., and Sahay, S. 2000. "Understanding Virtual Team Development: An Interpretive Study," *Journal of the Association for Information Systems* (4), pp. 1-38.

Sarker, S., and Sahay, S. 2004. "Implications of Space and Time for Distributed Work: An Interpretive Study of US–Norwegian Systems Development Teams," *European Journal of Information Systems* (13:1), pp. 3-20.

Sarker, S., and Sarker, S. 2009. "Exploring Agility in Distributed Information Systems Development Teams: An Interpretive Study in an Offshoring Context," *Information Systems Research* (20:3), pp. 440-461.

Sobel, M. E. 1982. "Asymptotic Confidence Intervals for Indirect Effects in Structural Equation Models," in *Sociological Methodology,* S. Leinhardt (ed.), Washington, DC: pp. 290-312.

Spector, P. E. 1994. "Using Self-Report Questionnaires in O.B. Research: A Comment on the Use of a Controversial Method," *Journal of Organizational Behavior* (15:5), pp. 385-392.

Tajfel, H. T., and Turner, J. C. 1986. "The Social Identity Theory of Intergroup Behavior," in *Psychology of Intergroup Relations,* S. Worchel (ed.), Chicago, IL: Nelson-Hall Publishers, pp. 7-24.

Tindale, R. S., and Kameda, T. 2000. "‘Social Sharedness’ as a Unifying Theme for Information Processing in Groups," *Group Processes & Intergroup Relations* (3:2), pp. 123-140.

Tiwana, A., and Konsynski, B. 2010. "Complementarities between Organizational IT Architecture and Governance Structure," *Information Systems Research* (21:2), pp. 288-304.

Turner, J. C. 1985. "Social Categorization and the Self-Concept: A Social Cognitive Theory of Group Behavior," in *Advances in Group Processes: Theory and Research,* E.J. Lawler (ed.), Greenwich, CT: JAI Press, pp. 47-74.

Upadhyaya, A., and Krishna, S. 2007. "Antecedents of Knowledge Sharing in Globally Distributed Software Development Teams," in *Proceedings of the European Conference on Information Systems*, St. Gallen, Switzerland, pp. 727-738.

van Woerkom, M. 2001. "Team Coaching in Teacher Teams," in *Supporting Workplace Learning: Towards Evidence-Based Practice,* R.F. Poell, and M. van Woerkom (eds.), New York, NY: Springer, pp. 165-182.

Wayne, S. J., Liden, R. C., and Sparrowe, R. T. 1994. "Developing Leader-Member Exchanges: The Influence of Gender and Ingratiation," *American Behavioral Scientist* (37:5), pp. 697-714.

Webster, J., and Staples, D. S. 2006. "Comparing Virtual Teams to Traditional Teams: An Identification of New Research Opportunities," in *Research in Personnel and Human Resources Management,* J.J. Martocchio (ed.), San Diego, CA: Elsevier, pp. 183-218.

Wilson, J. M., Boyer, O. L., Metiu, A., and Jeff, Q. 2008. "Perceived Proximity in Virtual Work: Explaining the Paradox of Far-but-Close," *Organization Studies* (29:7), pp. 979-1002.

Woolley, A. W. 1998. "Effects of Intervention Content and Timing on Group Task Performance," *Journal of Applied Behavioral Science* (34:1), pp. 30-49.

APPENDIX

Table 1. Essay 2 Survey Items

Construct	#	Item	Source	Scale*
Motivational coaching	1	As a team leader I…	Liu et al. 2009	1
	2	Help the team build a high shared commitment to its purposes.		
	3	Help the team sustain the motivation of all team members.		
	4	Foster the enthusiasm of team members.		
Consultative coaching	1	Work with the team to develop the best-possible approach to project objectives.	Liu et al. 2009	1
	2	Keep the team alert to anything that might require a change in project strategy.		
	3	Challenge team members to think of better ways of doing project work.		
	4	Never help the team to develop appropriate project strategies. [R]		
Educational coaching	1	Help members learn from one another and from the team's project experiences.	Liu et al. 2009	1
	2	Help the team identify and use well each member's unique talents.		
	3	Help team members identify where they can get expert assistance from.		
	4	Encourage team members to draw on each others' experience and knowledge.		
Configurational-dispersion	1	Please provide the name of the city, state/region, and country where you work.	O'Leary & Cummings 2007	0
	2	Please provide the address of the building where you work.		
	3	Please provide the number of the floor of the building where you work.		
ICT use	-	Thinking of the past month, please indicate the extent to which you have/will used/use the following tools to communicate with your teammates:	Cummings et al. 2009	3
Asynchronous ICT use	1	Email		
	2	Group/Decision Support Systems (e.g. GroupSystems)		
Synchronous ICT use	1	Desktop Conferencing Software		
	2	Text-based chat applications		
Interpersonal processes	1	Members of my team create an environment of openness and trust.	Mathieu et al. 2006	1
	2	Members of my team really trust each other.		
	3	Members of my team think in terms of what is best for the team.		
Team performance	1	The team works efficiently	Ancona & Caldwell 1992	1
	2	The team produces high quality technical innovations.		
	3	The team adheres to schedules.		
	4	The team adheres to budgets.		
	5	The team demonstrates an ability to resolve conflicts.		

*Scale Legend: [0 = Open ended] [1 = 7 pt. Likert, Strong Disagree - Strongly Agree]
[2 = 7 pt. Likert, None/Not at all - a large extent] [3 = 7 pt. Likert, Never - Several times a day]

CHAPTER 4

ESSAY 3: SPATIAL, TEMPORAL, AND CONFIGURATIONAL DISPERSION: AN INVESTIGATION OF BEHAVIORAL COMPLEXITY IN LEADERSHIP AND ITS IMPACT ON DISPERSED TEAM CONFLICT AND COORDINATION

ABSTRACT

Geographically dispersed teamwork has become an increasingly popular means of organizing teamwork, as organizations look to reduce expenses and access specialized expertise that is not available locally. However, these teams face unique challenges in coordinating their work and managing interpersonal relationships. Recent research indicates that the leaders of dispersed teams are not well-prepared to meet these challenges. At the same time, several reviews of the literature on dispersed teams note a lack of understanding in the role that leaders can play in the dispersed team context. The current study responds to this call by examining the implications of participative and directive leadership behaviors for dispersed teams. To add richness to this exploration, I investigate how leaders can reduce the impact of differing forms of dispersion on team outcomes. While prior research on dispersed teams has made great strides in understanding how dispersion affects teams, this work has generally regarded dispersion as a loosely-specified dichotomy—teams are either dispersed or collocated. Recent research highlights the different forms that geographic dispersion can take—including spatial, temporal, and configurational (i.e., imbalance across sites, member isolation) dispersion. In response to this work and the calls for research on dispersed team leadership, I sought to understand how different forms of dispersion comparatively influence interpersonal conflict and coordination effectiveness and whether certain leadership behaviors moderate these effects. The research model is tested via a field study 72 software and hardware development teams with members distributed among China, India, and the U.S. The results show that spatial and configurational-imbalance dispersion negatively affect teams by increasing the amount of interpersonal conflict they experience, while configurational-site dispersion reduces their coordination effectiveness. Participative leadership behaviors (i.e., mentoring, facilitating) are shown to positively influence teams with high spatial or configurational-imbalance dispersion, by reducing the effects of dispersion on interpersonal conflict. Directive leadership behaviors (i.e., monitoring, coordinating) are not found to be an effective means of reducing the negative effects of dispersion.

INTRODUCTION

In recent years, dispersed teamwork has become a means to respond to an increasingly competitive global market by enabling organizations to compose teams with diverse knowledge and perspectives, regardless of their location (Boh et al. 2007, Maruping and Agarwal 2004). Dispersed teams represent an interdependent group of individuals using information and communication technologies as their primary medium of communication (Hambley et al. 2007). Due to the unique advantages of dispersed teamwork, organizations are increasingly employing dispersed teams to accomplish their objectives. The Gartner Group recently reported that over 60% of knowledge workers participate in dispersed, or "virtual", teamwork (Kanawattanachai and Yoo 2002). Dispersed teamwork, however, is not without its challenges. Team dispersion is found to cultivate difficulties with coordination, knowledge sharing and interpersonal relationships (Espinosa et al. 2007, Kiesler et al. 1984, Ko et al. 2005). Due to the collaborative and interpersonal challenges resulting from geographic dispersion, leadership is seen as a critical component to effectively managing dispersed teams (Joshi et al. 2009, Tyran et al. 2003). Assuring that team members are prepared for and contributing to team efforts, interpreting the meaning of non-responses or delayed responses (i.e., "electronic silence") due to asynchronous communication, and ensuring that team member expertise is fully leveraged, are just a few of the leadership challenges imposed by dispersion (Malhotra et al. 2007). While these challenges are readily acknowledged, support for resolving them is lacking. A recent survey of 440 human resource professionals shows that over 60% provide no training on how to lead a virtual team (Rosen et al. 2006). To adequately respond to these challenges we require a deeper understanding of how specific leadership behaviors can help overcome the barriers presented by geographic dispersion.

Several recent reviews of the literature on dispersed teams explicitly call for an examination of leadership issues in the dispersed team context (Bell and Kozlowski 2002, Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006). Research on traditional, collocated teams finds that leadership has a strong influence on team performance and member satisfaction (Bass and Bass 2008, Hackman 1990). While leadership is also important to dispersed team functioning (Carte et al. 2006), as with other aspects of teamwork, the dispersed context engenders different requirements and challenges that impact leadership effectiveness (Hooijberg et al. 1997, Tyran et al. 2003). Indeed, the literature shows that dispersed team leaders must engage in extensive and directive communication in order to be effective (Kayworth and Leidner 2002, Tyran et al. 2003) and that dispersion increases the need for inspirational leadership (Joshi et al. 2009). Recent work on leadership suggests that dispersed teams engage in specific leadership behaviors and roles (Avolio 1999, Carte et al. 2006, Tyran et al. 2003, Yoo and Alavi 2004, Zigurs 2003) suggesting that leadership roles are enacted in dispersed teams, similar to leadership roles in collocated teams. However, prior research has not explored the implications that leadership has for differing forms of dispersion, or the downstream, interactive implications that leadership and dispersion have for team outcomes. Thus, a significant gap exists in our understanding of the role leaders can play in helping to improve team processes in the face of differing forms of geographic dispersion.

Recent reviews of team dispersion note only five studies that actually measure different forms of dispersion, none of which focus on leadership behaviors (O'Leary and Cummings 2007), and with most studies focused on the spatial dimension of geographic dispersion (O'Leary and Cummings 2007). In their review of the dispersion literature, O'Leary and Cummings (2007) note that only 23 of 150 studies make mention of multiple forms of dispersion, and of these none explicitly theorize and measure multiple forms, despite evidence that different forms of dispersion uniquely impact team outcomes (Cramton and Hinds 2005, O'Leary and Mortensen 2010, Polzer et al. 2006, Saunders et al. 2004). Currently, researchers seek to provide a clearer definition of what constitutes team dispersion. Prior conceptualizations have treated dispersion as a loosely-specified dichotomy—teams are either completely separated by some form of dispersion, or they are completely collocated. More recent work, however, has begun to view dispersion according to degrees and form (i.e., spatial, temporal, configurational). No systematic empirical examination of the three types of dispersion is found to exist (O'Leary and Cummings 2007). This represents an important gap in our understanding, as the three forms of geographic dispersion are thought to differ in theoretically important ways (O'Leary and Cummings 2007). Spontaneous, face-to-face communication, for example, is most impacted by spatial dispersion, while synchronous communication is hampered most by temporal dispersion. Given the challenges inherent in dispersed teamwork, effective leadership in this context is all the more crucial. A clearer, more complete understanding of the complex effects of dispersion and leadership is required.

The purpose of this research is to investigate the implications of differing forms of dispersion for team effectiveness, and explore the potential for leadership to impact these relationships. To shed light on these issues, I draw on the theory of behavioral complexity in leadership (BCL) (Denison et al. 1995), which captures key behaviors enacted by team leaders. The BCL provides a framework for examining the complex behaviors exhibited by leaders and has been used to examine leadership in dispersed teams (Carte et al. 2006, Kayworth and Leidner 2002). I synthesize this work with O'Leary and Cummings' (2007) framework of geographic dispersion, which consists of three forms of dispersion: (1) spatial; (2) temporal; and (3) configurational. This synthesis will provide a more granular understanding of the consequences of dispersion and explicate the mechanisms by which such consequences can be managed.

How do the three forms of geographic dispersion comparatively impact important team outcomes? How and why can specific leadership behaviors help mitigate the negative effects of each form of dispersion on outcomes? This research aims to answer these questions. To do so, I put forth a model that demonstrates how the three forms of dispersion comparatively impact team variables that are selected for their theoretical importance to the dispersed context—interpersonal conflict and coordination effectiveness. These two states are chosen because they have been consistently shown to be particularly problematic for dispersed teams and in need of further research (Bell and Kozlowski 2002, Griffith et al. 2003b, Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006). Further, each exemplifies one of the primary mediators of team performance: socio-emotional factors and task-related factors (Marks et al. 2001, Martins et al. 2004, Powell et al. 2004). Specific leadership behaviors are hypothesized to moderate the relationships between these forms of dispersion and team states. The downstream consequences for team performance are included in the model that is shown in Figure 1. The proposed model is tested via a field study of software and hardware design teams located in China, India, and the U.S. collaborating under varying forms and degrees of geographic dispersion.

The proposed study makes several important contributions. First, it represents a step toward understanding the distinct impacts of multiple dimensions of geographic dispersion. In comparing these dimensions and their differential impacts on team outcomes, this research contributes to the growing literature on geographically dispersed teams. Only recently have researchers begun to conceptualize the finer gradations of team dispersion or virtuality (Griffith et al. 2003b, O'Leary and Cummings 2007). Consequently, empirical investigations of these distinctions are lacking. Not only does the current study contribute empirical support, it also provide researchers with a theoretically-grounded foundation for further extending our understanding of dispersion and its multiple and differential impacts on other important team outcomes. Second, this research contributes to the literature on leadership in geographically dispersed teams. Despite several calls for research on this aspect of geographically dispersed teamwork (Bell and Kozlowski 2002, Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006), as well as the rich body of work that points to the important role leaders play in managing collocated teams (Bass and Bass 2008, Hackman 1990), this topic has received scant attention. By examining how leadership can reduce the negative effects of geographic dispersion, this study provides both practical prescriptions, as well as, theoretical insight into how and why these effects can be attenuated. Furthermore, an examination of the specific behaviors elicited by leadership for different forms of geographic dispersion promises to further enrich our understanding of leadership, dispersion, and the complex relationship between them.

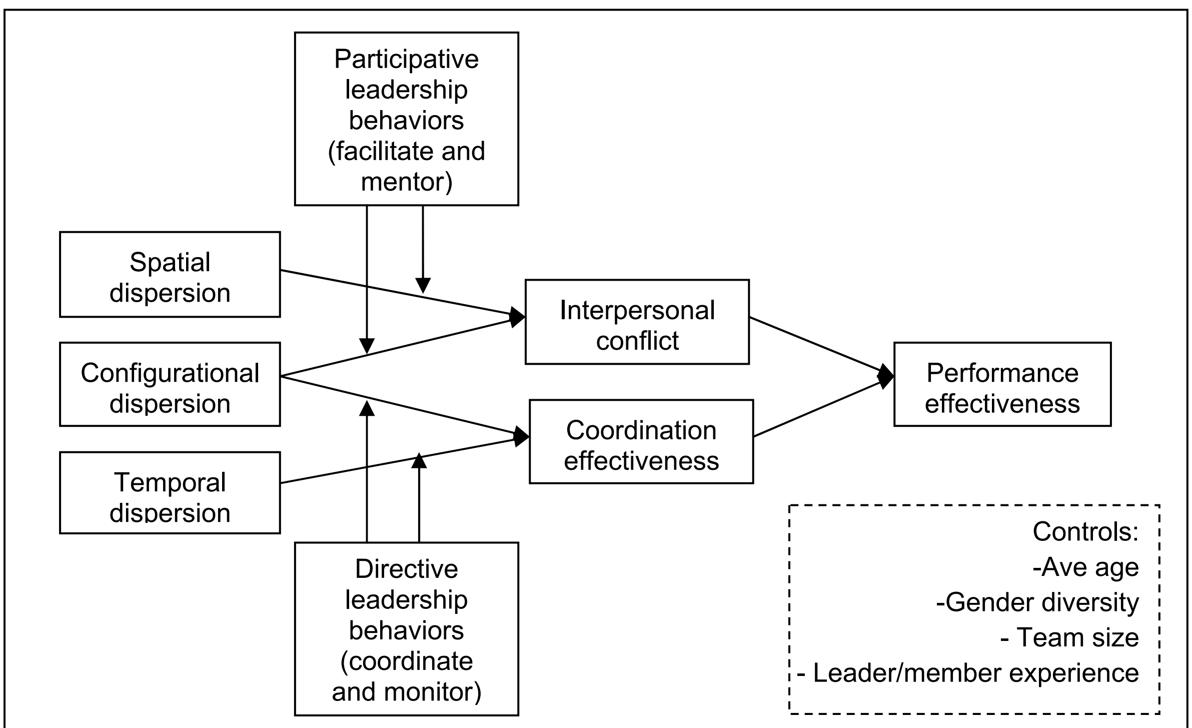

Figure 1. Research Model

THEORETICAL BACKGROUND

Leadership in Dispersed Teams

While there is a dearth of research on leadership in the dispersed context (Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Warkentin and Beranek 1999), it is recognized to embody greater difficulty. Leadership of dispersed teams is complicated by the leader's lack of direct control over team members, as well as their inability to monitor and adjust performance objectives with all team members in real time (Hertel et al. 2005). In response to calls for research on leadership in this context (Bell and Kozlowski 2002, Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006), researchers have begun to examine the efficacy of different leadership styles and behaviors that may influence performance. Effective leaders of dispersed teams are found to be especially adept at communicating, including the provision of timely, consistent and detailed information, and at exerting authority without being perceived as overbearing (Kayworth and Leidner 2002). Dispersed team leaders are shown to be effective at reducing certain types of conflict by helping teams with activities related to monitoring and control (Wakefield et al. 2008). In contrast to leader behaviors or roles, Joshi and her colleagues (2009) studied leadership style. They found that, compared to collocated teams, dispersed teams benefit more from inspirational leadership—a leadership style characterized by communicating a compelling vision, expressing confidence and energizing team members (Bass 1985). This leadership style is found to be particularly effective at influencing trust and commitment to the team, factors that are problematic in the dispersed context (Joshi et al. 2009). These findings underscore the need to explore the potential for leadership to help mitigate the unique challenges faced by dispersed teams.

To explore this potential, I draw on the theory of BCL (also referred to as the Leaderplex Model) (Hooijberg et al. 1997). The fundamental principle driving this theory is that leaders exhibit a varied set of behaviors in response to changing and complex circumstances (Denison et al. 1995, Hooijberg et al. 1997, Quinn 1988). The choice of this theoretical lens is driven by the particular challenges inherent in dispersed teamwork. As dispersion decreases a leader's direct control and influence over team members (Hertel et al. 2005), it alters the function of the leader from supervisor, to enabler. In this capacity, leaders are engaged in providing behavioral support services to their subordinates, including oversight, monitoring and setting standards for collaboration (Wakefield et al. 2008). Thus, as Wakefield and her colleagues (2008, p. 436) point out, “it is helpful to consider team leadership in terms of “dimensions of influence” and the repertoire of behaviors used in leader-subordinate interactions.” The BCL provides a taxonomy of leader behaviors that are organized according to dimensions of influence on internal versus external forces aimed at engendering flexibility versus stability in the team.

The BCL posits that effective leaders enact various roles in support of their subordinates' performance. They do so as required by the needs or demands of a given situation and avoid assuming other roles when a situation does not call for them (Hooijberg et al. 1997). Thus, effective leaders are adept at perceiving the needs of others and adapting their supportive measures depending upon circumstances. The BCL offers eight primary behaviors categorized into four quadrants according to their focus. External-flexibility (quadrant I) includes innovating and brokering behaviors, external-stability (quadrant II) focuses on producing and directing behaviors, internal-stability (quadrant III) focuses on monitoring and coordinating behaviors and internal-flexibility (quadrant IV) focuses on mentoring and facilitating behaviors. See Figure 2 for an illustration. Due to the focus of this research on factors *within* the team (interpersonal conflict and coordination effectiveness), attention is given to the internally-focused leadership roles: monitoring, coordinating, mentoring and facilitating (i.e., the left-hand side of Figure 2).

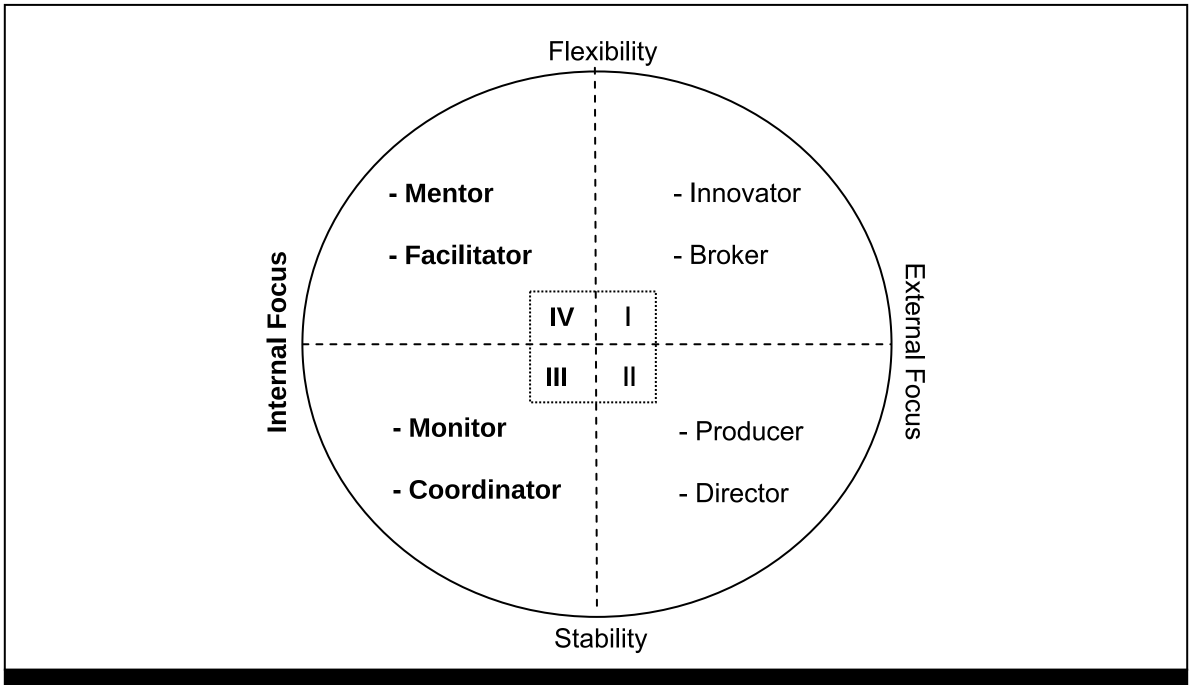

Figure 2. Behavioral Complexity in Leadership Model. ***Adapted from Quinn (1988)***

Leadership behaviors that revolve around engendering internal stability (i.e., monitoring and coordinating) are *directive* in nature as they focus on the management of team operations (Wakefield et al. 2008). In contrast, leadership behaviors that revolve around engendering internal flexibility (i.e., facilitating and mentoring) are *participative* in nature as they focus on the interpersonal aspect of team functioning (Wakefield et al. 2008). Through the behaviors enacted in these various roles, I theorize that team leaders enable teams to better cope with the challenges incurred by different dimensions of dispersion.

Team Dispersion

Recent research has called into question the ways in which dispersion has been conceptualized in extant research and call for greater clarity concerning the nature of dispersion (Fiol and O'Connor 2005, Griffith et al. 2003b, Hertel et al. 2005, O'Leary and Cummings 2007). In response, O'Leary and Cumming (2007) performed a comprehensive review of the literature on team dispersion and developed a holistic and theoretically-driven framework for categorizing geographic dispersion. They identify three categories of geographic dispersion: spatial, temporal, and configurational. Spatial dispersion captures, "the average spatial distance among team members"; temporal dispersion refers to, "the extent to which team members have overlapping work hours"; and configurational dispersion consists of three forms, including, "the number of sites at which team members are located, their isolation from other members and the imbalance between subgroups of members across sites", (O'Leary and Cummings 2007, p. 434). I refer to these from here on as, configurational-site, configurational-isolation, and configurational-imbalance dispersion, respectively. For purposes of this study, temporal, spatial, configurational-site and configurational-imbalance dispersion are explored. Configurational-isolation dispersion predominantly impacts individuals in teams (Burke et al. 1999, Cooper and Kurland 2002, Kirkman et al. 2002, O'Leary and Cummings 2007) and the focus of the current study is on team-level, rather than individual-level factors, thus this form of dispersion is not explored. The next section discusses how the three forms of geographic dispersion affect team outcomes. Following this, I explore the mechanisms by which leadership behaviors and dimensions of dispersion interactively affect team outcomes.

HYPOTHESES DEVELOPMENT

The nascent research on leadership in the dispersed context provides some preliminary evidence that leadership behaviors can be effective in improving interpersonal conflict and coordination effectiveness (Hertel et al. 2005, Kayworth and Leidner 2002, Wakefield et al. 2008). Interpersonal conflict is defined as, "an awareness of interpersonal incompatibilities, [and] includes affective components such as feeling tension and friction. This type of conflict involves personal issues such as dislike among group members and feelings such as annoyance, frustration, and irritation" (Jehn and Mannix 2001, p. 238). Not surprisingly, interpersonal conflict is linked to lower team cohesion, satisfaction, viability and performance (De Dreu and Weingart 2003, Jehn 1995, Schweiger et al. 1986, Shah and Jehn 1993). In the dispersed context, conflict management and resolution is made more difficult (Griffith et al. 2003a) as team members may more easily misinterpret critical message and are afforded more opportunities to avoid uncomfortable confrontations and efforts required to clarify exchanges. Supporting this ascertain, a number of studies have shown that technology-mediated communication tends to engender more criticism and uninhibited, inflammatory exchanges (Jessup et al. 1990, Kiesler et al. 1984, Siegel et al. 1986, Sproull and Kiesler 1986). Research also shows that dispersed teams have more difficulty achieving group cohesion, integration, and trust (Chidambaram 1996, Jarvenpaa et al. 2004, Walther 1995). These factors have been linked to the preponderance of interpersonal conflict in teams (De Dreu and Weingart 2003, Jehn 1995, Peterson and Behfar 2003).

Coordination effectiveness refers to, "the resulting outcome in which all key dependencies among activities in a task have been well-managed (e.g., software parts integrated well, all parts were completed on time, there were no priority conflicts, etc.)" (Espinosa and Pickering 2006, p. 26). A number of factors are identified as contributing to the coordination difficulties faced by dispersed teams, including, failure to communicate and retain contextual information, uneven distribution of information, difficulty understanding and communicating the salience of information, differences in speed of access to information and interpreting the meaning of silence (Cramton 2001). Such difficulties lead to problems maintaining mutual knowledge (Cramton 2001). Mutual knowledge is a critical requirement for the effective and efficient coordination of action (Clark 1996, Clark and Carlson 1982, Clark and Marshall

1981). It allows team members to, “formulate their contributions with an awareness of what their addressee does and does not know” (Krauss and Fussell 1990, p. 112).

A large corpus of research has consistently shown that, to the extent that teams are constrained by some form of geographic dispersion, coordination will be more effortful and relational development inhibited to some degree (Bell and Kozlowski 2002, Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Walther 1995, Warkentin et al. 1997). However, given our limited understanding of the multifaceted nature of geographic dispersion, it is important to understand how different forms of dispersion will *comparatively* impact teams. Such an approach should guide future researchers in choosing to study the particular type of dispersion that has the maximum impact on their variables of interest. Thus, the theoretical development offered below explores the impact of each form of dispersion, relative to other forms of dispersion, in order to tease out their differential effects on interpersonal conflict and coordination effectiveness.

Dispersion and Team States

Spatial dispersion and configurational-imbalance dispersion are believed to more strongly impact interpersonal conflict, compared to other forms of dispersion. Both forms of dispersion are thought to engender significant psychological hurdles, due to their respective natures (O'Leary and Cummings 2007). Further, they do not necessarily involve additional structural challenges, in terms of information exchange and managing dependencies, that configurational-imbalance and temporal dispersion engender. For spatial dispersion, two primary mechanisms are thought to underlie its connection to interpersonal conflict: fewer opportunities for face-to-face interaction and greater potential for racial and ethnic diversity. Spatially-dispersed teams have fewer opportunities for face-to-face interaction (O'Leary and Cummings 2007), as increasing spatial dispersion results in more expensive, effortful travel in order for teams to meet. The literature provides consistent support that the lack of face-to-face interaction weakens interpersonal ties by way of its negative impact on factors such as trust, cohesion and social integration, shared identity and personal information sharing (Chidambaram 1996, Harrison et al. 1998, Harrison et al. 2002, Hill et al. 2009, Hinds and Mortensen 2005, Jarvenpaa et al. 2004, Walther 1992, Walther 1995, Wilson et al. 2006). Face-to-face interaction is said to improve interpersonal interaction due to the benefits afforded by social presence. Indeed, much of the work on computer-mediated versus face-to-face interaction is based on social presence theory, which holds that interpersonal relationships are negatively affected when the feeling of “being there” with communication partners is reduced (Short et al. 1976). Subsequent research supports this, showing that face-to-face interaction represents an important source of social context cues (Spears and Lea 1992), facilitates team members’ awareness of one another (Cramton 2001), and helps maintain social boundaries that normally regulate behavior (Spears et al. 2002).

As spatial dispersion increases, so too does the likelihood that team members are located in different countries with different racial and cultural identities. Though temporal dispersion may mean that team members are located in different countries and thus different time zones, this is not always the case. High temporal dispersion may result when team members are located in the same city, but have different work shifts, as with around-the-clock schedules. In this case, spatial dispersion would be more likely to be associated with racial and cultural diversity, while temporal dispersion would not. Much research has demonstrated that similarity in culture and race leads to stronger interpersonal ties (for a review, see McPherson et al. 2001). In a similar vein, research on team diversity shows that teams that are more racially diverse suffer from greater interpersonal conflict (Moreland et al. 1996, Pelled et al. 1999). Hoftede’s (1980) work on cultural differences provides compelling evidence of the varied sources of interpersonal conflict among culturally diverse team members.

Configurational-imbalance dispersion is also believed to more strongly impact interpersonal conflict, relative to temporal and configurational-site dispersion. This is because imbalance in the number of team members across sites is likely to create divisive subgroups (O'Leary and Cummings 2007) where majority-minority and faultline effects lead to conflict. To the extent that there is a perceived imbalance in the distribution of team members across sites, certain subgroups may develop a majority influence, welding more social power and leading to perceived inequalities in power and thus greater interpersonal conflict (Kabanoff 1991, Mannix 1993). Sites with fewer members (i.e., the minority site), may feel “out of the loop” (O'Leary and Cummings 2007) and develop negative perceptions toward members at the majority site. Research shows that relations among imbalanced subgroups can lead to polarizing competition that is not apparent in relations among individuals (Insko et al. 1990). More recent research on imbalanced subgroups finds that imbalance in the size of subgroups within a team leads to a competitive, coalitional mentality resulting in sites with minority members having poorer scores on identification with the team and conflict (O'Leary and Mortensen 2010). The powerful effects of this type of this subgroup behavior are illustrated by research showing that configurational dispersion creates faultlines—hypothetical dividing lines that split a group into subgroups—leading to higher conflict and lower trust (Polzer et al. 2006). Further, Lau and Murnighhan (1998) suggest that greater imbalance in size between subgroups cultivates conflict that lasts longer and is more difficult to resolve because majority group members may attempt to dominate the group's processes. Thus, I hypothesize:

> *H1a: Spatial dispersion will have a stronger influence on interpersonal conflict, compared to configurational-site and temporal dispersion.*

> *H1b: Configurational-imbalance dispersion will have a stronger influence on interpersonal conflict, compared to configurational-site and temporal dispersion.*

Configurational-site and temporal dispersion are expected to have stronger relationships with coordination effectiveness, compared to spatial and configurational-imbalance dispersion. Increases in the number of sites at which team members are located also increases the number of dependencies to be managed. Coordination is fundamentally about managing dependencies (Crowston 1997). Team members who rely on others' input to do their work will have more difficulty managing information exchanges if they must coordinate these exchanges between multiple sites. Research shows that increasing configurational-site dispersion results in greater delays in sending and receiving information, less communication across sites, reduced clarity of plans, and a reduced likelihood that team members receive help from other members (Herbsleb et al. 2000). Likewise, knowledge sharing, which is integral to team coordination (Srivastava et al. 2006), is more effortful and difficult if knowledge must be shared among multiple locations, because the team must ensure that all members have received and understand assignments, directives, and goals. This difficulty is partly due to the reduction in spontaneous communication that occurs when interaction is made more complex by the need to orchestrate people, time, and communication channels in order for members at multiple sites to interact. Recent research finds that distribution across sites does indeed decrease spontaneous communication, which in turn impacts the development of shared context (Hinds and Mortensen 2005). Differences in contextual experiences can make it difficult to coordinate work because it requires more effort to co-orient to a particular perspective (Schober 1998) and develop mutual understanding (Fussell and Krauss 1992).

Temporal dispersion is also expected to exert more influence on coordination effectiveness compared to other forms of dispersion. Compared to all other forms of dispersion, temporally-dispersed teams have the least opportunity for synchronous communication and real-time problem solving (O'Leary and Cummings 2007). Synchronicity is important for coordination purposes because it allows for the timely exchange of information and feedback and allows teams to resolve ambiguity more quickly, thus avoiding lengthy work delays that inhibit effective coordination (Cramton 2001, Grinter et al. 1999, Hinds and Bailey 2003). Synchronous interaction may be achieved by meeting face-to-face, as temporally-dispersed teams may be afforded more opportunities to meet face-to-face without requiring expensive and time-consuming travel (as in the case of collocated, but opposing round-the-clock work schedules), however, such meetings would require disruptive arrangements of work schedules. Thus, temporally-dispersed teams are likely to have less face-to-face interaction than their configurationally-dispersed counterparts, albeit more than spatially-dispersed teams. In addition to a lack of synchronous communication, temporal differences represent an additional coordinative component of work for teams as they may be required to manage the exchange or hand-off of work in progress to other team members working at different times (Massey et al. 2003). This coordinative complexity is similar to that incurred by configurational-site dispersion where additional interdependencies created by dispersion contribute to greater difficulty in coordinating activities. Indeed, research shows that temporal differences represent a form of coordination complexity that has significant effects on team performance (Massey et al. 2003). In sum, compared to both configurationally-imbalanced and spatially-dispersed teams, temporally-dispersed teams are expected to have fewer opportunities for synchronous interaction, and more coordinative complexity, thus engendering more difficulty in coordinating their work. Thus, I hypothesize:

H1c: Configurational-site dispersion will have a stronger influence on coordination effectiveness, compared to spatial and configurational-imbalance dispersion.

H1d: Temporal dispersion will have a stronger influence on coordination effectiveness, compared to spatial and configurational-imbalance dispersion.

Spatial, configurational, and temporal dispersion are expected to impact team performance through their effect on interpersonal conflict and coordination effectiveness. The negative performance implications of interpersonal conflict and coordination effectiveness are well-documented in the dispersed team literature (Bell and Kozlowski 2002, Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006), and the impact of varying forms of dispersion on interpersonal conflict and coordination effectiveness have been offered here. Dispersion is a structural property of the team, representing an input to the team processes and states that ultimately drive performance (Ilgen et al. 2005). Thus, I hypothesize:

> *H2: The impact of spatial, configurational-imbalance, configurational-site and temporal dispersion on team performance will be partially mediated by interpersonal conflict and coordination effectiveness.*

Team Dispersion and Leadership Behaviors

These negative impacts of geographic dispersion on interpersonal conflict and coordination effectiveness are expected to be alleviated by leadership behaviors. Drawing on the theory of BCL, participative leadership behaviors are thought to ameliorate interpersonal conflict, while directive leadership behaviors are thought to enable coordination effectiveness. Participative leadership behaviors include facilitating and mentoring, while directive leadership behaviors include monitoring and coordinating (Denison et al. 1995, Hooijberg et al. 1997, Kayworth and Leidner 2002, Wakefield et al. 2008).

Through participative behaviors, leaders are expected to reduce the negative impact of spatial dispersion on interpersonal conflict by acting as an intermediary between distant team members. As an intermediary, leaders can help teams foster interpersonal relationships that may be inhibited by a lack of face-to-face interaction. Behaviors that reflect the facilitator role, such as seeking consensus and compromise (Denison et al. 1995, Hooijberg et al. 1997) are thought to compensate for a lack face-to-face interaction by encouraging team members to communicate with one another in a fair way, facilitating the development of interpersonal relationships. Facilitating behaviors also include encouraging members to express their opinions and share information (Denison et al. 1995, Hooijberg et al. 1997). While the exchange of opinions may at times trigger interpersonal conflict, a participative leader also works to direct these expressions in a productive, and respectful way (Quinn 1988). Such open communication should have positive implications for the interpersonal relationships among members that have limited opportunities for interpersonal exchange.

Mentoring activities, while directed primarily at individual team members, are also thought to alleviate the impact of spatial dispersion on interpersonal conflict. Mentoring behaviors include listening to and communicating understanding of the needs and concerns of team members, supporting the legitimacy of team member input, and supporting the professional development of members of the team (Denison et al. 1995, Hooijberg et al. 1997, Quinn 1988). Research shows that behaviors such as active listening and supporting individuals' requests engender a greater feeling of legitimacy as a member of the team (Kozlowski et al. 2009) and thus should help team members to more strongly identify with the team. Team identification has been established as an important factor in reducing the interpersonal conflict that teams may experience (Mortensen and Hinds 2001). Mentors also help team members understand their individual role in the team (Wakefield et al. 2008). Spatial dispersion is thought to contribute to difficulty in the interpretation of team roles because, due to a lack of face-to-face interaction, team members do not have common frame of reference for interpreting their place in the team (Cramton 2001, Lipnack and Stamps 1997). Greater clarity about roles and responsibilities should facilitate stronger intrateam relationships by helping team members to communicate better in the face of technology-mediated communication and thus avoid falling short of other members' expectations. Leadership behaviors that provide role clarity have been demonstrated to strengthen team members' sense of belonging and reduce role ambiguity (Fiol and O'Connor 2005), thus reducing the potential for spatial dispersion to induce interpersonal conflict. Thus, I hypothesize:

> *H3: Spatial dispersion and participative leadership behaviors will have an interactive effect on interpersonal conflict, such that, the relationship between spatial dispersion and interpersonal conflict will be weaker when participative leadership behaviors are high.*

Participative leadership behaviors are also expected to alleviate relationship challenges due to configurational-imbalance dispersion. To the extent that team members do not feel that they are part of the team, they will be less likely to identify with the team, hampering the social cohesion and trust that computer-mediated teams already lack (Hinds and Mortensen 2005, Mortensen and Hinds 2001). In their role as facilitator, leaders help to surface team member concerns and provide strategies and opportunities for resolution (Denison et al. 1995). Facilitating leaders also seek out input from all team members and support the exchange of information (Denison et al. 1995, Quinn 1988). Such activities will be especially beneficial for team members who feel that they "do not have a voice" in the team, due to their minority status in a subgroup. To the extent that facilitating leadership behaviors promote information exchange, leaders can help to lessen the impact that minority subgroup status has on interpersonal conflict by ensuring that information held by majority members is made accessible to minority subgroups. Furthermore, facilitating leadership behaviors can help unite disparate subgroups by promoting equality of participation and encouraging team members to engage in perspective-taking on behalf of their team members. Such actions have been shown to improve social bonds and reduce competitive behavior (Galinsky et al. 2005). This would be especially beneficial to team members of majority subgroups who wield influence over minority subgroups without consideration for their perspective as minorities.

Mentoring behaviors will also help unite team members divided by subgroups and majority-minority faultlines. Mentoring is associated with leaders expressing consideration, respect and empathy for team members (Denison et al. 1995, Quinn 1988). Individuals that feel they are respected and cared for by their team leaders report being more satisfied (Chao et al. 1992, Kram 1985) and having higher levels of socialization with other members (Chao et al. 1992). These positive feelings toward the team leader should allow team members to better cope with the challenges of minority subgroup status. Team members would likely feel less isolated and 'out of the loop' if they feel that their leader listens to and supports their position as an integral member of the team, lessening the likelihood that they might engage in interpersonal conflict. Thus, I hypothesize:

> *H4: Configurational-imbalance dispersion and participative leadership behaviors will have an interactive effect on interpersonal conflict, such that, the relationship between configurational-imbalance dispersion and interpersonal conflict will be weaker when participative leadership behaviors are high.*

Directive leadership behaviors, such as coordinating and monitoring, are expected to influence the relationship between configurational-site dispersion and coordination effectiveness. Coordinating leadership behaviors are associated with anticipating problems and avoiding crises, as well as, bringing a sense of order to the team's work (Denison et al. 1995, Hooijberg et al. 1997). These leadership behaviors will be especially critical to teams with a high number of dependencies due to team members being located at multiple sites. The potential for cumulative and compounding errors, misdirection and misalignment of task requirements with task resources are more likely to occur as the number of information flows and dependencies increases (Herbsleb et al. 2000, Olson and Teasley 1996). Team leaders benefit from a macro, "birds-eye" view of the team's functioning. Due to this perspective, they are in a better position to anticipate work flow problems stemming from the exchange of information among multiple sites and to help avoid these crises, thus reducing the impact of configurational-site dispersion on coordination effectiveness. Team leaders are also in a better position to aggregate information from multiple sites and disseminate it to team members.

Directive leadership also involves monitoring behaviors. Monitoring revolves around the collection and dissemination of internal information, comparisons of performance against standards or expectations and the provision of assurance and continuity to the entire team (Denison et al. 1995, Wakefield et al. 2008). Monitors provide logistical control that is crucial to the team's coordination effectiveness when information must be coordinated across multiple sites (Morgeson et al. 2010). Teams that have members dispersed across many sites are at a particular disadvantage when it comes to ensuring that all members are progressing toward expected goals. As the number of sites increases, so does ambiguity about the work being done at any particular site (Herbsleb et al. 2000). Monitoring by a leader should provide the oversight needed to ensure that team members' efforts and progress are in line with expectations at the many sites where they may be located, thus reducing the negative impact of configurational-site dispersion on coordination effectiveness. Indeed, research shows that directive leadership behaviors can help teams overcome coordination challenges resulting from dispersion across sites by spanning team boundaries and acting a 'bridge' between members (Brett and Rognes 1986, Morgeson et al. 2010). Thus, I hypothesize:

H5: Configurational-site dispersion and directive leadership behaviors will have an interactive effect on coordination effectiveness, such that, the relationship between configurational-site dispersion and coordination effectiveness will be weaker when directive leadership behaviors are high.

Finally, the negative impact of temporal dispersion on coordination effectiveness should be alleviated by directive leadership behaviors. Temporally-dispersed teams are impacted by the lack of synchronicity that pervades their work (O'Leary and Cummings 2007). Coordinating leadership behaviors, such as bringing order to the team's work (Denison et al. 1995, Hooijberg et al. 1997), are expected to reduce coordinative problems resulting from a lack of synchronicity. For example, a team leader might set specific policies or establish norms governing the hand-off of work to other team members, such as requiring team members to complete a report that details the work they have completed. This would allow team members working at a different time to assess the progress made and the extent of work remaining.

Research shows that lags in feedback amplify coordination problems (Cramton 2001). To the extent that coordinative leadership can minimize these lags by setting standards and norms governing information exchange, coordination difficulties that are caused by synchronicity should be reduced.

Temporally-dispersed team members have a limited ability to assess the work and progress of their teammates and may have limited opportunities to do so in real time (O'Leary and Cummings 2007). This may result in problems correcting courses of action were it not for leaders' monitoring behaviors. Monitoring behaviors by the team leader can help temporally-dispersed teams control and manage their work in relation to the work being done by other team members at different times (Massey et al. 2003). Because team members lack awareness of what their temporally-dispersed team members may be working on, leaders can help teams by generating and comparing reports, records and performance metrics to ensure that team members working at different times are comparatively contributing an appropriate amount of effort, making progress and positively contributing to the overall objectives of the team. As with configurational-site dispersion, directive leadership behaviors are expected to function as the 'bridge' that connects temporally-dispersed teams, reducing the impact that temporal dispersion has on coordination effectiveness. Thus, I hypothesize:

> *H6: Temporal dispersion and directive leadership behaviors will have an interactive effect on coordination effectiveness, such that, the relationship between temporal dispersion and coordination effectiveness will be weaker when directive leadership behaviors are high.*

METHODOLOGY

Research Site and Participants

The model is tested via a survey-based field study of IS development teams. The data collection site is a large, multinational corporation specializing in the development of software and hardware technologies that are used in consumer electronics, networking and telecommunications equipment, and computer systems. The firm has over 4,500 employees with revenue for 2010 exceeding 900 million U.S. dollars. Participants are members of software and hardware development teams, drawn from a variety of locations across the globe, including China, India, and the U.S. The sampling frame is 1,140 team members working in 119 teams on development projects beginning in 2010 and ending in 2011. From this sampling frame, 753 members from 72 teams, and their leaders, provided usable responses, for a response rate of 66%. The average team size was 10.4, and the average age was 32.5 years for team members and 47.0 years for team leaders. Approximately 49% of the team members were women and 46% of team leaders were women. Three waves of data were collected, with surveys administered at the beginning, midpoint, and end of the projects' cycles and data collection took approximately 1 year. Response rates over this time were bolstered by support of the study from top management and team leaders.

Measures

All measurement items are taken from previously validated scales. Measurement of the constructs is collected from multiple sources, including individual team members and the project leader. This strategy is recommended as a means to alleviate concerns of common method bias (Spector 1994). Data related to location, which is used to calculate the dispersion measures, is collected from team members. Leadership behaviors, team interpersonal conflict, coordination, and performance are captured by responses from team leaders.

Dispersion Measures

All measures of dispersion are adopted from those given by O'Leary and Cummings (2007). *Spatial dispersion* is measured by the spatial dispersion index. The spatial dispersion index uses the geodesic distance (in miles) between team members (i.e., the shortest straight line between two points), weighted by the number of team members at a particular site, based on all possible combinations of non-redundant connections between team members. The formula to calculate this index is:

$$\frac{\sum_{i-j}^{k} (Miles_{i-j} * n_i * n_j}{(N_2 - N)/2}$$

where $miles_{i\text{-}j}$ is the miles between sites i and j, k = the total number of sites represented in the team, n_i = the number of team members in the i^{th} site, n_j = the number of team members in the j^{th} site and N = the total number of team members across all sites. *Temporal dispersion* is measured by O'Leary and Cummings' (2007) time zone index. This measure captures how many work hours team members have during their work day in which they can communicate synchronously. The formula is similar to the spatial dispersion index, but instead of building on a matrix of all possible connections between team members, the matrix is populated by the number of time zones between team members. The formula to calculate this index is:

$$\frac{\sum_{i-j}^{k}(TimeZones_{i-j} * n_i * n_j}{(N_2 - N)/2}$$

where TimeZones $_{i-j}$ are the number of time zones between sites. All other variable definitions are the same as that of the spatial dispersion index. *Configurational-site dispersion* is measured simply by counting the number of locations at which team members are collocated. Finally, *configurational-imbalance* dispersion is similar to the configurational-site dispersion index. It is calculated as the standard deviation of members per site, divided by the size of the team and thus captures how evenly members are distributed across sites.

Leadership behaviors

Measures for directive and participative leadership behaviors are taken from Dennison, Hooijberg and Quinn (1995). The scales are comprised of two items, measured on a 7 point Likert-type scale where 1 represents “completely disagree” and 7 represents “completely agree”. For participative leadership behaviors, a sample item for mentoring is, “My team leader shows empathy and concern in dealing with members of the team”, while a sample item for facilitating is, “My team leader surfaces key difference among team members, then works participatively to resolve them”. For directive leadership behaviors, a sample item for monitoring is, “My team member compares records, reports and so on to detect discrepancies”. A sample item for coordinating is, “My team leader anticipates workflow problems to avoid crises”. The items for participative and directive leadership behaviors are each averaged to create a single score for each leadership behavior.

Team states

Interpersonal conflict is measured with a 5 item scale from Jehn (1995). The measure has been used extensively and found to be robust (Jehn and Mannix 2001, Jehn et al. 1999, Pelled et al. 1999, Wakefield et al. 2008). It is assessed on a 7 point Likert-type scale where 1 represents “not at all” and 7 represents “to a large extent”. A sample item is, “How much are personality conflicts evident in your team?”. Following prior research, *coordination effectiveness* is a multidimensional construct consisting of administrative coordination mechanisms, such as formal planning tools and methods, integrative coordination, which refers to how team members exchange information among themselves and help define objectives, and expertise coordination, which refers to how well team members can locate specialized knowledge residing in members of their team and how well they share their specialized knowledge with other team members (Barki et al. 2001, Faraj and Sproull 2000, Nidumolu 1995). All scales are measured on a 7 point Likert-type scale where 1 represents “not at all” and 7 represents “to a large extent”. Administrative coordination is measured with two items from Nidumolu (1995). A sample item is, “Project management tools and techniques were used on this project”. Integrative coordination is measured with three items from Barki, Rivard, and Talbot (2001). A sample item is, “Project team members actively participated in the definition of project goals and schedules.” Finally, expertise coordination was adopted from a scale developed by Faraj and Sproull (2000). A sample item is, “People on the team shared their special knowledge and expertise with one another”. The measures were averaged to obtain a single team-level score of coordination effectiveness.

Performance effectiveness

Performance effectiveness was assessed by the leader and measured using a 5-item scale that assesses a leader’s rating of their team’s efficiency, adherence to budgets and schedules, as well as the production of quality work (Ancona and Caldwell 1992). The items are measured on a 7 point Likert-type scale where 1 represents complete disagreement and 7 represents complete agreement. A sample item is, “The team produced high quality technical innovations.”

Controls

Control variables are selected for their ability to eliminate alternative interpretations that may account for variability in team performance. A variable that has been established as an important control in team research is group size. Since size may indirectly influence group processes and the efficacy of leadership behaviors, it was included in the analysis. To control for variability in team performance, I also account for the experience of team members and leaders working on other similar projects, as well as gender diversity and the average age of team members.

Data Collection Procedure

Three waves of data collection were necessary, with measurement points at the beginning, midpoint, and end of the project. The surveys were administered by an external market research firm, with each survey bar-coded to maintain anonymity while tracking responses over time. The measurement points, respondents, and constructs measured are depicted in Table 1. The first wave captures data that is not dependent on team interaction and measures individual characteristics that are likely to remain stable over time. Wave 2 captures leader behaviors, interpersonal conflict, and coordination effectiveness. These variables are measured at the midpoint of the teams' project cycle, when they have had an opportunity to develop relationship and perform their work, but before the project had started to wind down. Wave 3 captures team performance, as this is known only at the end of the project.

Table 1. Measurement Points and Respondents

Wave 1 **Project Start**	**Wave 2** **Project Midpoint**	**Wave 3** **Project End**
Team characteristics[1,2] (e.g., location, size) Individual demographics[1,2] (e.g., age, gender)	Interpersonal conflict[2] Coordination effectiveness[2] Leadership behaviors[2]	Team performance[2]

Note: Respondent/ Source: [1] = team member; [2] = team leader

Analysis

The hypotheses were tested using hierarchical regression analysis (HRA). HRA allows for an assessment of the additional variance explained by the independent variables, after controls are added, and by the interaction terms after introducing the independent variables to the model. Thus, in step 1, control variables are added, in step 2, independent variables are added, and in step 3, interaction terms are added to the model. HRA thus allows for an assessment of the variance attributed to each block of variables. Results can be compared by examining the change in variance explained by each block. Before conducting the test of the hypotheses, the psychometric properties of the measures were assessed using confirmatory factor analysis (CFA), in order to demonstrate the appropriateness of the measures. CFA allows researchers to determine how well the model fits the data. Two metrics are consistently used in prior literature and accepted as measures of good fit: comparative fit index (CFI) and the standardized root-mean square residual (SRMR) (Bentler 1990, Hu and Bentler 1999). The CFI is found to be a good estimate of the population value for a model, while SRMR reflects the average standardized residual per degree of freedom. For the CFI and SRMR, values larger than .95 and smaller than .08, respectively, are considered indicators of good fit (Hu and Bentler 1999). Convergent validity was assessed by examining the lambda values for the indicators and the average variance extracted (AVE). It is recommended that lambda values should be larger than .70 and AVEs should be larger than .50 to support convergent validity (Kline 2005). Finally, discriminate validity was assessed by comparing the square root of the AVE to the correlations among constructs. Discriminant validity is established if the constructs have more common variance with their corresponding items than with other constructs. This is demonstrated when the AVEs are greater than the inter-construct correlations (Fornell and Larcker 1981). All metrics were within their recommended thresholds, demonstrating acceptable reliability and validity.

Table 2 presents the means, standard deviations, and correlations among constructs. The variables demonstrate moderate variance and significant correlations that provide some preliminary support for the hypothesized relationships. Spatial dispersion and configurational-imbalance dispersion are both significantly and positively correlated with interpersonal conflict, while configurational-site dispersion is significantly and negatively correlated with coordination effectiveness. Interpersonal conflict is negatively correlated with performance, while coordination effectiveness is positively correlated with performance.

RESULTS

Direct Effects

Models 1 and 2 of Table 3 present the tests of the direct effects hypothesized in H1a-H1d. H1a predicted that spatial dispersion would have a stronger influence on interpersonal conflict, compared to configurational-site and temporal dispersion. Model 1 of Table 3 shows that this is indeed the case. The coefficient for spatial dispersion ($\beta = .25$, $p < .05$) is larger than the coefficient for configurational-site ($\beta = .08$, $p > .10$) or temporal dispersion ($\beta = -.09$, $p > .10$). Thus, H1a is supported. H1b predicted that configurational-imbalance dispersion would have a stronger influence on interpersonal conflict, compared to configurational-site or temporal dispersion. Model 1 of Table 3 also shows this to be the case. The coefficient for configurational-imbalance ($\beta = .22$, $p < .05$) is larger than that of configurational-site ($\beta = .08$, $p > .10$), or temporal dispersion ($\beta = -.09$, $p > .10$). Thus, H1b is supported. Overall, this model explains 26% of the variance in interpersonal conflict. H1c suggested that configurational-site dispersion would have a stronger influence on coordination effectiveness, compared to spatial and configurational-imbalance dispersion. Model 2 of Table 3 shows that this is the case. The coefficient for configurational-site (β = -.37, p < .01) is larger than that of spatial (β = -.16, p > .10), or configurational-imbalance dispersion (β = -.21, p < .10). Thus, H1c is supported. Finally, H1d predicted that temporal dispersion would have a stronger influence on coordination effectiveness, compared to spatial and configurational-imbalance dispersion. Model 2 of Table 3 shows that this is not the case. The coefficient for temporal dispersion is not significant (β = .02, p > .10), thus, H1d is not supported. Overall, this model explains 21% of the variance in coordination effectiveness.

Mediation Analysis

Table 4 presents the results of the mediation analysis. H2 predicted that interpersonal conflict and coordination effectiveness would mediate the effect of dispersion on team performance. Following Baron and Kenny's (1986) three-step procedure, in order for mediation to be present, there must exist: (1) a relationship between the independent variables and the mediator(s); (2) a relationship between the mediator(s) and the dependent variable; and (3) a relationship between the independent variables and the dependent variable in the presence of the mediators and the strength of the influence of the independent variables must be reduced in the presence of the mediator(s). Models 1 and 2 of Table 4 show the analysis for the first step of the mediation test. Spatial dispersion and configurational-imbalance positively influence interpersonal conflict (β = .27, p < .05 and β = .23, p < .05, respectively) while configurational-site dispersion negatively influences coordination effectiveness (β = -.38, p < .01). For step two of the mediation analysis, the dispersion variables must be significantly related to team performance. Model 3 of Table 4 shows that only spatial dispersion is significant in predicting team performance (β = -.23, p < .01). Models 5-7 of Table 4 show the results of adding the mediating variables to the model. Model 5 shows the addition of interpersonal conflict, Model 6, the addition of coordination effectiveness, and Model 7 shows both conflict and coordination. When considering the each mediator separately, the relationship between spatial dispersion and team performance is significant, but reduced, in the presence of each of the mediators (Model 5: β = -.32, p < .05; Model 6: β = .23, p < .05). Model 5, which includes conflict as the sole mediator, explains 19% of the variance in team performance. Model 6,

Table 2. Descriptive Statistics and Correlations (n = 72)

	M	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Ave age	32.54	2.31	-												
2. Gender diversity	.51	.16	.21†												
3. Mem. expr.	3.92	1.73	.06	.23*											
4. Leader expr.	15.78	7.66	-.05	.00	.15										
5. Team size	10.46	1.98	-.03	.01	-.04	-.30**									
6. Spatial disp.	3457.77	277.90	.01	-.07	.15	.04	-.04								
7. Imbalance disp.	.49	.29	-.17	-.27*	.08	.05	-.13	.14							
8. Site disp.	3.53	1.07	-.07	-.05	.09	-.02	-.13	.15	.24*						
9. Temporal disp.	2.88	1.15	-.09	.05	.00	-.06	-.12	.09	.02	.04					
10. Conflict	4.16	1.72	.07	.03	.14	.20†	-.12	.30**	.29*	-.05	.17				
11. Coordination	3.88	1.72	-.07	-.03	.24*	-.06	.08	-.16	.08	.02	-.35**	.02			
12. Particip. lead.	4.00	1.80	-.03	-.11	.06	.00	.00	.11	.01	-.03	-.11	-.08	-.01		
13. Direct. lead	3.66	1.67	.03	-.27*	-.24*	-.24*	.22*	.13	-.06	-.18	.02	-.32**	-.04	.17	
14. Performance	4.00	1.74	-.07	.08	.09	-.11	-.07	-.23†	.09	.07	.04	-.26**	.24**	.10	.13

*Notes: 1. Variables are abbreviated as follows: Mem. expr = Member experience, Leader expr. = Leader experience, disp. = dispersion, Particip.lead = Participative leadership, Direct. lead. = Directive leadership; 3. **p < .01, *p < .05,* $^{\dagger}p < .10$

Table 3. HRM Analysis for Direct and Moderated Effects (n = 72)

	Model 1 Conflict	**Model 2 Coordin**	**Model 3 Conflict**	**Model 4 Conflict**	**Model 6 Conflict**	**Model 7 Conflict**	**Model 8 Coordin**	**Model 9 Coordin**	**Model 10 Coordin**	**Model 11 Coordin**
R^2	.26	.21	.15	.21	.15	19	.08	.08	.18	.19
Adj R^2	.15	.15	.06	.11	.06	.08	.02	.03	.10	.10
ΔR^2	-	-	-	.06	-	.04	-	.01	-	.00
F	2.38*	1.96*	1.63	2.08*	1.60	1.98*	.72	.77	2.06*	2.06*
Ave age	.08 (.09)	-.06 (.09)	.06 (.09)	.07 (.09)	.11 (.09)	.11 (.09)	-.05 (.09)	-.04 (.09)	-.08 (.09)	-.07 (.09)
Gender diversity	.12 (1.28)	.07 (1.36)	.01 (1.34)	.01 (1.31)	.07 (1.39)	.02 (1.40)	.01 (1.43)	.00 (1.45)	.00 (1.34)	.00 (1.36)
Mem. expr	.21 (.39)†	.22 (.41)†	.07 (.41)	.03 (.40)	.07 (.41)	.05 (.41)	.26 (.43)*	.25 (.43)*	.22 (.41)†	.22 (.41)†
Leader expr	.18 (.03)	-.04 (.03)	.16 (.03)	.17 (.03)	.17 (.03)	.12 (.03)	-.03 (.03)	-.02 (.03)	-.06 (.03)	-.06 (.03)
Team size	-.07 (.11)	.11 (.03)	-.06 (.11)	-.06 (.10)	-.03 (.11)	.01 (.11)	.08 (.11)	.11 (.09)	.03 (.11)	.03 (.11)
Spatial disp.	.25 (.01)*	-.16 (.01)	.30 (.01)**	.26 (.01)**	-	-	-	-	-	-
Imbalance disp.	.22 (.72)*	-.21 (73)†	-	-	.31 (.73)**	.27 (.72)*	-	-	-	-
Site disp.	.08 (.18)	-.37 (.19)**	-	-	-	-	-	-	-.33 (.19)***	-.33 (19)***
Temporal disp.	-.09 (.17)	.02 (.17)	-	-	-	-	.00 (.19)	.00 (.19)	-	-
Particip. lead.	-	-	-.11 (.11)	-.10 (.11)	-.08 (.11)	-.08 (.11)	-	-	-	-
ParticipXSpat	-	-	-	-.24 (.01)*	-	-	-	-	-	-
ParticipXImbal	-	-	-	-	-	-.23 (.43)*	-	-	-	-
Direct. lead.	-	-	-	-	-	-	.12 (.14)	.13 (.14)	.12 (.13)	.12 (.13)
DirectXSite	-	-	-	-	-	-	-	-	-	-.03 (.12)
DirectXTemp.	-	-	-	-	-	-	-	-.08 (.11)	-	-

*Notes: 1. Italicized variables are controls; 2. Variables are abbreviated as follows: Mem. expr = Member experience, Leader expr. = Leader experience, disp. = dispersion, Particip.lead = Participative leadership, Direct. lead. = Directive leadership, Spat = Spatial dispersion, Imbal = Imbalance dispersion, Temp = Temporal dispersion, Site = Site dispersion; 3. **p < .01, *p < .05, †p < .10* which includes coordination as the sole mediator, explains 12% of the variance in team performance. In Model 7, which shows the addition of both mediators together, spatial dispersion is just above the cutoff criteria for significantly influencing team performance (β = .22, p = .06). This model explains 23% of the variance in team performance.

To further probe the indirect effects, Sobel tests (Sobel 1982) were conducted to test the indirect effect of dispersion on performance. Table 5 shows the results of this analysis. Spatial dispersion demonstrates a significant indirect effect on performance through both conflict (Sobel statistic = -2.89, p <.05) and coordination (Sobel statistic = -2.08, p < .05). The other forms of dispersion do not demonstrate a significant indirect influence on performance. Based on this analysis, I conclude that there is partial support for H2. Interpersonal conflict and coordination effectiveness partially mediate the effect of spatial dispersion on team performance.

Table 4. Results of Mediation Analysis (n = 72)

	Model 1: Conflict	**Model 2: Coordin**	**Model 3: Perform**	**Model 5: Perform**	**Model 6: Perform**	**Model 7: Perform**
R^2	.16	.16	.06	.19	.12	.23
Adj R^2	.11	.11	.04	.13	.05	.16
F	3.29*	3.17*	1.99*	3.05*	1.97*	3.25**
Spatial disp.	.27 (.01)*	-.18 (.01)	-.23 (.01)*	-.32 (.01)**	-.23 (.01)*	-.22 (.01)†
Imbalance disp.	.23 (.69)*	.18 (.69)	.06 (.73)	.15 (.71)	.02 (.73)	.06 (.73)
Site disp.	.08 (.19)	-.38 (.19)**	-.01 (.20)	.02 (.19)	-.02 (.19)	-.01 (.20)
Temporal disp.	-.08 (.17)	.04 (.17)	.05 (.18)	.02 (.17)	.03 (.18)	.05 (.18)
Conflict	-	-	-	-.39 (.12)**	-	-.37 (.11)**
Coordination	-	-	-	-	.25 (.09)*	.22 (.11)†

*Note: **p < .01, *p < .05, †p < .10*

Table 5. Sobel Tests of Indirect Effects of Dispersion on Performance

IV	**Indirect Effect**	
	Conflict	**Coordin**
Spatial disp.	-2.89*	-2.08*
Imbalance disp.	-.41	.11
Temporal disp.	.28	.11
Site Disp.	-.82	-1.61

*Note: **p < .01, *p < .05, †p < .10*

Moderation Analysis

Before conducting the analysis for the moderation effects, main effect predictors (dispersion and leadership behaviors) were mean-centered to reduce the threat of multicollinearity. All resulting variance inflation factors were below 2.0 for the interaction models shown in Table 3. H3 predicted that spatial dispersion and participative leadership behaviors would have an interactive effect on interpersonal conflict. Model 4 of Table 3 shows a significant interaction between spatial dispersion and participative leadership behaviors ($\beta = -.24$, $p < .05$). Thus, H3 receives support. This model explains 21% of the variance in interpersonal conflict. H4 predicted that configurational-imbalance dispersion and participative leadership behaviors would also have an interactive effect on interpersonal conflict. Model 7 of Table 3 shows a significant interaction between configurational-imbalance dispersion and participative leadership behaviors ($\beta = -.23$, $p < .05$). Thus, H4 receives support. This model explains 19% of the variance in interpersonal conflict. H5 and H6 predicted that the effect of configurational-site dispersion and temporal dispersion on coordination effectiveness would each be moderated by directive leadership. Models 9 and 11 of Table 3 demonstrate that this is not the case. There is no significant interaction between configurational-site dispersion and directive leadership ($\beta = -.03$, $p > .10$) or between temporal dispersion and directive leadership ($\beta = -.08$, $p > .10$). Thus, H5 and H6 are not supported.

The supported interaction models shown in Models 4 and 7 of Table 3 explain an additional 6% and 4% of the variance in interpersonal conflict, over and above the direct effects models shown in Models 3 and 6, respectively. While at first glance these values appear small, they are actually quite large in the context of field research. In their study of the difficulties of detecting interaction effects, McClellend and Judd (1993, p. 377) note, "…reduction in model error due to adding the product term is often disconcertingly low. Evans (1985), for example, concluded that moderator effects are so difficult to detect that even those explaining as little as 1% of the total variance should be considered important. Champoux and Peters (1987) and Chaplin (1991) reviewed much of the social science literature and reported that field study interactions typically account for about 1%-3% of the variance."

To further probe the nature of the interaction effects, the two significant interactions were plotted following the guidelines of Aiken and West (1991). Figures 3a and 3b illustrate these interaction plots. The plots show that, under conditions of high spatial or configurational-imbalance dispersion, when participative leadership is high, interpersonal conflict is lower than when participative leadership is low, providing further support for hypotheses 3 and 4.

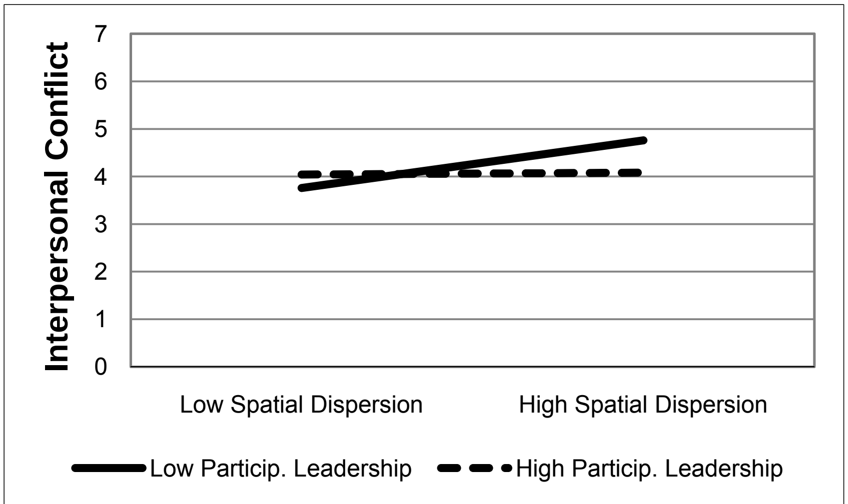

Figure 3a. Plot for Conflict (Spatial Disp.* Participative Lead.)

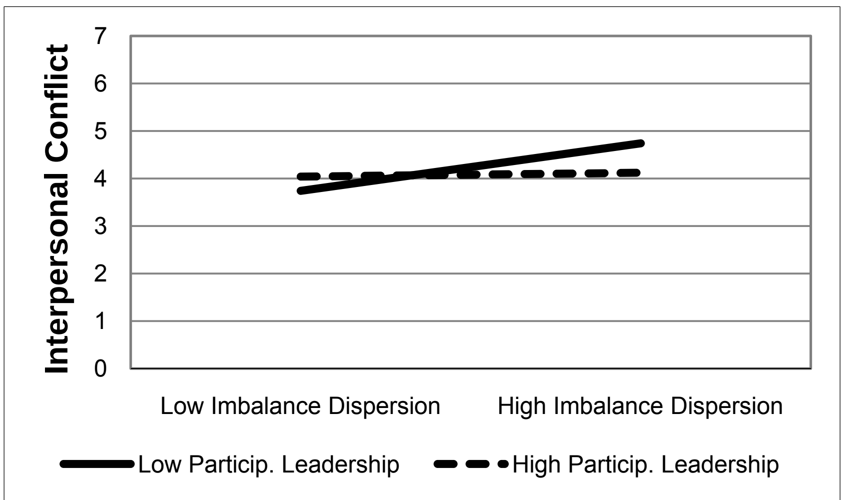

Figure 3b. Plot for Conflict (Imbalance Disp. * Participative Lead.)

Note: t-tests show that the slope of the line representing high participative leadership is not significantly different from zero.

DISCUSSION

Dispersed teamwork involves many challenges. Fortunately, our understanding of the complexity facing dispersed teams has recently been advanced by research that has extended the notion of dispersion to cover differing geographic forms (O'Leary and Cummings 2007). The purpose of this research was to investigate how these differing forms of dispersion, including spatial, configurational-imbalance, configurational-site, and temporal dispersion comparatively affect two team states: interpersonal conflict and coordination effectiveness. Further, I sought to understand whether and how participative and directive leadership behaviors might mitigate the negative influence of dispersion on interpersonal conflict and coordination effectiveness. Drawing from the literature on team dispersion and leadership, I put forth a model to test the relative impact of dispersion on team states, and whether and how different leadership behaviors influence these relationships. The model was tested among 72 teams and their leaders, composed of 753 members working on systems development projects, with members located in China, India, and the U.S. The results show that spatial and configurational-imbalance dispersion negatively affect teams by increasing the amount of interpersonal conflict they experience, while configurational-site dispersion reduces coordination effectiveness. Participative leadership behaviors are shown to positively influence teams with high spatial or configurational-imbalance dispersion, by reducing the effects of dispersion on interpersonal conflict. Directive leadership was not found to be an effective means of reducing the negative effects of dispersion. Finally, spatial dispersion was found to have an indirect effect on performance through both conflict and coordination.

Theoretical Contributions

This work makes several contributions to the literature. First, it builds on the work by O'Leary and Cummings (2007) on geographic dispersion to provide additional understanding of the distinct impacts of varied forms of dispersion, including spatial, configurational-imbalance, configurational-site, and temporal dispersion. This contributes to the information systems and management literatures on dispersed teams by "opening the black box" that is dispersion and examining different conceptualizations and theoretical mechanisms governing its influence on team outcomes. Further, by examining the *comparative* influences that different forms of geographic dispersion have on team outcomes, the current work provides researchers with a platform for studying the forms of dispersion that have a maximum impact on their outcomes of interest. In a similar vein, the current work may also help researchers studying teams that face a particular type of dispersion in selecting outcome variables that are particularly relevant to their context. This is expected to help researchers in theoretically grounding subsequent models of dispersion and extending our knowledge to consider the finer gradations and subtleties inherent in dispersed teamwork. Specifically, researchers studying teams that are dispersed spatially or are configurationally-imbalanced across sites, will want to focus on interpersonal factors, such as conflict, that impact team performance. Researchers studying teams that are dispersed across many sites, will want to focus more on coordination activities between team members. While prior research has found that spatial and temporal dispersion affect coordination activities (Cummings et al. 2009), these effects do not play out in the current sample. This may be due to sample size limitations that preclude the observation of weaker effects, or some aspect of the organizational context in which these teams were embedded. For example, the teams studied by Cummings and his colleagues (2009) were from the manufacturing sector, while the teams in the current study were from the information technology sector. Perhaps IT workers are more experienced with collaborative technologies are thus are able to better leverage these tools to reduce disruptions in coordination activities that might otherwise result from temporal differences. Future research is needed to investigate such possibilities, particularly as it pertains to the contextual factors involved in dispersed teamwork.

Second, this research contributes to the literature on leadership by incorporating the role of dispersion in theorizing about the impacts of leadership on team outcomes. Specifically, this work explicates the specific mechanisms by which leaders may facilitate positive team outcomes to inform both science and practice. Researchers of dispersed teams will benefit from a more complete understanding of how and why leaders are able to influence the relationship between dispersion and conflict or coordination. This represents a basis for understanding the reach that leaders have across space and time and their ability to influence other important team processes. In this way, with work enriches our current understanding of the way in which leaders are positioned to respond to teams' needs and challenges. Such an understanding is critical in delineating the leadership practices that are relevant and effective in the dispersed context from those that are not. While leadership in the dispersed context has not received much attention in extant research (Bell and Kozlowski 2002, Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006), the research that does address this issue highlights the unique constraints facing leaders of dispersed teams (Hertel et al. 2005). Dispersion severs ties between leaders and team members, making it more difficult for them to direct and monitor teamwork. This may perhaps explain why directive leadership, which is characterized by monitoring and coordinating behaviors, was not an effective means of reducing the negative impacts of dispersion in this study. Perhaps attempts at directive leadership are suppressed by the lack of direct contact with team members or require too much overhead on the part of team members in responding to their leaders' direction. In light of recent literature on the effectiveness of more delegative, motivational, and hands-off approaches to leadership in the dispersed context (Hertel et al. 2005, Joshi et al. 2009, Pearce et al. 2004), the results observed are not surprising, but do bear further investigation.

Third, this research contributes an empirical field-based study of dispersion that involves not only varying dimensions of dispersion, but incorporates the understudied dimension of configurational-dispersion. In reviewing the literature on dispersion, O'Leary and Cummings (2007) note that the overwhelming majority of research on dispersed teams focuses on spatial dispersion. Temporal dispersion, too, has received much attention (e.g., Cummings et al. 2009, Grinter et al. 1999, Herbsleb et al. 2000, Malone and Crowston 1994, Massey et al. 2003, Montoya-Weiss et al. 2001, Saunders et al. 2004), while only a handful of studies have indirectly examined configurational-dispersion (Cramton 2001, Cramton and Hinds 2005, Polzer et al. 2006), with only one studying it explicitly (O'Leary and Mortensen 2010). While this prior research has laid the foundation for subsequent research on configurational-dispersion, these studies have all taken place in the lab, with student samples. Lab studies play a critical role in advancing science, particularly in the early stages of theory development, however they are limited in their ability to capture the complexity of naturally-occurring teams (Dennis et al. 1990). The current study represents the first to empirically examine configurational-dispersion among naturally-occurring teams. Thus, this study contributes to the growing literature on the complex effects of dispersion by uncovering the mechanisms by which configurational-dispersion affects team outcomes. This is important, as recent research suggests that configurational-dispersion is increasingly prevalent in organizational teams (Cummings 2004, O'Leary and Mortensen 2010). In order for research to keep pace with the growing complexity of modern team-based structures, we must give consideration to the various forms of dispersion that they experience.

Limitations and Future Research Directions

While the findings of this work may stimulate further research, so too, will its limitations. In particular, I note three key limitations of the current study. First, the survey was cross-sectional, which prompts concerns of common method variance (CMV). To alleviate this concern, steps were taken to reduce the possibility of CMV, as recommended in prior research (Podsakoff et al. 2003). First, the data were gathered from different sources, including members and leaders. Second, the survey was structured in such a way so as to proximally separate the predictor and criterion variables. In addition, steps were taken to communicate to respondents that their anonymity would be protected by having the survey administered by an external market research firm with the intent of reducing evaluation apprehension and threats of social desirability bias. Finally, statistical analyses that minimize concerns related to CMV were conducted and results show that it was not a concern (Podsakoff et al. 2003). Despite these precautions, longitudinal research is needed to completely rule out CMV. Longitudinal analysis may also prove fruitful in shedding light on the effectiveness of participative leadership behaviors throughout the team's life cycle.

Second, data were collected from only one company. Although respondents spanned several different countries, the organizational culture, work climate, or practices of this particular organization may have some influence on the results observed. In addition, the demographic profile of this organization is somewhat unique in that a large percentage of the team members and leaders are women. Prior research finds that supervisor-employee relationships may be different for men versus women (e.g., Wayne et al. 1994). For the purpose of generalizability, it will be important to examine this model not only in other organizations and cultures, but also with different gender compositions.

Third, only two team states were examined—interpersonal conflict and coordination effectiveness. While this research shows that these particular states are affected by dispersion, different dimensions of dispersion have also been theorized to impact other important team processes and states, including communication effectiveness, problem-solving processes, and awareness or shared understanding among team members (O'Leary and Cummings 2007). Moreover, extant research also points to other leadership approaches and behaviors that may be influential in helping dispersed teams, including shared leadership approaches (Pearce et al. 2004) and inspirational leadership behaviors (Joshi et al. 2009). To fully explore the conditions under which dispersion and affects team outcomes, future research will want to explore other important team states, processes, and leadership approaches.

Practical Implications

This results of this work also provides important implications for the management of dispersed teams. First and foremost, is the need to consider the type of dispersion that a team experiences. In doing so, organizations, and more specifically, leaders of dispersed teams may be able to head off problems that arise from a particular form of dispersion. For example, when teams are spatially-dispersed, or configurationally-imbalanced, team leaders will want to be particularly sensitive to interpersonal relationships and take steps to foster closer bonds among team members so that interpersonal conflict can be avoided. When team members are dispersed across many different sites, team leaders will want to play close attention to implementing work practices, information and communication technologies, or other tools that will help team members coordinate the work that is shared among them.

Second, this work has implications for the design of leadership interventions and leader training programs. As mentioned in the introduction, research finds that a majority of team leaders do not receive training on how to effectively manage and lead dispersed teams (Rosen et al. 2006). The results presented here provide evidence that leaders represent an effective way to minimize the negative impact of dispersion, underscoring the importance of their role in dispersed teamwork. Furthermore, by engaging in specific behaviors, including mentoring and facilitating, dispersed team leaders can impact the degree to which dispersion induces interpersonal conflict. In contrast, the results show that directive leadership behaviors are largely ineffective in reducing the negative effects of dispersion. Further research on the efficacy of this type of leadership approach is certainly warranted. However, given the inherent difficulty in monitoring and coordinating dispersed team members' activities (Hertel et al. 2005), and the evidence provided here in favor of more participative approaches aimed at facilitating psychosocial outcomes, leaders may be well advised to focus their efforts on participative behaviors. By demonstrating the influence that different leader behaviors have in reducing the negative impact of specific forms of dispersion on team outcomes, practitioners are better positioned to tailor interventions and training programs according to the type of dispersion teams experience.

CONCLUSIONS

By examining various forms of geographical dispersion, our study stresses the importance of considering the comparative influences of different forms of dispersion. Not only do these different forms of dispersion influence different team outcomes, certain leadership behaviors are effective in reducing the negative effects of some, but not all types of dispersion. Based on an empirical study of 753 members working in 72 globally-dispersed teams, results show that participative leadership behaviors are effective in reducing the negative impact of spatial and temporal dispersion on team interpersonal conflict, and that interpersonal conflict mediates the impact of spatial dispersion on team performance. Further, configurational-site dispersion is shown to negatively influence coordination effectiveness. These findings have implications for future research on the impact of differing dimensions of dispersion and future research on leadership interventions in the dispersed context. Both dispersion and leadership practices have significant effects on team dynamics and thus should be accounted for in both research and practice.

REFERENCES

Aiken, L. S., and West, S. G. 1991. *Multiple Regression: Testing and Interpreting Interactions*, Newbury Park, CA: Sage Publications.

Ancona, D. G., and Caldwell, D. F. 1992. "Demography and Design: Predictors of New Product Team Performance," *Organization Science* (3:3), pp. 321-341.

Avolio, B. J. 1999. *Full Leadership Development: Building the Vital Forces in Organizations*, Thousand Oaks: Sage Publications.

Barki, H., Rivard, S., and Talbot, J. 2001. "An Integrative Contingency Model of Software Project Risk Management," *Journal of Management Information Systems* (17:4), pp. 37-69.

Baron, R. M., and Kenny, D. A. 1986. "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Journal of Personality and Social Psychology* (51:6), pp. 1173-1182.

Bass, B. M. 1985. *Leadership and Performance Beyond Expectations*, New York, NY: Free Press.

Bass, B. M., and Bass, R. 2008. *The Bass Handbook of Leadership: Theory, Research, and Managerial Applications*, New York, NY: Free Press.

Bell, B. S., and Kozlowski, S. W. 2002. "A Typology of Virtual Teams: Implications for Effective Leadership," *Group & Organization Management* (27:1), pp. 14-49.

Bentler, P. M. 1990. "Comparative Fit Indexes in Structural Models," *Psychological Bulletin* (107:2), pp. 238-246.

Boh, W. F., Ren, Y., Kiesler, S., and Bussjaeger, R. 2007. "Expertise and Collaboration in the Geographically Dispersed Organization," *Organization Science* (18:4), pp. 595.

Brett, J. M., and Rognes, J. K. 1986. "Intergroup Relations in Organizations," in *Designing Effective Work Groups,* P.S. Goodman (ed.), San Francisco, CA: Jossey-Bass, pp. 202-236.

Burke, K., Aytes, K., Chidambaram, L., and Johnson, J. J. 1999. "A Study of Partially Distributed Work Groups: The Impact of Media, Location, and Time on Perceptions and Performance," *Small Group Research* (30:4), pp. 453-490.

Carte, T. A., Chidambaram, L., and Becker, A. 2006. "Emergent Leadership in Self-Managed Virtual Teams," *Group Decision and Negotiation* (15:4), pp. 323-343.

Chao, G. T., Walz, P. M., and Gardner, P. D. 1992. "Formal and Informal Mentorships: A Comparison on Mentoring Functions and Contrast with Non-Mentored Counterparts," *Personnel Psychology* (45:3), pp. 619-636.

Chidambaram, L. 1996. "Relational Development in Computer-Supported Groups," *MIS Quarterly* (20:2), pp. 143-165.

Clark, H. H. 1996. *Using Language*, New York, NY: Cambridge University Press.

Clark, H. H., and Carlson, T. 1982. "Speech Acts and Hearer's Beliefs," in *Mutual Knowledge,* N. Smith (ed.), New York, NY: Academic Press, pp. 1-36.

Clark, H. H., and Marshall, C. R. 1981. "Definite Reference and Mutual Knowledge," in *Elements of Discourse Understanding,* A. Joshi, I. Sag, and B. Webber (eds.), New York, NY: Cambridge University Press, pp. 10-63.

Cooper, C. B., and Kurland, N. B. 2002. "Telecommuting, Professional Isolation, and Employee Development in Public and Private Organizations," *Journal of Organizational Behavior* (23:4), pp. 511-532.

Cramton, C. D. 2001. "The Mutual Knowledge Problem and Its Consequences for Dispersed Collaboration," *Organization Science* (12:3), pp. 346-371.

Cramton, C. D., and Hinds, P. J. 2005. "Subgroup Dynamics in Internationally Distributed Teams: Ethnocentrism or Cross-National Learning?," *Research in Organizational Behavior* (26), pp. 231-263.

Cummings, J. N. 2004. "Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization," *Management Science* (50:3), pp. 352-364.

Cummings, J. N., Espinosa, J. A., and Pickering, C. K. 2009. "Crossing Spatial and Temporal Boundaries in Globally Distributed Projects: A Relational Model of Coordination Delay," *Information Systems Research* (20:3), pp. 420-439.

De Dreu, C. K. W., and Weingart, L. R. 2003. "Task Versus Relationship Conflict, Team Performance, and Team Member Satisfaction: A Meta-Analysis," *Journal of Applied Psychology* (88:4), pp. 741-749.

Denison, D. R., Hooijberg, R., and Quinn, R. E. 1995. "Paradox and Performance: Toward a Theory of Behavioral Complexity in Managerial Leadership," *Organization Science* (6:5), pp. 524-540.

Dennis, A. R., Nunamaker, J. F., and Vogel, D. R. 1990. "A Comparison of Laboratory and Field Research in the Study of Electronic Meeting Systems," *Journal of Management Information Systems* (7:3), pp. 107-135.

Espinosa, J. A., and Pickering, C. 2006. "The Effect of Time Separation on Coordination Processes and Outcomes: A Case Study," in *Proceedings of the 39th Hawaii International Conference on System Sciences*, Hawaii, pp. 25-35.

Espinosa, J. A., Slaughter, S. A., Kraut, R. E., and Herbsleb, J. D. 2007. "Team Knowledge and Coordination in Geographically Distributed Software Development," *Journal of Management Information Systems* (24:1), pp. 135-169.

Faraj, S., and Sproull, L. 2000. "Coordinating Expertise in Software Development Teams," *Management Science* (46:12), pp. 1554-1568.

Fiol, C. M., and O'Connor, E. J. 2005. "Identification in Face-to-Face, Hybrid, and Pure Virtual Teams: Untangling the Contradictions," *Organization Science* (16:1), pp. 19-33.

Fornell, C., and Larcker, D. F. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research* (18:1), pp. 39-50.

Fussell, S. R., and Krauss, R. M. 1992. "Coordination of Knowledge in Communication: Effects of Speakers' Assumptions About What Others Know," *Journal of Personality and Social Psychology* (62:3), pp. 378-391.

Galinsky, A. D., Ku, G., and Wang, C. S. 2005. "Perspective-Taking and Self-Other Overlap: Fostering Social Bonds and Facilitating Social Coordination," *Group Processes & Intergroup Relations* (8:2), pp. 109-124.

Griffith, T. L., Mannix, E. A., and Neale, M. A. 2003a. "Conflict and Virtual Teams," in *Virtual Teams That Work,* C.B. Gibson, and S.G. Cohen (eds.), San Francisco, CA: Jossey Bass, pp. 335-352.

Griffith, T. L., Sawyer, J. E., and Neale, M. A. 2003b. "Virtualness and Knowledge in Teams: Managing the Love Triangle of Organizations, Individuals, and Information Technology," *MIS Quarterly* (27:2), pp. 265-287.

Grinter, R. E., Herbsleb, J. D., and Perry, D. E. 1999. "The Geography of Coordination: Dealing with Distance in R&D Work," in *Proceedings of the GROUP 99 Conference on the ACM*, Phoenix, AZ, pp. 306-315.

Hackman, J. R. 1990. *Groups That Work (and Those That Don't): Creating Conditions for Effective Teamwork*, San Francisco, CA: Jossey-Bass.

Hambley, L. A., O'Neill, T. A., and Kline, T. J. B. 2007. "Virtual Team Leadership: The Effects of Leadership Style and Communication Medium on Team Interaction Styles and Outcomes," *Organizational Behavior and Human Decision Processes* (103:1), pp. 1-20.

Harrison, D. A., Price, K. H., and Bell, M. P. 1998. "Beyond Relational Demography: Time and the Effects of Surface-and Deep-Level Diversity on Work Group Cohesion," *Academy of Management Journal* (41:1), pp. 96-107.

Harrison, D. A., Price, K. H., Gavin, J. H., and Florey, A. T. 2002. "Time, Teams, and Task Performance: Changing Effects of Surface-and Deep-Level Diversity on Group Functioning," *Academy of Management Journal* (45:5), pp. 1029-1045.

Herbsleb, J. D., Mockus, A., Finholt, T., and Grinter, R. E. 2000. "Distance, Dependencies, and Delay in a Global Collaboration," in *Proceedings of the 2000 ACM Conference on Computer Supported Cooperative Work*, Philadelphia, PA, pp. 319-328.

Hertel, G., Geister, S., and Konradt, U. 2005. "Managing Virtual Teams: A Review of Current Empirical Research," *Human Resource Management Review* (15:1), pp. 69-95.

Hill, N. S., Bartol, K. M., Tesluk, P. E., and Langa, G. A. 2009. "Organizational Context and Face-to-Face Interaction: Influences on the Development of Trust and Collaborative Behaviors in Computer-

Mediated Groups," *Organizational Behavior and Human Decision Processes* (108:2), pp. 187-201.

Hinds, P. J., and Bailey, D. E. 2003. "Out of Sight, out of Sync: Understanding Conflict in Distributed Teams," *Organization Science* (14:6), pp. 615-632.

Hinds, P. J., and Mortensen, M. 2005. "Understanding Conflict in Geographically Distributed Teams: The Moderating Effects of Shared Identity, Shared Context, and Spontaneous Communication," *Organization Science* (16:3), pp. 290-307.

Hofstede, G. H. 1980. *Culture's Consequences: International Differences in Work-Related Values*, Newbury Park, CA: Sage Publications.

Hooijberg, R., Hunt, J. G., and Dodge, G. E. 1997. "Leadership Complexity and Development of the Leaderplex Model," *Journal of Management* (23:3), pp. 375-408.

Hu, L., and Bentler, P. M. 1999. "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives," *Structural Equation Modeling* (6:1), pp. 1-55.

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., and Jundt, D. 2005. "Teams in Organizations: From Input-Process-Output Models to I.M.O.I. Models," *Annual Review of Psychology* (56:1), pp. 517-543.

Insko, C. A., Schopler, J., Hoyle, R. H., Dardis, G. J., and Graetz, K. A. 1990. "Individual-Group Discontinuity as a Function of Fear and Greed," *Journal of Personality and Social Psychology* (58:1), pp. 68-79.

Jarvenpaa, S. L., Shaw, T. R., and Staples, D. S. 2004. "Toward Contextualized Theories of Trust: The Role of Trust in Global Virtual Teams," *Information Systems Research* (15:3), pp. 250-267.

Jehn, K., and Mannix, E. A. 2001. "The Dynamic Nature of Conflict: A Longitudinal Study of Intragroup Conflict and Group Performance: A Field Experiment," *Academy of Management Journal* (44:2), pp. 238-251.

Jehn, K. A. 1995. "A Multimethod Examination of the Benefits and Detriments of Intragroup Conflict," *Administrative Science Quarterly* (40:2), pp. 256-282.

Jehn, K. A., Northcraft, G. B., and Neale, M. A. 1999. "Why Differences Make a Difference: A Field Study of Diversity, Conflict, and Performance in Workgroups," *Administrative Science Quarterly* (44:4), pp. 741-763.

Jessup, L. M., Connolly, T., and Tansik, D. A. 1990. "Toward a Theory of Automated Group Work: The Deindividuating Effects of Anonymity," *Small Group Research* (21:3), pp. 333-348.

Joshi, A., Lazarova, M. B., and Liao, H. 2009. "Getting Everyone on Board: The Role of Inspirational Leadership in Geographically Dispersed Teams," *Organization Science* (20:1), pp. 240-252.

Kabanoff, B. 1991. "Equity, Equality, Power, and Conflict," *Academy of Management Review* (16:2), pp. 416-441.

Kanawattanachai, P., and Yoo, Y. 2002. "Dynamic Nature of Trust in Virtual Teams," *Journal of Strategic Information Systems* (11:3-4), pp. 187-213.

Kayworth, T. R., and Leidner, D. E. 2002. "Leadership Effectiveness in Global Virtual Teams," *Journal of Management Information Systems* (18:3), pp. 7-40.

Kiesler, S., Siegel, J., and McGuire, T. W. 1984. "Social Psychological Aspects of Computer-Mediated Communication," *American Psychologist* (39:10), pp. 1123-1134.

Kirkman, B. L., Rosen, B., Gibson, C. B., Tesluk, P. E., and McPherson, S. O. 2002. "Five Challenges to Virtual Team Success: Lessons from Sabre, Inc.," *Academy of Management Executive* (16:3), pp. 67-79.

Kline, R. B. 2005. *Principles and Practice of Structural Equation Modeling*, New York, NY: The Guilford Press.

Ko, D. G., Kirsch, L., and King, W. R. 2005. "Antecedents of Knowledge Transfer from Consultants to Clients in Enterprise System Implementations," *MIS Quarterly* (29:1), pp. 59-85.

Kozlowski, S. W. J., Watola, D. J., Nowakowski, J. M., Kim, B. H., and Botero, I. C. 2009. "Developing Adaptive Teams: A Theory of Dynamic Team Leadership," in *Team Effectiveness in Complex Organizations: Cross-Disciplinary Perspectives and Approaches,* E. Salas, G.F. Goodwin, and C.S. Burke (eds.), New York, NY: Psychology Press, pp. 113-155.

Kram, K. E. 1985. *Mentoring at Work: Developmental Relationships in Organizational Life*, Glenview, IL: Scott Foresman.

Krauss, R. M., and Fussell, S. R. 1990. "Mutual Knowledge and Communicative Effectiveness," in *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work,* J. Galegher, R.E. Kraut, and C. Egido (eds.), Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 111-146.

Lau, D. C., and Murnighan, J. K. 1998. "Demographic Diversity and Faultlines: The Compositional Dynamics of Organizational Groups " *Academy of Management Review* (23:2), pp. 325-340.

Lipnack, J., and Stamps, J. 1997. *Reaching across Space, Time, and Organizations with Technology*, New York, NY: John, Wiley & Sons, Inc.

Malhotra, A., Majchrzak, A., and Rosen, B. 2007. "Leading Virtual Teams," *Academy of Management Perspectives* (21:1), pp. 60-70.

Malone, T. W., and Crowston, K. 1994. "The Interdisciplinary Study of Coordination," *ACM Computing Surveys* (26:1), pp. 87-119.

Mannix, E. A. 1993. "Organizations as Resource Dilemmas: The Effects of Power Balance on Coalition Formation in Small Groups," *Organizational Behavior and Human Decision Processes* (55:1), pp. 1-22.

Marks, M. A., Mathieu, J. E., and Zaccaro, S. J. 2001. "A Temporally Based Framework and Taxonomy of Team Processes," *Academy of Management Review* (26:3), pp. 356-376.

Martins, L. L., Gilson, L., L., and Maynard, M. T. 2004. "Virtual Teams: What Do We Know and Where Do We Go from Here?," *Journal of Management* (30:6), pp. 805-835.

Maruping, L. M., and Agarwal, R. 2004. "Managing Team Interpersonal Processes through Technology: A Task-Technology Fit Perspective," *Journal of Applied Psychology* (89:6), pp. 975-990.

Massey, A. P., Montoya-Weiss, M. M., and Hung, Y. 2003. "Because Time Matters: Temporal Coordination in Global Virtual Project Teams," *Journal of Management Information Systems* (19:4), pp. 129-155.

McClelland, G. H., and Judd, C. M. 1993. "Statistical Difficulties of Detecting Interactions and Moderator Effects," *Psychological Bulletin* (114:2), pp. 376-390.

McPherson, M., Smith-Lovin, L., and Cook, J. M. 2001. "Birds of a Feather: Homophily in Social Networks," *Annual Reviews in Sociology* (27:1), pp. 415-444.

Montoya-Weiss, M. M., Massey, A. P., and Song, M. 2001. "Getting It Together: Temporal Coordination and Conflict Management in Global Virtual Teams," *Academy of Management Journal* (44:6), pp. 1251-1262.

Moreland, R. L., Levine, J. M., and Wingert, M. L. 1996. "Creating the Ideal Group: Composition Effects at Work," in *Understanding Group Behavior: Vol. 2. Small Group Processes and Interpersonal Relations,* E.H. Witte, and J.H. Davis (eds.), Mahwah, NJ: Lawrence Erlbaum Associates, pp. 11–35.

Morgeson, F. P., DeRue, D. S., and Karam, E. P. 2010. "Leadership in Teams: A Functional Approach to Understanding Leadership Structures and Processes," *Journal of Management* (36:1), pp. 5-39.

Mortensen, M., and Hinds, P. J. 2001. "Conflict and Shared Identity in Geographically Distributed Teams," *International Journal of Conflict Management* (12:3), pp. 212-238.

Nidumolu, S. 1995. "The Effect of Coordination and Uncertainty on Software Project Performance: Residual Performance Risk as an Intervening Variable," *Information Systems Research* (6:3), pp. 191-219.

O'Leary, M. B., and Cummings, J. N. 2007. "The Spatial, Temporal, and Configurational Characteristics of Geographic Dispersion in Work Teams," *MIS Quarterly* (31:3), pp. 433-452.

O'Leary, M. B., and Mortensen, M. 2010. "Go (Con)Figure: Subgroups, Imbalance, and Isolates in Geographically Dispersed Teams," *Organization Science* (21:1), pp. 115-131.

O’Leary, M. B., and Cummings, J. N. 2007. "The Spatial, Temporal, and Configurational Characteristics of Geographic Dispersion in Work Teams," *MIS Quarterly* (31:3), pp. 433-452.

Olson, J. S., and Teasley, S. 1996. "Groupware in the Wild: Lessons Learned from a Year of Virtual Collocation," in *Proceedings of the 1996 ACM Conference on Computer Supported Cooperative Work*, Cambridge, MA, pp. 419-427.

Pearce, C. L., Yoo, Y., and Alavi, M. 2004. "Leadership, Social Work, and Virtual Teams: The Relative Influence of Vertical Versus Shared Leadership in the Nonprofit Sector," in *Improving Leadership in Nonprofit Organizations,* R. Riggio, and S.S. Orr (eds.), San Francisco, CA: Jossey-Bass, pp. 180-203.

Pelled, L. H., Eisenhardt, K. M., and Xin, K. R. 1999. "Exploring the Black Box: An Analysis of Work Group Diversity, Conflict, and Performance," *Administrative Science Quarterly* (44:1), pp. 1-28.

Peterson, R. S., and Behfar, K. J. 2003. "The Dynamic Relationship between Performance Feedback, Trust, and Conflict in Groups: A Longitudinal Study," *Organizational Behavior and Human Decision Processes* (92:1-2), pp. 102-112.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. 2003. "Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies," *Journal of Applied Psychology* (88:5), pp. 879-902.

Polzer, J. T., Crisp, C. B., Jarvenpaa, S. L., and Kim, J. W. 2006. "Extending the Faultline Model to Geographically Dispersed Teams: How Colocated Subgroups Can Impair Group Functioning," *Academy of Management Journal* (49:4), pp. 679-692.

Powell, A., Piccoli, G., and Ives, B. 2004. "Virtual Teams: A Review of Current Literature and Directions for Future Research," *DATA BASE for Advances in Information Systems* (35:1), pp. 6-36.

Quinn, R. E. 1988. *Beyond Rational Management: Mastering the Paradoxes and Competing Demands of High Performance*, San Francisco, CA: Jossey-Bass.

Rosen, B., Furst, S., and Blackburn, R. 2006. "Training for Virtual Teams: An Investigation of Current Practices and Future Needs," *Human Resource Management* (45:2), pp. 229-247.

Saunders, C., Van Slyke, C., and Vogel, D. R. 2004. "My Time or Yours? Managing Time Visions in Global Virtual Teams," *Academy of Management Executive* (18:1), pp. 19-31.

Schober, M. F. 1998. "Different Kinds of Conversational Perspective-Taking," in *Social and Cognitive Approaches to Interpersonal Communication,* S.R. Fussell, and R.J. Kreuz (eds.), Mahwah, NJ: Lawrence Erlbaum Associates, pp. 145–174.

Schweiger, D. M., Sandberg, W. R., and Ragan, J. W. 1986. "Group Approaches for Improving Strategic Decision Making: A Comparative Analysis of Dialectical Inquiry, Devil's Advocacy, and Consensus," *Academy of Management Journal* (29:1), pp. 51-71.

Shah, P. P., and Jehn, K. A. 1993. "Do Friends Perform Better Than Acquaintances? The Interaction of Friendship, Conflict, and Task," *Group Decision and Negotiation* (2:2), pp. 149-165.

Short, J., Williams, E., and Christie, B. 1976. *The Social Psychology of Telecommunications*, London, England: John, Wiley & Sons, Inc.

Siegel, J., Dubrovsky, V., Kiesler, S., and McGuire, T. W. 1986. "Group Processes in Computer-Mediated Communication," *Organizational Behavior and Human Decision Processes* (37:2), pp. 157-187.

Sobel, M. E. 1982. "Asymptotic Confidence Intervals for Indirect Effects in Structural Equation Models," in *Sociological Methodology,* S. Leinhardt (ed.), Washington, DC: pp. 290-312.

Spears, R., and Lea, M. 1992. "Social Influence and the Influence of the “Social” in Computer-Mediated Communication," in *Contexts of Computer-Mediated Communication,* M. Lea (ed.), London, England: Harvester-Wheatsheaf, pp. 30-65.

Spears, R., Lea, M., Corneliussen, R. A., Postmes, T., and Haar, W. T. 2002. "Computer-Mediated Communication as a Channel for Social Resistance: The Strategic Side of SIDE," *Small Group Research* (33:5), pp. 555-574.

Spector, P. E. 1994. "Using Self-Report Questionnaires in O.B. Research: A Comment on the Use of a Controversial Method," *Journal of Organizational Behavior* (15:5), pp. 385-392.

Sproull, L., and Kiesler, S. 1986. "Reducing Social Context Cues: Electronic Mail in Organizational Communication," *Management Science* (32:11), pp. 1492-1512.

Srivastava, A., Bartol, K. M., and Locke, E. A. 2006. "Empowering Leadership in Management Teams: Effects of Knowledge Sharing, Efficacy, and Performance," *Academy of Management Journal* (49:6), pp. 1239-1251.

Tyran, K. L., Tyran, C. K., and Shephard, M. 2003. "Exploring Emerging Leadership in Virtual Teams," in *Virtual Teams That Work: Creating Conditions for Virtual Team Effectiveness,* C.B. Gibson, and S.G. Cohen (eds.), San Francisco, CA: Jossey-Bass, pp. 183-195.

Wakefield, R. L., Leidner, D. E., and Garrison, G. 2008. "A Model of Conflict, Leadership, and Performance in Virtual Teams," *Information Systems Research* (19:4), pp. 434-455.

Walther, J. B. 1992. "Interpersonal Effects in Computer-Mediated Interaction: A Relational Perspective," *Communication Research* (19:1), pp. 52-91.

Walther, J. B. 1995. "Relational Aspects of Computer-Mediated Communication: Experimental Observations over Time," *Organization Science* (6), pp. 186-186.

Warkentin, M., and Beranek, P. M. 1999. "Training to Improve Virtual Team Communication " *Information Systems Journal* (9:4), pp. 271-289.

Warkentin, M. E., Sayeed, L., and Hightower, R. 1997. "Virtual Teams Versus Face-to-Face Teams: An Exploratory Study of a Web-Based Conference System," *Decision Sciences* (28:4), pp. 975-996.

Wayne, S. J., Liden, R. C., and Sparrowe, R. T. 1994. "Developing Leader-Member Exchanges: The Influence of Gender and Ingratiation," *American Behavioral Scientist* (37:5), pp. 697-714.

Webster, J., and Staples, D. S. 2006. "Comparing Virtual Teams to Traditional Teams: An Identification of New Research Opportunities," in *Research in Personnel and Human Resources Management,* J.J. Martocchio (ed.), San Diego, CA: Elsevier, pp. 183-218.

Wilson, J. M., Straus, S. G., and McEvily, B. 2006. "All in Due Time: The Development of Trust in Computer-Mediated and Face-to-Face Teams," *Organizational Behavior and Human Decision Processes* (99:1), pp. 16-33.

Yoo, Y., and Alavi, M. 2004. "Emergent Leadership in Virtual Teams: What Do Emergent Leaders Do?," *Information and Organization* (14:1), pp. 27-58.

Zigurs, I. 2003. "Leadership in Virtual Teams: Oxymoron or Opportunity?," *Organizational Dynamics* (31:4), pp. 339-351.

APPENDIX

Table 1. Essay 3 Survey Items

Construct	#	Item	Source	Scale*
Spatial & config. dispersion	1	Please provide the name of the city, state/region, and country where you work.	O'Leary & Cummings 2007	0
Temporal dispersion	2	Please provide the hours during which you normally work on this project.		
	3	Is the time that you work on this project the time that your team members also typically work on the project?		
Configurational-dispersion	2	Please provide the address of the building where you work.		
	3	If applicable, please provide the number corresponding to the floor of the building where you work.		
Directive leadership (monitor)	-	As a team leader I…	Denison et al. 1995	1
	1	Anticipate workflow problems, avoid crises.		
	2	Bring a sense of order into the team.		
Directive leadership (coordinator)	1	Maintain tight logistical control.		
	2	Compare records, reports, and so on to detect discrepancies.		
Participative leadership (facilitator)	1	Surface key differences among team members, work participatively to resolve them.		
	2	Encourage participative decision-making in the team.		
Participative leadership (mentor)	1	Show empathy and concern in dealing with team members of the team.		
	2	Treat each individual in a sensitive, caring way.		
Interpersonal Conflict	1	How much are personality conflicts evident in your team?	Jehn 1995	2
	2	How much tension is there among team members in your team?		
	3	How much do people get upset while working in your team?		
	4	How much emotional conflict is there among team members in your team?		
	5	How much friction is there among team members of your team?		
Coordination effectiveness: administrative coordination	1	A project management methodology was used on this project.	Nidumolu 1995	2
	2	Project management tools and techniques were used on this project.		
Coordination effectiveness: integrative coordination	1	The project team meets frequently.	Barki et al. 2001	2
	2	Project team members are kept informed about major decisions about the project.		
	3	Project team members actively participate in the definition of project goals and schedules.		

Table 1 Continued. Essay 3 Survey Items

Construct	#	Item	Source	Scale*
Coordination Effectiveness: expertise coordination	1	The team has a good ‘‘map” of one another’s talents and skills.	Faraj & Sproull 2000	2
	2	Team members were assigned to tasks commensurate with their task-relevant knowledge and skill.		
	3	Team members know who on the team has specialized skills and knowledge that is relevant to their work.		
	4	Team members know what task-related skills and knowledge they each possess.		
Team performance	1	The team works efficiently	Ancona & Caldwell 1992	1
	2	The team produces high quality technical innovations.		
	3	The team adheres to schedules.		
	4	The team adheres to budgets.		
	5	The team demonstrates an ability to resolve conflicts.		

*Scale Legend: [0 = Open ended] [1 = 7 pt. Likert, Strong Disagree - Strongly Agree]
[2 = 7 pt. Likert, None/Not at all - a large extent] [3 = 7 pt. Likert, Never - Several times a day]

CHAPTER 5

CONCLUSIONS

The objective of this research was to examine the role that leaders play in helping dispersed teams cope with the nature of their work. In three essays, I explored this issue using a different leadership lens and examining different aspects of team effectiveness—task structure, team development, and team structure. Overall, the results generally support the hypothesized relationships. In essay 1, I found that empowering leadership can reduce the negative impact of project risk factors on role ambiguity and role conflict, and the influence of role ambiguity on stress. In essay 2, results show that coaching behaviors are beneficial in fostering interpersonal relationships among configurationally-isolated teams when teams use an asynchronous communication technology and among configurationally-imbalanced teams using synchronous technologies. Under other conditions (i.e., configurational-isolation and synchronous technologies), coaching can be detrimental to interpersonal relationships among team members. In essay 3, I found that spatial and configurational-imbalance dispersion increase the amount of interpersonal conflict teams experience, while configurational-site dispersion reduces their coordination effectiveness. Participative leadership behaviors positively influence teams with high spatial or configurational-imbalance dispersion, by reducing the effects of dispersion on interpersonal conflict, while directive leadership behaviors are not an effective means of reducing the negative effects of dispersion. Collectively, the findings from this work make several important contributions to science and practice by integrating of the literature on dispersed teams and leadership. Few studies have jointly examined these aspects of teamwork, despite calls for such (Bell and Kozlowski 2002, Hertel et al. 2005, Martins et al. 2004, Powell et al. 2004, Webster and Staples 2006). By integrating these two literature streams, this work sheds light on the boundaries of our current leadership paradigms and expands our understanding of how dispersed teams respond to intervention by leaders. Thus, it contributes to both the information systems literature on dispersed teamwork and technology-mediated communication, as well as the management literature on team leadership.

Specifically, this research advances theory on dispersed team functioning by uncovering the roles and mechanisms through which team leaders enable teams to be effective in the face of major barriers. Prior theory has identified how task structure can pose a barrier to dispersed team effectiveness (Martins et al. 2004, Straus and McGrath 1994). The extant literature has been largely silent about how leaders in the dispersed context might enable teams to respond appropriately to specific task-related factors (Webster and Staples 2006). Thus, the current study fills this void by uncovering the behaviors and cognitions by which leaders can empower teams, and individuals within teams, to cope with these factors. Extant research has also noted the potential importance of both leader behaviors and technology characteristics in facilitating dispersed team development (Avolio 1999, Avolio et al. 2000, Hertel et al. 2005). However, the literature lacks research that explores how leaders can leverage technology to support team development processes (Avolio et al. 2000, Wakefield et al. 2008). This dissertation addresses this gap in the literature by linking coaching behaviors with the characteristics of information technologies and theorizing about these factors influence teams that are configurationally-dispersed. Finally, several reviews of the dispersed team literature note the critical impact that team structure has on team outcomes (Bell and Kozlowski 2002, Martins et al. 2004, Powell et al. 2004). Recent progress in the information systems literature has begun to refine our conceptualization of an increasingly important element of team structure that technology enables—dispersion (O'Leary and Cummings 2007). While researchers have noted potentially important theoretical differences among different forms of dispersion, there is a lack of empirical research investigating their comparative impacts (O'Leary and Cummings 2007) and the role that leaders play in facilitating collaboration across different forms of dispersion (O'Leary and Mortensen 2010, Webster and Staples 2006). The current work addresses this gap by uncovering the mechanisms by which dispersed team leaders can facilitate effective team performance in the face of different forms of geographic dispersion. Thus, this research helps to refine the dispersed team literature to encompass a broader range of nuanced factors that impact dispersed team effectiveness and provides researchers with a platform for further extending our understanding of the unique context that dispersion embodies.

REFERENCES

Avolio, B. J. 1999. *Full Leadership Development: Building the Vital Forces in Organizations*, Thousand Oaks: Sage Publications.

Avolio, B. J., Kahai, S., and Dodge, G. E. 2000. "E-Leadership: Implications for Theory, Research, and Practice," *The Leadership Quarterly* (11:4), pp. 615-668.

Bell, B. S., and Kozlowski, S. W. 2002. "A Typology of Virtual Teams: Implications for Effective Leadership," *Group & Organization Management* (27:1), pp. 14-49.

Hertel, G., Geister, S., and Konradt, U. 2005. "Managing Virtual Teams: A Review of Current Empirical Research," *Human Resource Management Review* (15:1), pp. 69-95.

Martins, L. L., Gilson, L., L., and Maynard, M. T. 2004. "Virtual Teams: What Do We Know and Where Do We Go from Here?," *Journal of Management* (30:6), pp. 805-835.

O'Leary, M. B., and Cummings, J. N. 2007. "The Spatial, Temporal, and Configurational Characteristics of Geographic Dispersion in Work Teams," *MIS Quarterly* (31:3), pp. 433-452.

O'Leary, M. B., and Mortensen, M. 2010. "Go (Con)Figure: Subgroups, Imbalance, and Isolates in Geographically Dispersed Teams," *Organization Science* (21:1), pp. 115-131.

Powell, A., Piccoli, G., and Ives, B. 2004. "Virtual Teams: A Review of Current Literature and Directions for Future Research," *DATA BASE for Advances in Information Systems* (35:1), pp. 6-36.

Straus, S. G., and McGrath, J. E. 1994. "Does the Medium Matter? The Interaction of Task Type and Technology on Group Performance and Member Reactions," *Journal of Applied Psychology* (79:1), pp. 87-97.