# TEAM MEMBER DISTANCE AND INNOVATIVE TEAM PERFORMANCE - THE INFLUENCE OF LEADERSHIP STYLES AND TEAM DYNAMICS

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#### ABSTRACT OF THE DISSERTATION

#### Team Member Distance and Innovative Team Performance - the Influence of Leadership Styles and Team Dynamics

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Geographical dispersion of team members is posited to have negative effects on team dynamics such as communication and cohesion, and in turn on team performance because both of these dynamics are important mechanisms for improving team performance. Members of teams who do not have other collocated team members to support them, that is, isolates working alone at a location, present a special case of geographical dispersion. Organizations have tried to use leadership interventions such as transformational or shared leadership to mitigate the likely negative effects of distance among team members. This study examines the influence of both transformational and shared leadership styles, on geographically dispersed teams at the team level as well as isolation at the individual level.

This study is based on a sample of 86 cross-functional innovation-focused teams from 29 companies across multiple industries. At the team level, I find that as geographical dispersion increases, higher levels of transformational leadership effects become less positive on mediating team dynamics. Because team communication and cohesion are adversely affected, geographical dispersion negatively impacts team performance. Transformational leadership also has a similar pattern of effects at the individual level in influencing team performance through team communication, but not team cohesion. At the individual level, I find that as shared leadership increases, isolates have more positive perceptions of innovative team performance, but team communication and cohesion do not appear to mediate that effect.

#### Preface

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#### **CHAPTER I: INTRODUCTION**

Advances in information and communication technologies have enabled the expansion of geographically dispersed teams (Jarvenpaa & Leidner, 1999) which provide easier access to relevant expertise (Kirkman, Rosen, Gibson, Tesluk, & PcPherson, 2002), diverse participants, and dynamic structures. Thus, these advances enable greater creativity and flexibility in responding to environmental changes and are crucial especially for innovation (Dougherty, 2001; Gibson & Gibbs, 2006). Team performance is often assumed to require collaborative interactions among interdependent members that involve individuals combining expertise and insights (Edmondson, 2002), and organizations are increasingly structuring teams in a way that brings together geographically diverse individuals (Gibson & Gibbs, 2006). However, interactions among geographically dispersed team members via computer-mediated communication (CMC), are quite different than face-to-face interactions of collocated teams (Gressgård, 2011). These differences in the relationships and interactions among dispersed team members highlight the importance of examining the influence of the geographically dispersed context on team dynamics related to collaboration and team performance.

The use of geographically dispersed teams has been increasing in the global environment of modern organizations and thus in the research literature as well (Maynard, Mathieu, Rapp, & Gilson, 2012; Staples & Zhao, 2006; Walvoord, Redden, Elliott, & Coovert, 2008). In this study, geographically dispersed or virtual teams are defined as a group of people with common goals interacting through interdependent tasks to collaborate from different office locations utilizing a variety of communication technologies (Ebrahim, Ahmed, & Taha, 2009; Lipnack & Stamps, 1997). Earlier research compared collocated and virtual teams, but more recently the focus has been shifting from a dichotomy to a continuum of virtuality (Gibson & Gibbs, 2006). Following more recent trends, geographically dispersed teams are examined here on a continuum representing the extent of dispersion. Additionally, the influence of being an isolated team member, or someone with no other team members at a particular office location, is also studied. Examination of the effects of isolation, on the individual level, and geographical dispersion, on the team level, provide a novel approach to study how team member distance influences team dynamics and performance, particularly in teams that require a high level of productive interactions, such as in innovation teams.

Geographical dispersion decreases the opportunity for face-to-face social interactions among those in different locations. Technological changes have altered how teams interact (Kirkman, Rosen, Tesluk, & Gibson, 2004), leading to much variability in the virtual team context in terms of the extent of geographical dispersion (Chudoba, Wynn, Lu, & Watson-Manheim, 2005). New forms of team structures have, in turn, influenced the effects of dispersion on team dynamics and outcomes. Because of the reduced opportunity for face-to-face interactions, geographical dispersion among team members may have a negative effect on team dynamics (e.g. Triandis, 1959; Watson, Kumar, & Michaelsen, 1993) important for team performance and as such warrant further investigation. Earlier studies have demonstrated that teams with geographically dispersed members are associated with dynamics that differ from collocated teams (e.g. Maynard et al., 2012), often creating additional challenges (McDonough, Kahnb, & Barczaka, 2001). Receiving the benefits of bringing people together from dispersed locations, often with different expertise, is dependent on the team's ability to overcome the challenges to collaboration in geographically dispersed environment (Baba, Gluesing, Ratner, & Wagner, 2004). Team members who try to collaborate across distance often experience problems related to the interpretation of communication and coordination of efforts (Maynard et al., 2012), thus highlighting issues related to team communication and cohesion.

My main focus is on the effects of having team members in different locations. Drawing on the conceptualization of Harrison and Klein, I define geographical dispersion as diversity of office locations or as variety (Harrison & Klein, 2007) rather than as disparity or separation. Harrison and Klein's conceptualization of diversity as variety is based on the Information Processing Theory suggesting that as a unit these diverse team members bring a variety of information (Harrison & Klein, 2007). However, their geographical differences may also be associated with other dissimilarities affected by the local contextual environment and may make it harder for them to establish mutual understanding, leading to increased complexity in team interactions.

Geographical dispersion has been suggested to adversely affect inner team dynamics such as team communication and cohesion (van Knippenberg & Schippers,

2007), which can undermine team performance. Decades of team related research have yielded a list of requirements that best predict success. They include a number of factors, with team communication and cohesion at the forefront (c.f. Hülsheger, Anderson, & Salgado, 2009; Pinto & Pinto, 1990). Team communication and cohesion are also some of the primary factors highlighted by years of research on teams as key predictors of success (Hülsheger et al., 2009). Both of these team dynamics have been recognized in the literature for their influence on team outcomes (Daim et al., 2012; Huang, Kahai, & Jestice, 2010; Jarvenpaa & Leidner, 1999; Yoo & Alavi, 2001) especially for innovation (Ebrahim et al., 2009).

Team communication in particular, has been shown to be a critical predictor of team performance (Ancona & Caldwell, 1992; Cohen & Bailey, 1997; Smith et al., 1994). In geographically dispersed settings, communication plays an even more important role than in traditional collocated teams due to a limitation of alternative ways in which they are able to exchange information to collaborate, with some associating the term "virtual" with the means of communication (Gierszewska, 2013). Communication among team members differs considerably across collocated and geographically dispersed teams. While quite efficient, electronically mediated communication, associated with geographically dispersed teams, is still not as effective in fostering bonds among team members as face-to-face communication (Jarvenpaa & Leidner, 1999). Reduced relationship bonds as well as differences among team members are also associated with decreased cohesion (Staples & Zhao, 2006). Lack of cohesion may make it harder for team members to work together. Due to their influence on team performance, both team communication and cohesion are examined in this study.

The teams used in this study are innovation teams and as such may differ from other team types in the degree to which their performance depends on successful interaction among diverse team members. Team dynamics such as communication and cohesion, related to knowledge exchange necessary for innovation are of particular importance. Other categories of teams, such as tactical, problem-solving, advisory, and decision-making, among others may be less reliant on team communication and cohesion to inspire success. This is due to the fact that innovation focused teams are particularly reliant on team members with diverse perspectives overcoming their differences to work collaboratively and to brainstorm new ways of addressing opportunities as well as problems. Other types of teams may deal with similar issues because it may be easier to document their actions and there are fewer unknown factors associated with their tasks. Geographical dispersion of team members and its negative effects on team communication and cohesion thus may adversely impact innovation teams, more so than other types of teams.

Geographically dispersed teams may be configured in different ways. In this study, I examine the influence of geographical dispersion on team dynamics and innovative team outcomes in two ways: one, on a continuum from collocated to dispersed, and two, when individual team members are completely isolated from the rest of the team. While there is a general consensus that teams that are geographically

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dispersed differ from the teams that interact face-to-face (e.g., Martins, Gilson, & Maynard, 2004), not all structural variations of team members' dispersion are equivalent. For example, working as part of a larger subgroup at a geographically remote location may be quite different than being isolated from all others on a team.

Isolated team members, referred to here as "isolates," are defined as team members who work at a site separate from all other members of their team (O'Leary & Mortensen, 2009). Isolated team members are an important special case of structural team differences as they may differ in their interactions with and perceptions of team dynamics, affecting their contribution to team collaboration and outcomes. Team environments with isolated members require attention as they help identify the limits of the effects that traditional team research has established. Despite growing literature examining geographically dispersed teams, few studies have directly analyzed the isolated geographical configuration (O'Leary & Mortensen, 2010).

Given the likely negative effects of geographical dispersion on team dynamics, leadership has long been established as a mechanism to address problems related to team dynamics and outcomes and is likely to be influential in geographically dispersed teams. Yet, our understanding of how various leadership styles interact with team dispersion to affect team dynamics and thus performance is underdeveloped (e.g. Hambley et al., 2007). Team leadership is thought to be particularly crucial to enhancing team functioning in dispersed teams (Connaughton & Daly, 2005) and is regarded as a key mechanism for minimizing issues that might arise because of communication and cohesion difficulties in virtual teams (Bell & Kozlowski, 2002; Malhotra, Majchrzak, & Rosen, 2007; Martins et al., 2004; Zigurs, 2003). Some styles of leadership may be more relevant to geographically dispersed teams than others (Hill, 2005). It has been suggested that geographically dispersed teams may require additional attention from team leaders to mitigate or make up for the gaps that arise in group dynamics. There has also been interest in how geographical dispersion may interact with different types of leadership in influencing team performance (Howell & Hall-Merenda, 1999; Howell, Neufeld, & Avolio, 2005; Purvanova & Bono, 2009).

The type of leadership style that has received most attention in this regard is transformational leadership, which is defined as a style that raises expectations for followers' performance and seeks to transform them to higher levels of aspiration. Most studies of transformational leadership expect it to positively influence team dynamics and performance in collocated teams (Bass, 1985a, 1999). In general, transformational leadership is perceived as a positive influence on team performance (Dionne, Yammarino, Atwater, & Spangler, 2004) by creating an environment that fosters change (Oke, Munshi, & Walumbwa, 2009). Furthermore, transformational leadership on the one hand facilitates team dynamics that affect outcomes (Pearce & Sims, 2002) and on the other hand is expected to mitigate some of the negative aspects of team interaction. Earlier research suggests that while transformational leadership is influential in collocated teams, its influence may be bounded by contextual factors such that it is not as influential in geographically dispersed settings (Howell & Hall-Merenda, 1999; Howell et al., 2005). Transformational leaders influence followers based on personalized, close and continuous contact with them (Bass, 1985;House, Spangler, & Woycke, 1991; Podaskoff, MacKenzie, Moorman, & Fetter, 1990), which leaders may find particularly hard to accomplish in more dispersed teams. In fact, one of the major disadvantages of dispersed teams is "the lack of physical interaction with its associated verbal and nonverbal cues" (Kirkman et al., 2002: 72).

Transformational leadership is a form of leadership where the team's hierarchical leader(s) demonstrate a certain set of behaviors. In more recent research, shared leadership, a horizontal form of mutual team member leadership, has been gaining attention as well (Pearce, Conger, & Locke, 2007). Shared leadership is defined as a leadership style in which responsibility is dispersed among team members (Carson, Tesluk, & Marrone, 2007). Shared leadership enhances team dynamics and effectiveness (Pearce & Sims, 2002) and involves interactions among team members that go above and beyond good communication and include the type of behaviors that are related to action taking, fostering discussion, and seeking a broad range of perspectives to address problems. Shared leadership appears to be particularly important in affecting geographically dispersed teams (Hill, 2005), because geographically dispersed teams may put more responsibility on team members to facilitate positive outcomes. Since a transformational leader's effectiveness relies in part on a relationship that is based on non-verbal communication (Shamir, House, & Arthur, 1993), these leaders' effectiveness may be especially affected by lack of the non-verbal cues coupled with the lack of social interactions to make up for it. While also diminished due to a lack in cues, peer-to-peer team member interactions, conceptualized as part of shared leadership, may be more

frequent and open, than transformational leadership in virtual teams. While transformational leadership may be thought to have the potential to positively influence teams, lack of a strong personal relationship between a hierarchical team leader in the context of geographically dispersed members may prevent the transformational leader from having the necessary type of influence associated with the effects of this leadership style in collocated teams.

Research related to the effects of both transformational and shared leadership on team dynamics and performance in innovation teams in the context of geographical dispersion is still evolving. The majority of studies of dispersed teams have examined more formal or hierarchical leadership (Connaughton & Daly, 2005) including transformational leadership. Shared leadership has been gaining more recent attention with some research comparing the effects of transformational and shared leadership styles within the context of team dispersion (e.g., Hoch & Kozlowski, 2012). However, most research on these issues has been experimental with very few field studies (Hoch & Kozlowski, 2012), particularly those that examine the influence of leadership in differently configured geographically dispersed teams on team performance and through key team dynamics.

This dissertation contributes to the literature by examining how team communication and cohesion may mediate the effects of geographical dispersion among team members on team performance, and how leadership styles moderate the relationship of the effect of dispersion on these team dynamics. I examine the effects of geographical dispersion by looking at the effects of dispersion under two conditions, as a continuous variable and then in the specialized case where a team member is isolated. This dissertation follows earlier studies that have examined factors which influence teams using the inputs-mediators-outputs (IMO) framework (e.g. Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Mathieu, Maynard, Rapp, & Gilson, 2008). I develop and test a model of the effects of geographical dispersion on team performance using two related analyses. First, I explore how on the team level geographical dispersion among team members affects team performance when moderated by transformational and shared leadership styles and mediated by team communication and cohesion. Second, on the individual level, I explore how isolation from the rest of the team affects individual team members' perceptions of team dynamics and in turn, the perceptions of innovative team performance, taking into consideration the moderating influence of transformational and shared leadership and mediation of the perceptions of team communication and cohesion.

This dissertation is based on a field study of real teams working toward innovation with variation both in team structure and in styles of leadership. Given obstacles presented by geographical dispersion, factors that may influence these effects in teams are of interest both for theoretical and practical purposes. This study creates a research agenda for future research on geographically dispersed teams, especially those with interdependent tasks such as those focused on innovation.

#### **CHAPTER II: THEORETICAL BACKGROUND**

#### **Geographical Dispersion: Effect on Team Dynamics and Performance**

The past few decades have witnessed a steadily growing reliance on geographically dispersed teams (Kratzer, Leenders, & Van Engelen, 2006). Organizations are using teams with geographically dispersed members in order to address global market forces, access broader expertise, reduce travel costs, provide convenience to team members, flexibility, and greater responsiveness (Montoya, Massey, Hung, & Crisp, 2009; Powell, Piccoli, & Ives, 2004; Townsend, Demarie, & Hendrickson, 1998). Inclusion of team members from multiple locations has become crucial for organizational competitive advantage and is an important work structure in modern organizations (Gressgård, 2011). Removing the constraints associated with being geographically collocated and having broader access to expertise is especially important for teams focused on knowledge intensive work and tasks such as innovation (Gibson & Gibbs, 2006). It is one of the reasons for the prevalence of virtual team structures in modern organizations.

As geographically dispersed teams become more common, research related to virtual team context has also increased and has been studied across various disciplines such as information technology (Chudoba, Wynn, Lu, & Watson-Manheim, 2005; Powell, Piccoli, & Ives, 2004), management (Gibson & Gibbs, 2006; Kirkman et al., 2004; Polzer, Crisp, Jarvenpaa, & Kim, 2006; Walvoord et al., 2008), and communication (Wang, Walther, & Hancock, 2009). With more research related to geographically dispersed teams, the number of definitions has also increased, creating some controversy regarding their meaning (Chudoba et al., 2005). In this study, dispersed teams represent dispersed and interdependent team members working towards a common set of goals.

A number of studies have highlighted important differences in team dynamics between collocated and geographically dispersed teams (e.g. Maynard, Mathieu, Rapp, & Gilson, 2012). Dispersed teams may enjoy a range of benefits such as access to expertise, enhanced quality of decisions, and a capacity to attract talent (Martins et al., 2004). However, a review of the literature suggests that teams characterized by geographical dispersion have unique challenges associated with management, technology, and social relationships among others (Chattopadhyay, George, & Shulman, 2008; McDonough et al., 2001; Powell et al., 2004). While dispersed teams may face some of the same issues as traditional collocated teams, dispersion exacerbates any such problems and thus makes them harder to address (Kurtzberg, 2014).

There are numerous reasons why geographically dispersed teams may face more challenges in achieving levels of collaboration usually developed in collocated teams. First, working across multiple locations creates additional strains (Gibbs, 2009b; Mannix & Neale, 2005), which may be particularly complex and difficult to manage (Hinds & Mortensen, 2005). Second, although the dispersed environment promises greater knowledge of the local environment or situational knowledge, dispersion may also contribute to problems related to combining knowledge from different sources, and may

also lead to misinterpretations, and situational "stickiness" of knowledge, since knowledge cannot be easily transferred from one context to the next (Sole & Edmondson, 2002). Furthermore, it is difficult for dispersed teams to maintain the kind of common knowledge that is shared among members of collocated teams. When team members interact across distance, there may be failure to communicate sufficient contextual information and difficulties in accessing and interpreting information (Cramton, 2001). Third, dispersed context may provide additional barriers to collaborations due to lack of a social platform for interactions and the ensuing weakened social ties (Gressgård, 2011). Specifically, virtual teams seem to have more of a task related focus than a social one, compared to collocated teams (Powell et al., 2004). Distance may also reduce the extent to which members trust each other (Ebrahim et al., 2009), leading to the creation of additional boundaries based on their location (Lau & Murnighan, 1998; Polzer et al., 2006). Finally, distance can result in increased tension between members in different offices (Cramton & Hinds, 2005) and lead to decreased team cohesion (O'Leary & Mortensen, 2009).

There is some divergence in the literature about the effects of geographical dispersion on team dynamics and outcomes. On the one hand, virtual teams may offer a variety of perspectives by providing access to expertise unrestricted by location (Maloney & Zellmer-Bruhn, 2006; Martins, Shalley, & Gilson, 2009; Zakaria, Amelinckx, & Wilemon, 2004), which may be beneficial, for example, for innovation (Post, De Lia, DiTomaso, Tirpak, & Borwankar, 2009). On the other hand, dispersed environments make it harder to attain a shared understanding due to differences in norms (Gibson,

Gibbs, Stanko, Tesluk, & Cohen, 2011), making it harder to benefit from the variety of perspectives. Divergent perspectives are associated with the inherent challenge of fostering understanding among team members (Holmstrom, Conchúir, Ågerfalk, & Fitzgerald, 2006) and increased likelihood of problems in intra team interactions (Mannix & Neale, 2005). Furthermore, differences among members of a social unit are associated with lower levels of attraction, negatively affecting social integration, and diminishing communication (Tsui, Egan, & O'Reilly, 1992).

Differences in office locations may also be associated with differences in thought worlds among team members, which have been suggested to potentially inhibit team members' ability to benefit from varied expertise (Dougherty, 1992), and thus can negatively influence team's performance. Team member differences may lead to inhibited communication and cohesion in a team (Bunderson & Sutcliffe, 2002), particularly affecting dispersed teams due to the weaker connections that may be more likely in the context of geographical dispersion.

Variability of effects on team interactions and norms depend greatly on the extent of dispersion. Since teams vary quite a bit in the extent of dispersion, it is important to evaluate it on a continuum as well as evaluating special cases such as team members working in isolation.

#### **Team Dispersion and Communication**

In their literature review of virtual teams, Powell et al. (2004) suggest that team communication is a crucial mediator in predicting team performance in geographically dispersed teams. They argue that "at the core of any virtual team process is communication" (Powell et al., 2004: 11). Communication among team members is defined in the literature in many different and broad ways from a team process of transmitting information (Pinto & Pinto, 1990) and knowledge sharing, to an open and supportive climate surrounding communication processes, which is especially important for positively influencing team performance of innovation teams in virtual settings (Gibson & Gibbs, 2006). In this study, team communication is defined as a multidimensional concept capturing the nature and extent of team communication (Markulis, Jassowalia, & Sashittal, 2006), team member participation and input (Carson, Tesluk, Marrone, & Carson, 2007), expertise coordination (Faraj & Sproull, 2000), as well as exchanges that advance knowledge sharing and mutual learning (Jassawalla & Sashittal, 2002).

Team communication is especially important for innovative outcomes (Brown & Eisenhardt, 1995) and team performance in general (Ancona & Caldwell, 1992; Cohen & Bailey, 1997; Smith et al., 1994). It has also been suggested to be an important mediator in predicting team outcomes, particularly among geographically dispersed teams (Powell et al. 2004). Earlier research suggested that electronically mediated communication, associated with dispersed teams, is less rich, "often lead[ing] to feelings of isolation and de-individuation"(Connaughton & Daly, 2004, p. vii), depersonalizing interactions (Wang et al., 2009), and may be particularly complex and challenging (Cramton, 2001a), creating barriers to cooperation (Naquin, Kurtzberg, & Belkin, 2008), and effective knowledge exchange (Baba et al., 2004), which are key for innovation in virtual teams

(Gressgård, 2011). If subgroups develop in geographically dispersed teams, there may be a further exacerbation of communication issues (Cramton & Hinds, 2005; Levina & Vaast, 2008).

Geographical dispersion can "greatly interfere with the communication process" (Stahl, Maznevski, Voigt, & Jonsen, 2009: p. 4). Lack of face-to-face interaction coupled with geographical barriers stemming from dispersion of team members, can lead to negative effects on different aspects of communication (Cordery & Soo, 2008; Gibson & Gibbs, 2006; Kiesler & Cummings, 2002; Kraut, Fussell, Brennan, & Siege, 1990; Leenders, van Engelen, & Kratzer, 2003; Van den Bulte & Moenaert, 1998). First, communication in the context of geographical dispersion has been suggested to be associated with decreased cooperation in teams (Naquin, Kurtzberg, & Belkin, 2008), which is likely to negatively influence team dynamics and performance. Furthermore, research suggests that geographical dispersion may make it harder to foster trust among team members (Jarvenpaa & Leidner, 1999), and lead to slower exchanges due to the use of technology that limits the ability to share information non-verbally (Straus, 1997; Straus & McGrath, 1994; Walther & Burgoon, 1992). Geographical dispersion may also decrease the probability of chance meetings and unplanned knowledge sharing (Van den Bulte & Moenaert, 1998), which can also negatively affect team dynamics. Second, having common ground is integral for effective communication, making it particularly complex for those not working face-to-face (Cramton, 2001b), thus reducing communication of expertise across distance (Treem & Leonardi, 2012). Finally, globally dispersed teams may be particularly affected by challenges associated with collaboration

across different contextual environments, for example, in the use of electronically mediated communication rather than face-to-face interactions (Gibbs, 2009a).

In traditional team research, collocated teams are also depicted to be highly reliant on effective communication for successful outcomes (e.g. Ancona & Caldwell, 1992). Communication characterized by high frequency and high openness in the exchange of information is suggested to be a key predictor of high quality information exchange (Hoegl & Gemuenden, 2001). Furthermore, open and prompt communication appears to improve team performance (Dionne et al., 2004). Even in sports teams, which are collocated by definition, intra-team communication is argued to be an important mediator, influencing performance (Smith, Arthur, Hardy, Callow, & Williams, 2013).

May and Carter (2001) show that among geographically dispersed engineers, enhanced communication leads to improved quality, reduced costs, and faster turnaround times for new products. Yet, fostering openness and effective communication in the context of geographical dispersion, regardless of the advanced state of technology, is challenging. Effective communication is particularly important for the performance of dispersed teams because it is harder for such teams to rely on non-verbal cues. The lack of such cues in geographically dispersed teams (which result in heavy reliance on computer-mediated communication) has been suggested to potentially lead to psychological distance (Jarvenpaa & Leidner, 1999; O'Hara-Devereaux & Johansen, 1996). Dispersed employees often lack opportunities to informally discuss both work and non-work related topics, negatively influencing levels of information exchange. Both formal and informal communication play a role in the effectiveness of collaborative interactions that are associated with higher levels of performance (Hsu, Shih, Chiang, & Liu, 2012).

#### **Team Dispersion and Cohesion**

It is important to examine cohesion in the context of geographically dispersed teams because team cohesion may have different effects in collocated and geographically dispersed teams (MacDonnell, O'Neill, Kline, & Hambley, 2009). Therefore, differences associated with decreased cohesion are suggested to be one of the crucial challenges for virtual teams (Kirkman et al., 2002). Team cohesion is important for team performance as well (Miron-Spektor, Erez, & Haveh, 2011). Cohesion is defined as an integrated construct focused on emotional relationships among team members (Evans & Jarvis, 1980). Specifically, cohesion is examined here from the perspective of the feelings and enthusiasm members have about belonging to the team and the connection they have with others on the team. An individual's identification with and attraction to the team fosters cohesion, while a lack of face-to-face collaboration associated with a geographically dispersed team context is suggested to inhibit it (Cramton et al., 2007; Wang et al., 2009). Furthermore, cohesion tends to grow out of social relationships, which may be difficult to foster in the context of virtual teams (Powell et al., 2004).

A number of factors influence team cohesion in the context of geographically dispersed teams. First, working with colleagues who may be embedded in a variety of local contexts due to geographical dispersion of a team, has been suggested to lead to lower levels of mutual understanding (Gibson & Gibbs, 2006), negatively influencing cohesion. Second, being geographically dispersed may make it harder for individual team members to establish the type of awareness and understanding of each other that would facilitate cohesion among them, despite advanced levels of technology, which has the potential to connect team members. Furthermore, cohesion has been linked to increased inclusiveness and trust (Powell et al., 2004), but these may be harder to establish among geographically dispersed team members. Differences among geographically dispersed teams working on knowledge intensive tasks such as innovation are quite prevalent and may intensify lack of understanding, leading to lower cohesion in a team (Horwitz & Horwitz, 2007). Differences in geographical location may separate members, leading to lower cohesion (van Knippenberg & Schippers, 2007). Compounding the effects of multiple types of team member differences associated with multiple geographical locations, may make it particularly complex for virtual teams to have high levels of cohesion. Geographically dispersed teams have frequently been shown to be diverse across multiple categories (Cordery & Soo, 2008; Gibbs, 2009b; Griffith et al., 2003; Martins et al., 2009), making it harder to foster cohesion.

In collocated teams, leaders may have the ability to facilitate relationship building through increased socialization and have been shown to have a generally positive influence on cohesion (Mumford & Licuanan, 2004). However, established relationships in traditional collocated teams may not work in the same ways in geographically dispersed team environment.

#### **Team Dispersion and Leadership**

The importance of leadership in influencing team dynamics has been highlighted in a number of studies (De Lia, 2011; Gumusluoglu & Ilsev, 2009; Mumford & Licuanan, 2004; Mumford, 2003; Oke et al., 2009). Over the years, many studies have examined the effects of various leadership styles on team dynamics and team outcomes across different environments (see Avolio, Walumbwa, & Weber, 2009 for a review). Because leadership has an important role in influencing how differences in experiences or interests among team members are understood, appreciated, and leveraged (Malhotra, Majchrzak, & Rosen, 2007), it is important to examine it across different contextual settings and team structures.

As team structures that include members scattered around different geographical locations gained prevalence and introduced a range of potential new issues for leaders to address, research in the area of "distanced leadership" has also gained momentum (Connaughton & Daly, 2004, p. 50). Team leaders of geographically dispersed teams are recognized to play an important role in addressing a variety of issues made necessary by the dispersion of team members to different locations (Bell & Kozlowski, 2002; Malhotra et al., 2007; Martins et al., 2004). However, leadership of geographically dispersed teams is complex, so the team leadership theories may not easily translate to the virtual team context (Carte, Chidambaram, & Becker, 2006). For example, leaders of

geographically dispersed teams must address complications related to communication and general teamwork (Connaughton & Daly, 2005) stemming from difficulties in fostering interpersonal relationships with and among out-of-sight individuals (Kurland & Cooper, 2002).

Maynard et al. (2012) suggested that geographically dispersed team members often experience difficulties collaborating, because of time lost in trying to interpret communications and coordinate efforts. Social presence theory (Short, Williams, & Christie, 1976) proposes that social presence is essential even for electronically mediated communication (Connaughton & Daly, 2004: 159), suggesting that not being present at the same location may limit the ability to develop close relationships, and thus effective communication. Leaders may therefore need to increase their efforts with dispersed members if they are to have the same positive effects as with collocated teams (Bell & Kozlowski, 2002; Hoch & Kozlowski, 2012). It may be difficult for leaders to find the extra time necessary to work with team members in different locations. This may be increasingly complex as geographical dispersion of a team increases.

#### **Team Dispersion and Transformational Leadership**

Transformational leadership has been associated with positive effects on team performance, especially for teams engaged in innovation. Transformational leadership has received a great deal of attention from the research community for its claimed effectiveness, as is reflected by a number of studies published over the years, and summarized in many reviews (Bass & Avolio, 1994; Bass, 1999; Braun, Peus, Weisweiler, & Frey, 2013; Dionne et al., 2004; Howell & Avolio, 1993; G. Wang, Oh, Courtright, & Colbert, 2011). Transformational leadership is a leadership style that influences team members by elevating followers' goals with a strong personal dedication to inspire followers to go above expectations (Dvir, Eden, Avolio, & Shamir, 2002). Earlier teams research suggests a positive link between transformational leadership, the development of team cohesion (King & Anderson, 1990), improvement in team communication (Dionne et al., 2004), and in turn team performance (Mumford & Licuanan, 2004). However, some have suggested that geographical proximity may be a precondition for the effectiveness of transformational leaders (Andressen et al., 2011).

The effectiveness of transformational leadership has been suggested to be contingent on the context or operating conditions of the team (Bass, Avolio, Jung, & Berson, 2003; Pawar & Eastman, 1997) and to vary based on a number of factors ranging from the type of managerial role (Keegan & Hartog, 2004) to the extent of reliance on computer mediated technology (Purvanova & Bono, 2009) to the extent of ties (Howell & Hall-Merenda, 1999) with mixed results across these conditions. Furthermore, transformational leadership has also been shown to affect team dynamics differently depending on the geographical dispersion of team members compared to traditional faceto-face teams, suggesting that transformational leadership may have a weaker influence in virtual teams (Hambley et al., 2007; Howell & Hall-Merenda, 1999; Howell et al., 2005).

Transformational leadership has been originally conceptualized as a leadership style that is based on a trustworthy role model who delineates future goals (Bass, 1985b; Burns, 1978). However, it has been suggested that some transformational leaders are not as authentic in which case their leadership may not have the same positive effects expected of transformational leaders (Bass & Steidlmeier, 1999). Bass & Steidlmeier (1999) further claim that team members can embrace or reject these so-called transformational leaders, depending on their relationship with them. However, regardless of context, leadership styles that are not effective at instilling confidence may have difficulties exerting positive effects on team dynamics and outcomes (Jarvenpaa, Knoll, & Leidner, 1998; Jarvenpaa & Leidner, 1999). Because close types of relationships are especially hard to foster in dispersed teams (Kirkman et al., 2002), it may be particularly difficult for a transformational leader to facilitate the type of relationship with dispersed team members that would lead to the same level of influence the leaders may have with collocated members. Transformational leaders may find it harder to affect geographically dispersed team members in the same ways that they affect collocated members because of the ways geographical distance alters the relationship between leaders and followers. Specifically, geographical distance between a leader and followers diminishes the leader's influence, affecting the quality of their relationship (Andressen, Konradt, & Neck, 2011).

In studying leadership over distance, Connaughton and Daly (2005) have suggested that one of the key dimensions of leadership is building and maintaining relationships with followers via not only formal, but also informal communication. These types of leader-member relationships are harder to foster across distance (Connaughton & Daly, 2005), limiting the extent of a leader's influence. Transformational leaders reflect values influenced by a number of different factors (Bass, 1985a), which may vary across geographical locations, making it harder for someone from one location (i.e. the leader) to influence team members at other locations.

Geographically dispersed teams literature suggests that dispersed teams are more susceptible to communication breakdowns and lack of cohesive processes (Ebrahim, Ahmed, & Taha, 2010). The implication is that it may be harder for any hierarchical leader, including a transformational one, to be as effective across geographical distance, in an environment that may lack interpersonal connections between the leader and followers and may have insufficient opportunity for open interpersonal communication lines compared with leaders of collocated teams.

## Hypotheses Regarding Geographical Dispersion, Transformational Leadership, Team Dynamics, and Team Performance

1A: Transformational leadership will moderate the relationship between geographical dispersion and team cohesion, such that as geographical dispersion increases, the influence of transformational leadership will become less positive

1B: Team cohesion mediates the interactive effects of geographical dispersion and transformational leadership on team performance.

1C: Transformational leadership will moderate the relationship between geographical dispersion and team communication, such that as geographical dispersion increases, the influence of transformational leadership will become less positive.

1D: Team communication mediates the interactive effects of geographical dispersion and transformational leadership on team performance.

#### **Team Dispersion and Shared Leadership**

Shared leadership has been suggested to be particularly important in affecting geographically dispersed teams (Hill, 2005). In this study, I extend theories of shared leadership (Lichtenstein & Plowman, 2009; Lichtenstein & Uhl-bien, 2006; Plowman et al., 2007; Uhl-Bien, Marion, & McKelvey, 2007; DeLia, 2011) by evaluating the role of leadership behaviors such as the extent to which team members foster interaction and open engagement within and outside the team, engage members of the team in joint problem solving, seek a broad range of perspectives from others on the team, and help the team stay informed about changes in the environment. Shared leadership may have positive effects on team dynamics and performance by not only increasing engagement within the team, but also interacting with others outside the team, which has been suggested to be important for team performance, particularly for innovation teams (Ancona & Caldwell, 1992). Physical separation from other team members or team leaders may require a greater dispersion of the leadership functions among team members (Shuffler, Wiese, Salas, & Burke, 2010). Shared leadership in geographically dispersed teams has been suggested to help minimize differences among team members based on

location and have a positive influence on dispersed team dynamics (Gibbs & Boyraz, 2014).

In their study, Majchrzak and colleagues noted that successful innovation teams placed more emphasis on the informal development of shared understandings and sharing information among individual team members, suggesting that formal communication channels in virtual innovation teams do not work as well as informal ones (Majchrzak, Rice, King, Malhotra, & Sulin, 2000). The increased levels of interactions related to seeking a broad range of perspectives, associated with shared leadership, may result in increased understanding and closer relationships, leading to improved team dynamics.

Empirical studies analyzing official and shared leadership's effect on team performance, particularly across different team environments, is a more recent development in the literature (Avolio et al., 2009; Hoch & Kozlowski, 2012). Pearce and Sims (2002) have shown that while both hierarchical and shared leadership improve team effectiveness, shared leadership is a stronger predictor and more appropriate for modern organizational structures. These authors concluded that shared leadership behaviors will have positive effects on members' perceptions of their team's success as well as encourage greater engagement and higher performance. Research has also demonstrated that a more inclusive climate, which is associated with members reaching out to each other, may help mitigate the negative effects associated with working from a remote location, thus creating opportunities to transcend distance to exchange information and improve team dynamics (Cramton & Hinds, 2005; Gibson et al., 2011; Hinds & Bailey, 2003).

With advances and widespread availability of collaboration technology, modern organizations are moving away from hierarchical leadership and towards more distributed leadership, which may be more effective in the context of virtual team structure (Nohria & Berkley, 1994). Although transformational leadership may be more effective in centralized and more traditional team structures, shared leadership may be more suited for teams with distributed members. Recent research demonstrates that teams with greater autonomy given to team members may fare better in geographically dispersed environments and highlights the benefits of dispersion of responsibility among team members (Gibson et al., 2011).

# Hypotheses Regarding Geographical Dispersion, Shared Leadership, Team Dynamics, and Team Performance

2A: Shared leadership will moderate the relationship between geographical dispersion and team cohesion, such that as geographical dispersion increases, the influence of shared leadership will become more positive.

2B: Team cohesion mediates the interactive effects of geographical dispersion and shared leadership on team performance.

2C: Shared leadership will moderate the relationship between geographical dispersion and team communication, such that as geographical dispersion increases, the influence of shared leadership will become more positive.

2D: Team communication mediates the interactive effects of geographical dispersion and shared leadership on team performance.

#### Geographical Isolation and Its Effect on Team Dynamics and Performance

Geographically dispersed teams come in a variety of configurations, including teams with isolates, who are defined here as geographically dispersed team members separated from all others on their team. O'Leary & Mortensen (2010) highlighted the importance of examining different team configurations based on geographical location, and in particular team member isolation. Geographic isolation may reduce other team members' awareness of the isolate (Grinter, Herbsleb, & Perry, 1999). Being isolated may influence team engagement and effectiveness differently than for those team members who work at the same location as at least some of the other members of their team, resulting in isolates possibly having a distinctly different experience than other members of a geographically dispersed team. Earlier research demonstrated that geographic isolation influences R&D team members' perceptions of the team (Grinter, Herbsleb, & Perry, 1999; O'Leary & Mortensen, 2009), making them more likely to feel disconnected and interfering with their feelings of belonging to their organizational unit. These feelings may be associated with negative effects on team dynamics (Bartel, Wrzesniewski, & Wiesenfeld, 2011).

Earlier research has studied structural diversity based on geographical location differences alongside demographic differences, particularly as it relates to innovativeness (Cummings, 2004). Geographically dispersed team members' sense of membership in particular clusters, based on their geographical location, is likely to affect team dynamics that in turn influence performance in these teams. This framework has been suggested to be relevant to studying the effects of various dispersion levels in a team as well as isolated team members, for whom being away from the other team mates and the resulting lack of close relationships may be especially salient. For example, Staples & Zhao (2006) utilized the Social Identity Theory to examine virtual team member interactions, suggesting that team member differences may lead to negative team dynamics and reduced performance. For example, members of the team at other locations may be perceived as different or distant and thus are evaluated less favorably resulting in decreased quality of communications and cooperation (Hinds & Mortensen, 2005), potentially leading to lower levels of cohesion and in turn negatively influencing team performance. Physical isolation from other team members may exacerbate team dynamics such as communication and cohesion by introducing additional barriers related to uncertainty among isolated members about how they are viewed by others on the team, coupled with the hardship that isolated members may experience in feeling close to the team and identifying with it (Bartel et al., 2011).

A number of issues have been suggested by earlier research to be associated with being isolated, which may in turn negatively influence communication and cohesion (Cramton, 2001a) and through them the perceptions of innovative team performance.
First, isolation may interfere with an individual's ability to feel equal to others on the team, impacting their participation in typical interactions with their colleagues (Bartel et al., 2011). Second, team members may feel less accountable towards remote colleagues (Gibson et al., 2011). Third, it may have a negative effect on team interactions (Armstrong & Cole, 2002) and reduce trust (Polzer et al., 2006).

Distance from teammates and the associated lack of a close connection with the rest of the team may have a negative influence on isolates' levels of communication and cohesion with fellow team members, which may hinder levels of unique expertise they could have contributed to improve team performance and which is suggested to be particularly valuable (Cummings, 2004). Spontaneous communication, or informal and unplanned interactions among team members, has been shown to mitigate some of the negative effects of team dispersion both directly as well as indirectly (Hinds & Mortensen, 2005). However, due to lack of opportunities to interact "by the water cooler," it may be harder for isolated team members to engage in spontaneous communication with teammates, which may exacerbate the negative effects of team dispersion (Avolio & Bass, 1995). Lack of a strong connection with the rest of the team is associated with more negative evaluation of others' behavior and can lead to a competitive rather than a cooperative stance towards team mates (Hinds & Mortensen, 2005), which may have a negative effect on cohesion and in turn team performance.

Team work among geographically dispersed team members influences how team members make inferences about causes of dynamics, which may in turn influence the levels of cohesion and leader-member relationships (Cramton, Orvis, & Wilson, 2007). Cramton and colleagues suggested that lack of face-to-face communication associated with a dispersed context may have a negative influence on the formation and development of interpersonal relationships, resulting in decreased connection to the team, which may be particularly relevant for isolated team members in influencing their perceptions.

As isolates appear to have a qualitatively different experience in dealing with their team members (O'Leary & Mortensen, 2009), it is important to consider their perceptions of team dynamics to better understand how their views differ from others and thus address these differences to ensure their full engagement and contribution to team's goals and to prevent them from disengaging. Individual team members' negative perceptions of their team are likely to influence the extent to which they contribute. Diminished relationships among team members due to geographical isolation, may be one of the biggest challenges in fostering collaboration related dynamics such as communication and cohesion with these members. However, some interventions focused on inclusion of isolates can help attenuate the negative outcomes of isolation (Kirkman et al., 2002), suggesting the importance of a better understanding of what specifically influences isolate experiences and how these concerns could be addressed.

Shared leadership, whereby members exhibit leadership like behaviors associated with taking a more active role in reaching out to others, sharing information, and being more inclusive of others, may be especially important to isolates. Research on isolates has suggested that one of the challenges is the notable decrease in the awareness of other team members (O'Leary & Cummings, 2007). This suggests that an increase in the engagement associated with team members' shared leadership behavior may shift isolates' perceptions of the team. Perceptions of greater involvement by fellow teammates, as part of shared leadership behavior, may enrich an isolate's experience on the team and thus positively influence his or her perceptions of team dynamics and performance.

In the context of isolation, receiving attention from a hierarchical leader, even a transformational leader, may be associated with ambiguity. Due to the vertical nature of a hierarchical leader, there may be a greater gap from them to the non-collocated team member. However, greater inclusion by fellow team members, associated with shared leadership, may influence an isolate's perceptions of their team for a number of reasons. Team members who are peers may share more common ground, a characteristic that has been associated with more effective communication and is especially key in the context of geographical dispersion (Olson & Olson, 2000). Closer relationships are more likely to be associated with improved team communication and cohesion. Shared leadership has been suggested to enhance the visibility of team members to each other (Muethel & Hoegl, 2010), which may facilitate the inclusion of isolates. Involved and considerate behavior from fellow teammates may be particularly important to isolated team members, who may be more appreciative of being included given their isolation from all other team members. The sum of parts in this case may be greater than the whole: individual leaders may not be able to devote as much time as the sum of the interactions an isolated team

member might receive from fellow peers. Yet, research of transformational leadership in geographical dispersed environment suggests a greater effort is required for such a leader to exert the same influence as in collocated teams, which may be difficult to implement given the usual constraints on a leader's time. Therefore, shared leadership may have a more positive influence in teams characterized by high geographical dispersion as well as to isolated team members when compared to collocated or teams with low dispersion.

#### Hypotheses Regarding Isolation of Individual Team Members

3A: Isolation will negatively influence perceptions of innovative team performance.

3B: Perception of a leader's transformational leadership style will moderate the effect of isolation on perceptions of innovative team performance, such that the perception of the leader's transformational leadership style will be less positive for those who are isolated compared to those who are not isolated on the team.

3C: Perception of shared leadership will moderate the effect of isolation on perceptions of innovative team performance, such that the perception of shared leadership will have a more positive effect for those who are isolated compared to those who are not isolated on the team.

3D: Individual perceptions of team cohesion level mediate the interactive effects of team member's isolation and transformational leadership on innovative team performance.

3E: Individual perceptions of team communication level mediate the interactive effects of team member's isolation and transformational leadership on innovative team performance.

3F: Individual perceptions of team cohesion level mediate the interactive effects of team member's isolation and shared leadership on innovative team performance.

3G: Individual perceptions of team communication level mediate the interactive effects of team member's isolation and shared leadership on innovative team performance.

## **CHAPTER III: RESEARCH METHODS**

#### **Research Design**

This dissertation is based on a field study of innovation teams across companies from different industries. The hypothesized relationships among team members' dispersion, team dynamics, leadership, and team performance were tested by analyzing data from a dataset of 86 cross-functional innovation teams from 29 companies. Most of the participants represent employees from member companies of the Industrial Research Institute (IRI), representing over 200 industrial firms. IRI is a major professional association of industrial research and development (R&D) executives, who were invited to provide feedback as part of a study examining factors influencing team performance by volunteering innovation teams to take part in an online survey. Criteria for participation were that teams were cross-functional, worked together for a minimum of three months, and had to either still be working together or had been disbanded less than 60 days prior to the start of the study. The teams in this sample are innovation focused teams with variability across levels of geographical dispersion, team size, and tenure, making it particularly well suited for this study because of the importance of information sharing, need for collaboration, and complexity of the task.

Each team member was asked to fill out a 30-minute online survey. Perceptions of team performance were collected from team members, leaders, and stakeholders. Stakeholders are defined as people outside the team who have an interest and are sufficiently involved with the team in question to enable them to provide a fair evaluation of the team's performance. Stakeholders were from senior ranks in their organizations. Stakeholders were chosen by each of the respective companies based on the criteria described above. This design was used to avoid methodological problems related to having a single source of data (Lindell & Whitney, 2001). The stakeholder survey was administered concurrently to the team member survey. Stakeholders' response rate was 93% with 142 stakeholders in the study. The surveys were confidential. All team members were invited to participate. Responses were received from 838 individuals, in 86 teams, representing a 92% response rate. Office location, used for geographical dispersion and isolation measures, was only available for 83 of these teams. For three teams there were no stakeholder evaluations available, reducing the number of teams in the sample to 80.

Team level variables were created by averaging scale variable scores of the individual team members. To test inter-rater agreement and whether aggregation was appropriate in this sample with variability in team sizes, the  $r_{wg}$  and the AD (average deviation) calculations were utilized (LeBreton & Senter, 2007). The  $r_{wg}$  and the AD calculations are recommended to make sure that there is a general agreement among team members in rating a particular measure. These indices were calculated for each team level aggregated variable. Those that did not meet the conditions specified by earlier research (Dunlap, Burke, & Smith-Crowe, 2003) were further analyzed. None of the teams failed the aggregation tests across all of the variables. Therefore, due to the relatively small sample size, high average agreement, and lower levels of agreement only among teams with very few team members, no teams were excluded from the analysis. Table 1 includes the results of the  $r_{wg}$  and the AD calculations, demonstrating acceptable average levels of inter-rater agreement.

#### Insert Table 1 Here

The average size of the team was about 10 people with a standard deviation of 6.39. The team size ranged from 4 to 45. The sample had 42 teams that included an isolate. In total there were 72 isolated team members. Twenty teams were fully collocated and sixty-three teams had geographically dispersed members.

#### Measures

This study examines individual and team level variables based on team member, team leader, and stakeholder responses. Survey responses ranged from 1= "strongly

disagree" to 7= "strongly agree", unless indicated otherwise. Independent variables are discussed first, followed by dependent variables and control variables.

*Team's Geographical Dispersion*. Established practices were followed to measure the geographical dispersion among members of a team (Gibson & Gibbs, 2006; Griffith et al., 2003; Martins et al., 2004; Staples & Zhao, 2006). Geographical dispersion was measured for each team using the formula for the Index of Variability, also referred to as the Blau Index (Blau, 1977), measured in terms of categorical dispersion across office locations within a team, taking into account the variability in the number of team members at each office location as well as the number of locations. A value of zero represents a completely collocated team, with everyone sharing the same office location, and the value of 1 represents a team where every member is at a different location. The mean was 0.37 with a standard deviation of 0.26. The measure was calculated utilizing the following formula, which is a common method for estimating variability, (P is the proportion of individuals of a particular background and *i* is the number of backgrounds):

$$D = 1 - \sum_{i=1}^{N} p_i^2$$

There was no need to standardize the measure because it is only advised in cases comparing across different diversity types, which was not the case here (Biemann & Kearney, 2009). In most of the cases, location represents the actual mailing address of the office for each survey participant. However, in a few cases, internal mailing codes for the office location were offered. This information was enough to identify whether team members were in the same office, making it possible to calculate dispersion as well as identify isolates, but it was not enough to decipherer the actual address and corresponding data such as time zone details. The analysis compares teams based on the extent to which team members are geographically dispersed.

*Team Member's Geographical Isolation*. Individual isolates are identified as those team members who are the only ones from their team at a particular location. Team isolates are given a score of 1, while team members located with at least one other team member were coded 0.

*Transformational Leadership.* The measure of transformational leadership in this data set is based on four items due to the overall aim of balancing the maximum survey length requirements from participating IRI organizations and measuring multiple concepts of interest. Transformational leadership was measured by asking team members to evaluate their leaders based on four items that touch on different aspects of the transformational leadership concept (Pearce & Sims, 2002): "my team leader expects me to perform at my highest level," "my team leader breaks the mold," "my team leader possesses strong personal dedication to higher purposes or ideals," "my team leader approaches new activities enthusiastically." At the individual level, the four items loaded onto a single factor. They were subsequently averaged into a scale of transformational leadership (Cronbach's alpha = 0.76). An inter-rater reliability coefficient (James, Demaree, & Wolf, 1993) was used to examine the intra-group reliability (rwg) of

responses, which was .84 for this scale in this sample, indicating an acceptable level of agreement within a group (George & Bettenhausen, 1990) that substantiates aggregation of individual respondents' scores into a team-level measure of transformational leadership.

*Shared Leadership*. Shared leadership was measured in this survey using items derived from Pearce and Sims (2002), Lichtenstein et al. (2006), Lichtenstein & Plowman (2009), Plowman et al., (2007), Uhl-Bien et al. (2007). To assess perceptions of shared leadership, respondents evaluated 11 questions about their fellow team members that loaded on a single factor (Cronbach's alpha = .90). All leadership related items were measured separately for team members and team leaders, suggesting that in providing their feedback, survey participants were clear that they were commenting on the extent of leadership-type behaviors exhibited by their fellow teammates. The intergroup reliability of responses was acceptable ( $r_{wg} = 0.89$ ), supporting the aggregation of individual team member responses into a team level shared leadership scale. Items are available in the Appendix.

*Team Communication.* The measure of team communication in this data set is aimed at balancing the maximum survey length requirements from participating IRI organizations with the desire to capture the multiple dimensions of team communication (Daft & Lengel, 1984). The measure includes items measuring key aspects of team communication: the nature and extent of team communication (Markulis et al., 2006); team member voice (Carson et al., 2007); expertise coordination (Faraj & Sproull, 2000); and collaborative interactions, or more specifically, the extent to which members educate and aid each other to complete tasks and facilitate each other's success (Jassawalla & Sashittal, 2002). The measure includes an item about outside communication because it has been shown by earlier research to influence team outcomes for innovation-focused teams (Ancona & Caldwell, 1992). Despite the multi-dimensionality of the scale, principal components factor analysis demonstrated that they loaded onto one factor. Therefore, the items were averaged into a single scale of team communication (Cronbach's alpha = .85). Inter-group reliability of responses was acceptable ( $r_{wg} = 0.86$ ), supporting the aggregation of individual team member responses into a team level communication scale. Team communication was assessed by asking participants to rate their agreement with eight statements available in the Appendix.

*Team Cohesion*. The measure of cohesion is made up of three items, two of which are adapted from Bollen and Hoyle (1990): "I feel a sense of belonging to this team" and "I am enthusiastic about being a member of this team" (Bollen & Hoyle, 1990), and a third item, "I feel a connection with the individual members of this team." Factor analysis at the team member level showed a single-factor structure with a Cronbach's alpha of 0.81. Hence, the items were averaged into an individual-level measure of cohesion, which was then aggregated to the team level by averaging the variable across members of each team. Inter-group reliability of responses was acceptable ( $r_{wg} = 0.84$ ), supporting the aggregation of individual team member responses into a team level communication scale. Individual items are available in the Appendix.

*Team Performance (evaluated by Stakeholders).* Relevant stakeholders, selected by participating companies for each team, rated the respective team's performance, comparing it to the performance of other teams within their organizational boundaries on a scale of 1 = far below to 7 = far exceeds. Stakeholders represented individuals outside the team who were familiar with its work, but not part of the team either as a member or a manager. The measure is based on work by Edmondson (1999) and Hackman (2002) as well as interview feedback. It is composed of four reverse-coded items (Cronbach's alpha = .74). The items focus on asking about a team's ability to carry out its plans, issues requiring managerial involvement, whether output generated by the team contains errors, and other's opinions about the team. Stakeholder data was averaged into a team-level measure of innovative performance. Because most teams had one or two stakeholders, AD and  $r_{wg}$  calculations were not applicable. Items that make up the measure are available in the Appendix.

#### Individual Perceptions of Team's Innovativeness (evaluated by Team

*Members*). Individual perceptions of team innovativeness were measured with 4 items that loaded on a separate factor (Cronbach's alpha = .82). The response range for the survey questions was on a seven-point Likert type scale. The items were newly developed by the research team based on the Innovative Work Behavior (IWB) scale (Janssen, 2000) to assess perceptions of team members about the extent to which the team engaged in innovative behaviors such as searching out new technologies, processes, and/or product ideas; creating ideas that are subsequently transformed into useful applications, mobilization of support for a team's innovative ideas, overall team

innovativeness rating. Items making up this variable are available in the Appendix.

*Control Variables. Team Size* is defined as the number of members in a team. Size has been demonstrated to influence team dynamics and outcomes (Hülsheger et al., 2009). It was used as a control variable. Team Tenure, defined as the average length of time team's members have been on the team, was controlled for to account for positive performance outcomes associated with greater team tenure (Hackman, 2002). The following response choices were available "less than 3 months" (1), "3-6 months" (2), "6-12 months" (3), "1-2 years" (4), "2-4 years" (5), ">4 years" (6). The responses were averaged across team members for each team, to construct the team tenure measure. *Psychological Safety* is defined as a belief by team members that they are safe to take risks (Edmondson, 1999), which is particularly important for isolated team members who may not have the same level and strength of relationships with their team members as those who work at the same locations and was used as a control in the individual level analysis that focuses on isolates. Four items from the Edmondson's 1999 study were utilized to measure psychological safety that loaded on one factor (Cronbach's alpha = .75) and include items such as "If you make a mistake on this team, it is held against you (reverse coded)" as well as "It is safe to take risks in this team." Because psychological safety was only used as a control in the individual level analysis, there was no need to calculate inter-rate agreement. A complete list of items is available in the Appendix.

## **Data Analysis**

I added a new measure of geographical dispersion to the existing data set, based on office location information provided by the participating companies. Principal components factor analysis with varimax rotation was utilized for analysis of items making up the measures to test that the variables making up the study were parsimonious and valid. Varimax rotation, an orthogonal rotation method was chosen for its simplicity of interpretation, generalizability, and greater replication (Pedhazur & Schmelkin, 1991). Reliability tests were carried out using Cronbach's alpha coefficient. Scales were created by averaging the factored variable items for each individual team member. Factor loadings are available in Appendix A, in brackets, next to each respective item.

In keeping with the nature of my hypotheses, two different statistical analyses were used. First, to test the moderation related and the main effect relationships, I used Ordinary Least Squares (OLS) regression to test the moderating effects of leadership. To test conditional indirect effects, otherwise known as mediated moderation, I utilized the boostrapped method to estimate the strength of the conditional indirect path, which has been the recommended method in the current literature (Hayes, 2013; Preacher, Rucker, & Hayes, 2007). Andrew Hayes' SPSS macro PROCESS (Hayes, 2013) was utilized to carry out the calculations of the conditional indirect effects and to test its significance. Specifically, the analysis of the conditional indirect effects was done using model 7 of Andrew Hayes' PROCESS macro, which is equivalent to the *first stage moderation model* (Edwards & Lambert, 2007). The bootstrapping method (Hayes, 2009, 2013) enables the analysis of conditional indirect effects of dispersion on innovative team

performance through its effects on team communication and cohesion, moderated by transformational and shared leadership. Bootstrapping is known as one of the resampling methods. In mediation analysis it is "used to generate an empirically derived representation of the sampling dispersion of the indirect effect, and this empirical representation is used for the construction of a confidence interval" (Hayes, 2013, p. 106). Bootstrapping generates a 95% bias-corrected CI for the indirect effect using 5,000 bootstrap samples. It calculates point estimates as well as the CI of the indirect effects' effect size. Furthermore, an index of moderated mediation gets calculated, which is a test of linear moderated mediation in path analysis. The index is based on an interval estimate of the indirect effect to the moderator. While called the index of moderated mediation, the value can be used for the types of models that integrate mediation and moderation (Hayes, 2013, 2014), highlighting its relevance here.

Estimating the size and the significance of the indirect effects using the bootstrap confidence interval approach addresses issues with both the Baron and Kenny (1986) method as well as the Sobel test, which make assumptions about the normal distribution of the data for computing the p-value. Specifically, in contrast to these other methods, bootstrapping makes no assumptions about the shape of the dispersion of the variables, has been suggested to circumvent the power problem, and is recommended to be applied to small samples with greater confidence (Hayes, 2009; Preacher & Hayes, 2004, 2008; Preacher et al., 2007; Zhao, Lynch Jr., & Chen, 2010). In sum, there is statistically significant presence of the indirect conditional effects if the effect includes at least one CI at various values of the moderator that does not include a zero as is also reflected by the

latest addition to the macro, namely the "index of moderated mediation", which is included in the output of the PROCESS macro for SPSS software (Hayes, 2013, 2014).

Figure 1 depicts team level relationships, which are the focus of the analysis titled

"Geographical Dispersion and Team Performance – a Relationship Mediated by

Communication and Team Cohesion and Moderated by Leadership."

Insert Figure 1 Here

Figure 2 depicts individual level relationships, which are the focus of the analysis titled "Isolation, Leadership and Perceptions of Innovative Outcomes."

Insert Figure 2 Here

## **CHAPTER IV: RESULTS**

## Summary of Analysis at the Team Level: Geographical Dispersion and Team Performance – A Relationship Mediated By Communication and Team Cohesion and Moderated By Leadership

Table 2 provides the means, standard deviations, and correlations for the variables in this team level analysis. On average in this sample of 80 teams, team members have been with their respective teams between one and two years and the average team size was about 10 members. The average geographical dispersion (0.37) and its standard deviation (0.26) suggest large variation in how dispersed team members were across teams in the sample. There were a number of significant correlations among the mediating team dynamics, leadership, and performance. Team communication and

cohesion were significantly correlated with team performance (r=.31,  $p \le 0.01$ ; r=.27;  $p \le$ 0.05), respectively. While shared leadership was significantly correlated with team performance (r=.26;  $p \le 0.05$ ), and transformational leadership was not, the two leadership styles were highly correlated with each other (r=.49,  $p \le 0.001$ ). Geographical dispersion was not significantly correlated with either the mediating team dynamics, the moderating leadership, or team performance. Team communication and cohesion were highly significantly correlated (r=.75,  $p \le 0.001$ ). Both team communication and cohesion were also highly correlated with shared leadership (r=.74;  $p \le 0.001$ ; r=.73  $p \le$ 0.001), which is not surprising since even though they evaluate separate concepts, all three were all related to the characteristics of effective teams. However, they were distinct measures that separated into different factors when they were all examined as part of the same factor analysis. Furthermore, all three measures had high Cronbach's alphas, demonstrating internal consistency of the measures. Due to the relatively small sample size and the high correlation among variables representing leadership and team dynamics, the relationships were examined in separate models to avoid issues related to multicollinearity.

#### Insert Table 2 Here

Continuous independent variables that were used to analyze interactions were all centered to address potential issues related to multicollinearity, risks of bias in the size of the coefficient, or statistical significance (Cohen, Cohen, West, & Aiken, 2003; Marquardt, 1980). To test the hypotheses, multivariate ordinary least squares regression was coupled with analysis of mediated moderation effects using the bootstraping method (Preacher & Hayes, 2004; Preacher et al., 2007). All of the models controlled for team tenure, and team size, which have been demonstrated in past research to account for variability in team performance.

As demonstrated in Table 3, controlling for team tenure and team size, transformational leadership significantly moderates the relationship between geographical dispersion and team cohesion (b=-1.162, p < .001), supporting Hypothesis 1A.

## Insert Table 3 Here

With evidence that the effect of geographical dispersion on team cohesion was moderated by transformational leadership, to further examine transformational leadership as a moderator, a simple slopes analysis was performed for the relationship between team dispersion and team cohesion at high and low values of transformational leadership (one standard deviation above and below the mean). A simple slope analysis (Aiken & West, 1991; Dawson, 2014) revealed the dispersion slope was negative and statistically significant both when transformational leadership was high (slope =-7.499, t =-3.835, p < 0.001) and when it was low (slope =-6.401, t =-3.855, p < 0.001). Figure 3 depicts the nature of the interaction.

## Insert Figure 3 Here

For Hypothesis 1B, to examine the conditional indirect effect of transformational leadership, the bootstrapping method was used to generate a 95% bias-corrected bootstrap confidence interval (CI) of for the index of moderated mediation: [-2.079, -0.1]. Because the CI does not include a zero, there is evidence of a significant mediated moderation (Hayes, 2013, 2014), supporting Hypothesis 1B. Table 4 includes the details.

#### Insert Table 4 Here

Transformational leadership significantly moderated the relationship between geographical dispersion and team communication (b=-1.034,  $p \le 0.01$ ), supporting Hypothesis 1C. Table 5 lists the results of the OLS regression. Specifically, more dispersed teams reported communicating less well when led by more transformational leaders.

## Insert Table 5 Here

To further examine transformational leadership as a moderator, the simple slopes for the relationship between geographical dispersion and team communication at high and low values of transformational leadership (one standard deviation above and below the mean) were evaluated. A simple slope analysis revealed the slope was negative and statistically significant both when transformational leadership was high (slope = -6.578, t = -3.218, p  $\leq$  0.01) and when it was low (slope = -5.584, t = -3.218, p  $\leq$  0.01), but that was more negative when transformational leadership was high. Figure 4 demonstrates the graph of the interaction.

#### Insert Figure 4 Here

For hypothesis 1D, the conditional indirect effects were examined using the bootstrapping method. A significant index of moderated mediation with a 95% bootstrap CI that did not include a zero [-1.7, -0.214], providing support to Hypothesis 1D and demonstrated in Table 4 above.

Hypotheses 2A, which suggested a positive influence of shared leadership in moderating the relationship between geographical dispersion and team cohesion was not supported. To test the indirect conditional effects of shared leadership on geographical dispersion's effect on team performance, mediated by team cohesion, suggested by Hypothesis 2B, bootstrapping method was utilized. Following the interpretation advocated by Andrew Hayes in his work on analysis of conditional indirect effects (Hayes, 2013, 2014), there was insufficient evidence to lend support to the presence of mediated moderation based on an index of moderated mediation that contains a zero. Specifically, as is shown in Table 6, the conditional indirect effect of shared leadership on the relationships between geographical dispersion and team performance through team cohesion is unsupported due to CIs that include a zero [-1.258, 0.041].

## Insert Table 6 Here

Hypothesis 2C predicted that shared leadership would moderate the geographical dispersion – team communication relationship but the relationship was not significant, rejecting the hypothesis. Hypothesis 2D, which stipulated the conditional indirect effect

of shared leadership on the team dispersion - team communication –team performance relationship was also not supported. The index of moderated mediation included a zero, as is demonstrated in Table 6 above. Therefore, there was no support for the hypothesized relationship, rejecting Hypothesis 2D. Table 7 includes a summary of all of the team level hypotheses, highlighting significant findings.

#### Insert Table 7 Here

# Summary of Analysis at the Individual Level: Isolation, Leadership and Perceptions of Innovative Outcomes

Using a sample of 838 individuals from 86 innovation-focused teams, with 71 isolates, (before reducing the sample because of missing data) the study examined how team members' geographical isolation affects their perceptions of team innovativeness. Due to missing data, models evaluated a sample that was reduced from the original 838 responses. Table 8 provides the means, standard deviations, and correlations for the variables in this individual level study. There is high correlation among some of the key variables in the study. Isolation is not significantly correlated with any of the variables other than psychological safety (r=0.10, p  $\leq$  .05). Team communication and cohesion are highly correlated (r=0.655, p  $\leq$  .001) with each other as well as with psychological safety (r=0.630, p  $\leq$  .001; r=0.546, p  $\leq$  .001), which is not surprising since while these concepts are distinct, they are all related to team functioning and one's ratings of such concepts may understandably be correlated. Therefore, the pertinent variables are tested in separate

models to better access the validity of the relationships without the constraints of multicollinearity and loss of power.

## Insert Table 8 Here

Continuous independent variables used in the models were centered to address potential problems related to multicollinearity, risks of bias in the size of the coefficient, or statistical significance (Cohen, Cohen, West, & Aiken, 2003; Marquardt, 1980). Multivariate ordinary least squares (OLS) regression was used to test the hypotheses. OLS regression was coupled with the analysis of mediated moderation effects using the bootstrap method (Preacher & Hayes, 2004). This approach enables the analysis of conditional indirect effects of isolation on individual perceptions of innovative team performance through its effects on team dynamics, moderated by leadership. All of the models control for psychological safety, which plays an important role in influencing team members (Edmondson, 1999; Gibson & Gibbs, 2006; Walumbwa & Schaubroeck, 2009), and particularly isolated team members who may be more hesitant to engage with the team due to their isolation.

Hypothesis 3A suggests that isolation has a negative effect on team member's perceptions of their team's innovative performance but it was not supported. Hypothesis 3B posits that transformational leadership will negatively moderate the effect of isolation on an individual's perceptions of their team's innovativeness but it was not supported. Hypothesis 3C, suggested that perceptions of shared leadership would positively moderate the effect of isolation on the perceptions of the team's innovative performance, which was supported (b=0.315;  $p \le 0.05$ ), demonstrated in Table 9.

## Insert Table 9 Here

To further examine shared leadership as a moderator, a simple slopes analysis was performed to analyze the relationship between isolation and perceptions of team's innovativeness at high and low values of shared leadership (one standard deviation above and below the mean. A simple slope analysis (Aiken & West, 1991; Dawson, 2014) revealed the slope is very slightly positive when shared leadership is high but it is not statistically significant (slope =0.141, t =1.125, p = 0.261) but it is statistically significant and negative when shared leadership is low (slope =0.332, t =-2.336, p = 0.02). Figure 5 includes the graph of the interaction.

#### Insert Figure 5 Here

The next set of hypotheses (3D, 3E, 3F, 3G) focus on examining multiple models analyzing the conditional indirect effects of leadership on the relationship between isolation and the perceptions of innovative team performance, mediated by communication and cohesion. Significance of the indirect conditional effects was tested using the bootstrapping method (Hayes, 2013). Hypothesis 3D was not significant as the 95% bootstrap CI estimating the strength of the indirect effects included a zero, indicating lack of a significant indirect effect through team cohesion. For Hypothesis 3E, the same analysis was conducted to examine conditional indirect effect of transformational leadership on the perceptions of innovative team performance through the perceptions of team communication. A 95% bootstrap CI of [-0.168, -0.032], does not contain a zero, supporting to Hypothesis 3E as is demonstrated in Table 10.

## Insert Table 10 Here

Hypotheses 3F and 3G test the conditional indirect effect of shared leadership on the perceptions of innovative team performance through team cohesion and communication. The results of the bootstrapping analysis presented no evidence of the conditional indirect effects of shared leadership in both cases, as evident by a CI that includes a zero, demonstrated in Table 11. Therefore, both hypotheses 3F and 3G were rejected.

## Insert Table 11 Here

Table 12 summarizes the individual level hypotheses and reports significant findings.

Insert Table 12 Here

## **CHAPTER V: DISCUSSION AND CONCLUSIONS**

## Discussion

Consistent with earlier studies (Hoch & Kozlowski, 2012; Howell & Hall-Merenda, 1999; Howell et al., 2005; Pearce & Conger, 2003), transformational leadership was hypothesized to have a less positive influence and shared leadership was hypothesized to have a more positive influence in the context of greater geographical dispersion of team members. Findings show that transformational leadership was associated with a less positive influence on team performance through its less positive influence on team communication and cohesion as a team's geographical dispersion increased. Perhaps unsurprisingly, given the overall level of interrelation between the two team dynamics, the pattern of the influence of transformational leadership was very similar for influencing both team communication and cohesion. In influencing both dynamics, the difference between high and low transformational leadership was small regardless of levels of geographical dispersion, although high transformational leadership had a slightly more positive effect in teams with low geographical dispersion in contrast to a slightly less positive effect in high geographical dispersion.

In the individual level analysis, a similar pattern of results was notable for team communication but not for team cohesion. Specifically, transformational leadership had a significant conditional indirect effect on the perceptions of team performance among isolates through team communication. Perhaps greater dispersion of team members made it harder to foster the types of relationships that would enable higher levels of transformational leadership to reach its full potential in terms of its influence and to help facilitate relationships and interactions among team members that improve team communication the way it did in collocated or slightly dispersed teams. One of the reasons team communication was a significant mediator while team cohesion was not, may have been related to the difference in the concepts, despite the similarities: team cohesion focuses more on the feelings, such as enthusiasm about the team, which may have been marginally less important to demonstrate a significant relationship in this sample, than the focus of team communication, which is how team members relate information to each other and perhaps despite the relatively small sample, was still significant.

Shared leadership's effect was not statistically significant in the team level analysis either as a conditional or the indirect conditional influence. However, it had a significant influence in the individual level analysis, which examined the perceptions of isolates. Perhaps the influence of shared leadership did not come through in the relatively small sample of teams, but was significant in a much larger sample of individuals making up the teams. The individual level analysis of this study examined the relationships associated with geographical isolation of a team member. There was no direct effect found between one's isolation and the perceptions of team's innovativeness. However, shared leadership positively influenced the effects of isolation on the perceptions of team innovativeness. Perhaps perceiving higher shared leadership behavior associated with a more active role taken on by fellow teammates contributed to making the perceptions of team performance more positive than lower shared leadership in the individual level analysis contrasting isolates with non-isolates. Neither team communication nor team cohesion were significant mediators for any of the indirect conditional effects of shared leadership on individual and team level, which may be attributable to multicollinearity related issues with the three concepts highly correlated with one another.

## Implications

With increasing frequency of a geographically dispersed team context, it is more relevant than ever to better understand factors that influence geographically dispersed teams and isolated team members in terms of how they perceive their team dynamics, and, in turn, their team's performance. This study highlights implications for organizational management stemming from the effects of an increasingly popular team structure. Geographical dispersion of team members made it harder for team members to communicate and have cohesion on their team, in contrast to the levels of such team dynamics in collocated teams. Transformational leadership was less positive in influencing both of these dynamics, as geographical dispersion increased, suggesting that it may be worthwhile to examine leadership related initiatives further.

With transformational leadership's influence on team performance through team communication and cohesion, being less positive in highly geographically dispersed teams and with little difference in the effect of high compared to low transformational leadership, it may not make much sense for organizations to invest in training of such leaders if the benefits are not tremendously different in either case. Perhaps in addition to developing traits of a transformational leader, team management can also consider development of relationships by increasing opportunities for face-to-face meetings to help build stronger relationships, which could potentially help the leader be more effective in positively influencing geographically dispersed team dynamics such as communication and cohesion, in turn leading to greater team performance. Additionally, because shared leadership had a positive influence on isolates' perceptions of their team's innovative performance, it may be helpful for organizations to encourage more leadership behavior among teammates associated with engaging fellow team members and instigating discussion, particularly in teams with isolated members.

While virtual teams have been studied for well over a decade, there is still a lack of consensus among scholars about the best approach to defining and studying such teams. This dissertation offers a unique perspective on studying geographically dispersed teams by examining teams on a continuum from collocated to highly geographically dispersed on the team level and isolated compared to non-isolated on the individual level. This study contributes to the literature on leadership in geographically dispersed teams by testing the boundaries of the effects of transformational and shared leadership in influencing team dynamics and performance by examining relationships among team members working in field innovation focused teams.

Few studies have examined the moderating role of transformational and shared leadership in influencing geographically dispersed teams. On the team level, the findings of this study confirm and extend existing theory that transformational leadership has a less positive influence as geographical dispersion increases (c.f. Hoch & Kozlowski, 2012). My contribution is to highlight that transformational leadership's influence on performance is through team communication and cohesion, which are less influenced by transformational leaders, as geographical dispersion among team members increases.

On the individual level, my research extends earlier studies that have suggested that shared leadership is likely to have a positive effect in geographically distributed teams (c.f. Shuffler et al., 2010). My contribution is to examine the case of geographical isolates, demonstrating that in the case of team members working in isolation, shared leadership has a more positive influence on isolates' perceptions of their team's innovativeness than for non-isolates.

#### Limitations

Because of the relatively small size of the sample, team level analysis was split into multiple models, which were tested separately to avoid low power and multicollinearity related issues, suggesting the possibility of a Type 2 error, whereby relationships in the population were not reflected in this analysis due to insufficient power. Other limitations associated with this sample of teams include bias in selection. The innovation teams were chosen by the companies and while they were asked to choose teams performing on a spectrum, they may have been biased in selecting higher performing teams (De Lia, 2011).

Part of the reason for non-statistically significant results on the individual level may be attributable to the limitations of this research sample, which included only 71 team members who work in isolation. Furthermore, some of the teams had multiple isolates making up the team, while other teams had just one or two. However, there may not have been enough of these different cases to test significance of the relationships given the number of isolates in the team. One of the other limitations of this sample is lack of information about multiple team membership for isolates to test whether their perceptions change based on the priority of the team in question in their daily workload or the number of other teams they are involved with.

There were also some limitations related to the measures used in this study based on an existing data set collected as part of a larger project. Due to the need to balance research interests with constraints imposed by the participating companies, some of the established measures had to be cut down to fulfill the required maximum length of 30 minutes for each team survey. Additionally, transformational leadership was measured using a different set of items than shared leadership, limiting the extent to which the influence of the two leadership types could be directly contrasted with each other.

## **Future Research**

Future research may want to explore how multiple team membership influences isolates and whether different styles of leadership make a difference to the same individual in different teams. Human nature does not seem to adapt very well to lack of personalized relationships and for teams tasked with innovation, it may be particularly important to continue to explore how in addition to geographical dispersion, various other aspects of virtuality, such as electronic dependence and structural dynamism (Gibson & Gibbs, 2006), differences related to time zone, work practices, organization, and technology capabilities (Chudoba et al., 2005), as well as perceptions of dispersion (Wilson, Boyer O'Leary, Metiu, & Jett, 2008) would influence team communication and cohesion and through them, affect team performance. Is it the settings, the team, the individual, or the leadership style that play the most important role? It would be

interesting to combine a field study with a controlled experiment to better isolate the boundaries and the nature of these relationships. Furthermore, as individual backgrounds influence one's perceptions, it would be important to explore whether certain demographic factors influence isolated team members and how that changes the overall team collaborative related interactions.

Leadership styles associated with positive effects on team dynamics and outcomes may work differently when having to overcome geographical and other boundaries to reach their followers. Perhaps future research can contrast the effect of transformational and shared leadership across a variety of boundaries associated with virtual team work in influencing team members within such an environment. Finally, as methods for statistical analyses continue to evolve, future studies may want to explore multilevel analysis of mediated moderation relationships put forth here, controlling for the organization and industry level effects.

## Conclusion

Teams characterized by high geographical dispersion may have an added level of complexity in how they respond to leadership. As organizations are transitioning to working in the context of greater geographical dispersion of team members, including distance between leaders and followers, it may become increasingly important to examine the moderating effect of leadership strategies in these shifting structural settings. Geographical dispersion of team members is still a key barrier to successful team interactions. Ranging from the concept of "trust needs touch" (Handy, 1995: 46) to increased engagement and efficiency stemming from an added opportunity to interact during a coffee break (Pentland & Gilmore, 2012), there is evidence of a long history but continued importance placed by employees on face-to-face interactions, despite or perhaps because of increasing popularity of geographically dispersed team structure. Not surprisingly then, lack of face-to-face interactions is often associated with decreased communication, cohesion, and in turn team performance. In contrast to teams that may do mundane tasks based on a set of procedures, members of innovation focused teams may need to come together to brainstorm and collaborate and as such their performance may be more affected by decreased communication and cohesion levels. Particularly affected may be teams focused on innovation because despite the added complexity, the necessary combination of expertise may be only available in a geographically dispersed team environment.

With increasing frequency of a geographically dispersed team context, it is important to better understand factors that influence such teams as well as isolates in terms of how they perceive their team dynamics, such as communication and cohesion, and in turn their team's performance as well as to better understand factors that influence them. The contributions of this research include examining current issues faced by modern organizations related to the increase in geographical dispersion and isolation of team members working on innovation focused projects. Remote workers in the United States make up an ever increasing part of the workforce (Lee, 2013), and there is a continuous emergence and growth of geographically dispersed teams. Globalization trends coupled with the war for talent and the need for innovation teams to reach experts wherever they may be suggests that trends analyzed as part of this dissertation are likely to continue to be important.

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## FIGURES

Figure 1. Theoretical Model: Team Level <sup>a</sup>



<sup>a</sup> Note: This sample's n is not large enough to examine mediating team dynamics, leadership styles, and distances as controls for each other (example: cohesion for communication and vice versa).





<sup>*a*</sup> Note: Due to the interrelated nature of variables examined in this model the mediating team dynamics and leadership styles were examined in separate models.



Figure 3: Interaction Graph - TL moderation of the GD and Team Cohesion relationship



Figure 4: Interaction Graph - TL moderation of the GD and Team Communication relationship



Figure 5: Interaction Graph – SL moderation of the Isolation and Perceptions of Innovative Team Performance Relationship

### **TABLES**

Variable	Average AD	Average r <sub>wg</sub>
Team	.58	.83
Communication		
Team Cohesion	.58	.84
Transformational	.55	.84
Leadership		
Shared Leadership	.49	.89

Table 1: Average Deviation (AD) and  $r_{wg}$  aggregation of variables rated by team members

Table 2: Means, Standard Deviations, and Bi-variate Correlations

		Mean	SD	1	2	3	4	5	6	7
1	Geographical Dispersion	0.37	0.26	1.00						
2	Transformational Leadership	5.77	0.48	-0.03	1.00					
3	Shared Leadership	5.32	0.34	-0.12	0.49 ***	1.00				
4	Team Communication	5.50	0.43	-0.04	0.44 ***	0.74 ***	1.00			
5	Team Cohesion	5.69	0.45	-0.16	0.51 ***	0.73 ***	0.75 ***	1.00		
6	Team Tenure	3.83	0.86	0.03	0.25 *	0.26 *	0.26 *	0.35 **	1.00	
7	Team Size	10.82	6.39	0.08	-0.07	-0.15	-0.13	-0.03	-0.03	1.00
8	Team Performance	5.10	1.09	0.04	0.14	0.26 *	0.31 **	0.27 *	0.08	0.07
**	* $p \le 0.001$ ; ** $p \le 0.01$ ; ** $p$	0.05								

	Coeff.				
Variables					
Geographical Dispersion (GD)	-0.373 *				
Transformational Leadership (TL)	0.440 ***				
GD * TL	-1.162 ***				
Team Tenure	0.109 *				
Team Size	0.004				
Constant	5.230 ***				
Model R <sup>2</sup>	0.445				
	F(5, 74)=11.859				
	$p \leq 0.001$				
a n = 80. $b Geographical Dispersion and$	Transformational				
* $p \le 0.05$ ; ** $p \le 0.01$ ; *** $p \le 0.001$ ; two tailed.					

Table 3. Unstandardized OLS Regression Coefficients Estimating Team Cohesion <sup>a, b</sup>

### Table 4. Indirect Conditional Effects of Transformational Leadership on Team Performance

Mediators		Tean	n Communication				Т	eam Cohesion	
			Lower Level	Upper Level				Lower Level	Upper Level
			Confidence	Confidence				Confidence	Confidence
	Index	SE(Boot)	Interval - LLCI	Interval - ULCI		Index	SE(Boot)	Interval - LLCI	Interval - ULCI
Index of Moderated									
Mediation	-0.794	0.366	-1.7	-0.214		-0.781	0.486	-2.079	-0.1
Bootstrap sample size	Bootstrap sample size = 5,000								

# Table 5. Unstandardized OLS Regression Coefficients Estimating Team Communication <sup>a, b</sup>

	Coeff.
Variables	
Geographical Dispersion (GD)	-0.102
Transformational Leadership (TL)	0.374 ***
GD * TL	-1.034 **
Team Tenure	0.055
Team Size	-0.005
Constant	5.338 ***
Model R <sup>2</sup>	0.326
	F(5, 74)= 7.142
	$p \leq 0.001$
<sup>a</sup> n = 80. <sup>b</sup> Geographical Dispersion	and
Transformational Leadership are me	ean centered.
* $p \le 0.05$ ; ** $p \le 0.01$ ; *** $p \le 0.00$	l; two tailed.

# Table 6. Indirect Conditional Effects of Shared Leadership on Team Performance

Mediators		Tear	n Communication			Т	eam Cohesion	
	Index	SE(Boot)	Lower Level Confidence Interval - LLCI	Upper Level Confidence Interval - ULCI	Index	SE(Boot)	Lower Level Confidence Interval - LLCI	Upper Level Confidence Interval - ULCI
Index of Moderated Mediation Bootstrap sample size =	-0.176	0.371	-0.968	0.53	-0.439	0.326	-1.258	0.041

Table 7	7. Summarv	of the Team	Level Hypotheses	and Findings
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Hypothesis #	Hypothesis	Finding
1A	Transformational leadership will moderate the relationship between geographical dispersion and team cohesion, such that as geographical dispersion increases, the influence of transformational leadership will become less positive	Supported: b=-1.162, p ≤ .001
1B	Team cohesion mediates the interactive effects of geographical dispersion and transformational leadership on team performance.	Supported: 95% bias-corrected Index of MM* with CI: [-2.079, -0.1].
1C	Transformational leadership will moderate the relationship between geographical dispersion and team communication, such that as geographical dispersion increases, the influence of transformational leadership will become less positive	Supported: b=-1.034, p ≤ 0.01
1D	Team communication mediates the interactive effects of geographical dispersion and transformational leadership on team performance.	Supported: 95% bias-corrected Index of MM* with CI: [-1.7, -0.214].
2A	Shared leadership will moderate the relationship between geographical dispersion and team cohesion, such that as geographical dispersion increases, the influence of shared leadership will become more positive	No significant findings
2B	Team cohesion mediates the interactive effects of geographical dispersion and shared leadership on team performance.	No significant findings
2C	Shared leadership will moderate the relationship between geographical dispersion and team communication, such that as geographical dispersion increases, the influence of shared leadership will become more positive	No significant findings
2D	Team communication mediates the interactive effects of geographical dispersion and shared leadership on team performance.	No significant findings
*MM – Modera	ated Mediation	

		Mean	SD	1	2	3	4	5	6
1	Isolation <sup>a</sup>	0.090	0.293	1.000					
2	Transformational Leadership	5.768	0.833	-0.053	1.000				
3	Shared Leadership	5.298	0.747	-0.003	0.474 ***	1.000			
4	Team Communication	5.430	0.915	0.022	0.478 ***	0.598 ***	1.000		
5	Team Cohesion	5.695	0.881	0.060	0.481 ***	0.544 ***	0.655 ***	1.000	
6	Psychological Safety	5.538	0.931	0.101 *	0.414 ***	0.462 ***	0.630 ***	0.546 ***	1.000
7	Innovative Team Performance	5.566	0.920	0.020	0.482 ***	0.532 ***	0.564 ***	0.546 ***	0.491 ***
***	*** $p \le 0.001$ ; ** $p \le 0.01$ ; * $p \le 0.05$ ; N=519								
<sup>a</sup> Is	olation: 1=Isolated; 0=Not-Isolated								

Table 8: Individual level variables - Means, Standard Deviations, and Bi-variate Correlations

	Coef.
Variables	
Isolation	-1.765 *
Shared Leadership (SL)	0.477 ***
Isolation * SL	0.315 *
Psychological Safety	0.310 ***
Constant	5.536 *
	Model R <sup>2</sup> =0.371
	F(4,578)=81.398;
	$p \le 0.001$
* < 0.05. ** < 0.01. **	$k n \leq 0.001$ two tailed

 Table 9. Unstandardized OLS Regression Coefficients Estimating Innovative Team Performance <sup>a</sup>

 Table 10. Indirect Conditional Effects of Transformational Leadership on the Perceptions of Innovative Team

 Performance – Individual Level Analysis

Mediators		Team	Communication		Team Cohesion				
	Index	SE(Boot)	Lower Level Confidence Interval - LLCI	Upper Level Confidence Interval - ULCI		Index	SE(Boot)	Lower Level Confidence Interval - LLCI	Upper Level Confidence Interval - ULCI
Index of Moderated									
Mediation	-0.095	0.035	-0.168	-0.032		-0.0264	0.045	-0.116	0.063
Bootstrap sample size	= 5,000								

 Table 11. Indirect Conditional Effects of Shared Leadership on the Perceptions of Innovative Team Performance –

 Individual Level Analysis

Mediators		Team	Communication		Team Cohesion			
	Index	SE(Boot)	Lower Level Confidence Interval - LLCI	Upper Level Confidence Interval - ULCI	Index	SE(Boot)	Lower Level Confidence Interval - LLCI	Upper Level Confidence Interval - ULCI
Index of Moderated Mediation	-0.045	0.073	-0.188	0.104	0.027	0.055	-0.084	0.131
Bootstrap sample size	e = 5,000							

Table 12. Sun	mary of the In	dividual Level	Hypotheses and	l Findings
	•		~ I	

Hypothesis #	Hypothesis	Finding
3A	Isolation will negatively influence perceptions of team's innovative performance.	No significant findings
3B	Perception of a leader's transformational leadership style will moderate the effect of isolation on perceptions of the team's innovative performance, such that the perception of the leader's transformational leadership style will be less positive for those who are isolated compared to those who are not isolated on the team	No significant findings
3C	Perception of shared leadership will moderate the effect of isolation on perceptions of the team's innovative performance, such that the perception of shared leadership will have a more positive effect for those who are isolated compared to those who are not isolated on the team	Supported: b=0.315; p ≤ 0.05
3D	Individual perceptions of team cohesion level mediate the interactive effects of team member's isolation and transformational leadership on perceptions of innovative team performance.	No significant findings
3E	Individual perceptions of team communication level mediate the interactive effects of team member's isolation and transformational leadership on perceptions of innovative team performance.	Supported: 95% bias- corrected Index of MM* with CI: [-0.168, -0.032]
3F	Individual perceptions of team cohesion level mediate the interactive effects of team member's isolation and shared leadership on perceptions of innovative team performance.	No significant findings
3G	Individual perceptions of team communication level mediate the interactive effects of team member's isolation and shared leadership on perceptions of innovative team performance.	No significant findings
*MM - Modera	ated Mediation	

#### **APPRENDIX A: Survey Items with Factor Loadings in Brackets**

# Transformational Leadership (team leader and member rated) Cronbach's alpha: .76; rwg = .84:

Instructions to participants for Transformational Leadership and Shared Leadership related items:

"Your Interaction with Leadership - As before, please indicate your agreement or disagreement with each of the following statements, but for this analysis provide a rating twice; once for the designated "Team Leader," as applicable, AND once for your teammates in general, that take on leadership roles. Use the scale provided, if either doesn't apply leave that scale blank.

If you are a team leader, rate yourself.

My team leader / teammates .... "

[Participants were then presented with two columns for each item and asked to provide an answer to each of the following items twice, once for each column labeled: *"Team Leader" and "Teammates."* Items making up the Transformational Leadership scale were all taken from the "Team Leader" column, while items making up the Shared Leadership scale were all taken from the "Teammates" column.

7 point scale ranging from strongly disagree to strongly agree. ]

My team leader approaches new activities enthusiastically [.832]

My team leader breaks the mold [.675]

My team leader possesses strong personal dedication to higher purposes or ideals [.711] My team leader expects me to perform at my highest level [.495]

# Shared Leadership (team leader and member rated) Cronbach's alpha = .90; rwg =.89:

[Instructions for Shared Leadership are specified above in the Transformational Leadership analysis.]

Seek(s) a broad range of perspectives when solving problems. [.678] Resolve(s) problems raised by other groups. [.636] Coordinate(s) activities with other groups. [.593] Procure(s) resources which the team needs from other groups. [.634] Release(s) timely information to others in the company to advance the team's image or work. [.621] Foster(s) interaction within and outside the team by encouraging open engagement. [.756]

Engage(s) members of the team in mutual problem solving [.747]Instigate(s) discussion of different types of thinking among team members.Guide(s) team members to converge on an agreement when one is needed.[.634]Recognize(s) the difference between unhelpful conflict and helpful conflict.Help(s) the team understand new events emerging in the team's environment.[.652]

**Team Communication (team leader and member rated) Cronbach's Alpha = .83:** [Instructions to participants for Team Communication Items: "Please read each of the following statements and indicate your agreement or disagreement using the scale provided. Leave blank if you are uncertain or the question/statement is not applicable."

7 point scale ranging from strongly disagree to strongly agree]

Team members routinely interact with each other and others outside the team. [.643] People in this team are encouraged to speak up to test assumptions about issues under discussion. [.756]

Team members actively share their special knowledge and expertise with one another. [.719]

This team does a great job of communicating and coordinating among members. [.727] Team members have access to all information available to the team. [.561]

**Team Cohesion (team leader and member rated) Cronbach's alpha = .81 rwg = .84:** [Instructions to participants for Team Cohesion Items: "Please read each of the following statements and indicate your agreement or disagreement using the scale provided. Leave blank if you are uncertain or the question/statement is not applicable."

7 point scale ranging from strongly disagree to strongly agree]

I feel a sense of belonging to this team [.933] I am enthusiastic about being a member of this team [.689] I feel a connection with the individual members of this team [.681]

### **Psychological Safety (team leader and member rated) Cronbach's alpha = .75:**

[Instructions to participants for Psychological Safety Items: "Please read each of the following statements and indicate your agreement or disagreement using the scale provided. Leave blank if you are uncertain or the question/statement is not applicable."

7 point scale ranging from strongly disagree to strongly agree]

If you make a mistake on this team, it is held against you – RC [-.666]

No one on this team would deliberately act in a way that undermines my efforts. [.530] It is safe to take risks in this team. [.715] Members of this team are able to bring up problems and tough issues. [.665]

#### Team Performance (stakeholder rated) Cronbach's alpha = .74:

[Instructions to participants of the stakeholder survey for Team Performance Items: "Please read each of the following statements and indicate your agreement or disagreement using the scale provided"

7 point scale including items: Uncertain, Strongly disagree, disagree, disagree somewhat, neither agree nor disagree, agree somewhat, agree, strongly agree]

Critical quality errors occur frequently in this team's work as observed by outsiders – RC [.522]

Others in the company who interact with this team often complain about how it operates - RC [.716]

This team has difficulty actually carrying out its plans – RC [.649]

Issues arise from the team which require the intervention of higher management to resolve - RC [.734]

### Individual Perceptions of Team's Innovativeness (team leader and member rated) Cronbach's alpha = .82:

[Instructions to participants for Individual Perceptions of Team's Innovativeness Items: "Please read each of the following statements and indicate your agreement or disagreement using the scale provided. Leave blank if you are uncertain or the question/statement is not applicable"

7 point scale ranging from strongly disagree to strongly agree]

Our team searches out new technologies, processes, techniques, and/or product ideas. [.775]

Our team creates new ideas which are transformed into useful applications. [.879] Our team mobilizes support to gain approval for our innovative ideas from others outside the team. [.585]

[Instructions: Please rate how satisfied you are with each of the following aspects of your team's performance. Leave blank if you are uncertain or if the statement is not applicable; Scale: Very dissatisfied, dissatisfied, somewhat dissatisfied, neutral, somewhat satisfied, satisfied, very satisfied]

Team innovativeness [.712]

## **Team Tenure**

[Instructions to participants for Team Tenure text box: "For how many months have you been a member of this team? Enter a whole number only, e.g. '8'."]

Average length of time the team's members have been on the team

## **APPENDIX B: VITA**

1977	Born in St. Petersburg, Russia
1995	Graduate from Edward R. Murrow High School, Brooklyn, NY
1995-1999	Bachelor of Business Administration, Pace University, New York, NY
1997-1998	Intern at Goldman Sachs Co., New York, NY
1999-2004	Master of Science, New York University, New York, NY
1999-2006	Application Developer and Manager, J.P. Morgan Private Bank, New
York, NY	
2006-2008	Manager, Morgan Stanley, New York, NY
2008-2008	Adjunct professor, PCCC, Paterson, NJ
2008-2010	Adjunct professor, Caldwell College, Caldwell, NJ
2009-2010	Ramapo College of New Jersey, Mahwah, NJ
2010-2014	Ph.D in Management, Rutgers Business School, Newark, NJ