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## **Go (Con)figure: Subgroups, Imbalance, and Isolates in Geographically Dispersed Teams**

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## **Abstract**

Research regarding geographically dispersed teams (GDTs) is increasingly common and has yielded many insights into how spatio-temporal and socio-demographic factors affect GDT functioning and performance. Largely missing, however, is research on the effects of the basic geographic configuration of GDTs. In this study, we explore the impact of GDT configuration (i.e., the relative number of team members at different sites, independent of the characteristics of those members or the spatial and temporal distances among them) on individual, subgroup, and team-level dynamics. In a quasi-experimental setting, we examine the effects of configuration using a sample of 62 six-person teams in four different one- and two-site configurations. As predicted based on social categorization, we find that configuration significantly affects team dynamics – independent of spatio-temporal distance and socio-demographic factors. More specifically, we find that the social categorization in teams with geographically-based subgroups (defined as two or more members per site) triggers significantly weaker identification with the team, less effective transactive memory, more conflict, and more coordination problems. Furthermore, imbalance (i.e., the uneven distribution of members across sites) in the size of subgroups invokes a competitive, coalitional mentality that exacerbates these effects; subgroups with a numerical minority of team members report significantly poorer scores on identification, transactive memory, conflict, and coordination problems. In contrast, teams with geographically isolated members (i.e., members who have no teammates at their site) have better scores on these same four outcomes than both balanced and imbalanced configurations.

## Introduction

Work in geographically dispersed teams (GDTs) is not “new” (King and Frost 2002; O’Leary et al. 2002), but it is increasingly common as firms try to tap into distributed expertise, expand their market reach, provide employees with flexibility, and reduce real estate costs (Richman et al. 2002). Consequently, a substantial amount of research has examined GDTs’ processes and performance, exploring the effects of many different dimensions of dispersion including space, time, and socio-demographic characteristics (Griffith et al. 2003; Kirkman and Mathieu 2005; O’Leary and Cummings 2007). However, another dimension of geographic dispersion – i.e., configuration – remains relatively understudied.

Research on spatial distance has found that as the physical distance (measured in feet, meters, miles, or kilometers) between individuals increases, they communicate both less frequently and less effectively (e.g., Allen 1977; Van den Bulte and Moenaert 1998). In GDTs, members may be separated by thousands of miles - distance that increases inter-site communication failures (Kiesler and Cummings 2002; Olson and Olson 2000). Research has also found that perceived proximity (Wilson et al. 2008) and temporal distance (measured in time zones between members) have distinct effects above and beyond those caused by spatial distance. For example, teams spanning multiple time zones often experience significant challenges coordinating schedules and deliverables (e.g. Espinosa and Carmel 2003; Espinosa and Pickering 2006; Massey et al. 2003; Rutkowski et al. 2007; Saunders et al. 2004). Scholars of GDTs and traditional teams have also explored the role of other types of intra-team boundaries and differences, including organizational, cultural, national, and other socio-demographic ones (Bhappu et al. 2001; Espinosa et al. 2003; Gibson and Gibbs 2006; Hardin et al. 2007; Harrison and Klein 2007; Krebs et al. 2006). These socio-demographic differences (especially cultural and national) often co-vary with the aforementioned spatio-temporal dispersion in GDTs and often lead to tension and conflict (Jehn 1994).

In addition to these spatio-temporal and socio-demographic dynamics, work in GDTs is also affected by teams’ *geographic configuration*, which O’Leary and Cummings (2007) define as the number of geographically dispersed sites and the relative number of team members at those sites, independent of the spatial, temporal, and socio-demographic distances between them. Several previous studies allude to

the effects of configuration. For example, Armstrong and Cole (2002) observed conflicts caused by interactions between large and small sites; Baba, Gluesing, Ratner and Wagner (2004) recognized the coordination challenges of teams spanning many sites; and Grinter, Herbsleb and Perry (1999) noted the effects of members' geographic isolation on teammates' awareness of them. Nevertheless, despite the rapidly growing number of studies of GDTs in the last decade (e.g., see recent reviews by Axtell et al. 2004; Hertel et al. 2005; Hinds and Kiesler 2002; Martins et al. 2004; Powell et al. 2004; Webster and Staples 2006), few scholars have directly examined configuration.

The few studies of GDTs that have directly addressed geographic configuration have focused on -balanced subgroups. Studying student project teams split between Texas and Virginia, Cramton (2001) did not set out to examine configuration, but her case analyses noted important effects of geographic subgroups. She found that geographic subgroups quickly triggered in-group/out-group dynamics, which led to restricted inter-site information flow and, in turn, faulty attributions, reduced cohesion, and increased intra-group conflict. She concluded with a call for more research on subgroup dynamics due to the reality that most dispersed teams include colocated subgroups. Cramton and Hinds (2005) took up this challenge and extended the research on faultlines (Lau and Murnighan 1998) to internationally dispersed teams. They drew on theories of social identity, intergroup relations, and coalition formation to develop a theoretical model for how geographic dispersion might align with demographic diversity to heighten subgroup salience, thereby exacerbating ethnocentrism. At the same time, they proposed several moderators, which they claimed could shift teams' subgroup dynamics from ethnocentrism to cross-national learning. In fact, they proposed that subgroup salience is *necessary* for cross-national learning because it makes people more aware of each other's unique strengths. Though making a significant theoretical contribution, Cramton and Hinds' noted that they did "not address the differential consequences of how team members are distributed, e.g., numbers of locations and number of people at each location" (pp.256-7).

Polzer, Crisp, Jarvenpaa, and Kim (2006) examined this empirically, arguing that subgroups with more members fostered stronger faultlines, with detrimental effects on trust and conflict. With 45 teams of six graduate students each at 10 different universities, they found the highest levels of conflict and

lowest levels of trust in teams split between two sites, with three members per site. Teams with two members at each of three sites had moderate levels of conflict and trust, while teams with one member at each of six sites had the lowest levels of conflict and highest levels of trust. They also found that these effects were exacerbated when people at a site were also of the same nationality. This is consistent with the aforementioned work on faultline theory (Cramton and Hinds 2005; Lau and Murnighan 1998), which argues that the alignment of multiple salient attributes (e.g., geography and demography) triggers heightened subgroup categorization and polarization.

As Cramton and Hinds (2005) theorized and as Polzer et al. (2006) found, configuration – and more specifically geographically-based subgroups – can powerfully affect team processes. However, neither of these studies (nor any other studies of geographically dispersed teams) explored the effects of *uneven or imbalanced* distribution of members, or of the combination of subgroups and isolates within one team. In practice, however, team members are often located at sites of differing sizes – for example, a large cluster of members at a headquarters or production facility and individual members at satellite or regional offices. The prevalence of such configurations “in the wild” is borne out in Cummings’ (2004) sample of teams in a *Fortune 500* telecommunications company. Of the 115 teams that were geographically dispersed, 68 teams (59%) were very unevenly distributed, with one site containing at least 50% of the team members or twice the number of the next largest site. In a second sample of 214 GDTs from another *Fortune 500* firm (Cummings 2005), 193 teams (90%) had an uneven distribution of members across sites, including many geographic isolates.

Thus, studies with only balanced distributions of members across sites are at odds with the reality of GDTs. Furthermore, Polzer and colleagues’ (2006) theorizing that teams with larger subgroups activate stronger faultlines cannot fully explain the dynamics of teams with subgroups of varying sizes and isolated members. Given the prevalence of imbalanced subgroups and isolates, and the general dearth of research on configurations in GDTs, we set out to study the relative effects of numerical isolates, minorities, majorities, and equally-sized subgroups on team dynamics, while holding constant spatial, temporal, and socio-demographic differences. In so doing, we extend previous work on dispersion and address

Hinds and Mortensen's (2005: 304) observation that the field lacks an understanding of the "different dimensions of distributed work and how these dimensions shape team dynamics."

Our findings contribute to the literature in theoretical, methodological, and managerial terms. Building on our empirical findings, we advance the field's theoretical understanding of GDTs and show how and why the largely unaddressed dimension of geographic configuration affects teams' dynamics. Methodologically, whereas prior teams research has focused almost exclusively on individual- or team-level outcomes, our study couples these with the intermediate level of subgroups. Thus, we respond to calls for more meso- and multi-level research (House et al. 1995; Klein and Kozlowski 2000). Finally, for managers, our findings provide both a cautionary tale about the effects of geographic subgroups and a promising one about potential roles that geographic isolates may play.

### **Theory and Hypotheses**

In line with Cramton and Hinds (2005) and Polzer et al. (2006), we propose that geographic subgroups and imbalance between them contribute to many of the negative outcomes found in previous studies of GDTs [e.g., impeded communication (Cramton 2001; DeSanctis and Monge 1999), reduced trust (Jarvenpaa and Leidner 1999), and increased conflict (Mortensen and Hinds 2001)] and that these result from social categorization. Research on self-categorization and social identity posits that individuals examine their environment, distilling their co-workers into prototypes whom they categorize as members of their "ingroup" (similar) or "outgroup" (dissimilar) (for a review, see Hogg and Terry 2000). Such categorizations, in turn, powerfully shape behavior, with those in the ingroup valued more highly and treated better than those in the outgroup (Tajfel and Turner 1986). Beyond affecting behavior, categorization changes perceptions of individual members of both ingroups and outgroups, as people maximize similarities within and differences between ingroups and outgroups (Brewer and Harasty 1996; Campbell 1958; Hamilton 1998; Sherman et al. 1999). This results in individuals holding attitudes and opinions more similar to their ingroup (Phillips and Loyd 2006) and renders outgroup members less easily identifiable (Taylor et al. 1978), with outgroups perceived as more homogenous than ingroups (Mullen and Hu 1989). In the next section, we elaborate on the ways in which different configurations trigger categorization, affect-

ing identification with the team, the development of transactive memory systems, and conflict and coordination problems with teammates. In brief, subgroups serve as a strong basis for intra-team categorization in general, which has a negative effect on identification, transactive memory, conflict, and coordination. Subgroups that are imbalanced in size heighten this effect, with numerical minority subgroups feeling its effect more than numerical majorities in imbalanced teams. In contrast, isolates are qualitatively different from minorities and do not trigger the same categorization-driven effects.

The existence of geographic *subgroups* provides a basis for the social categorization. Research finds that individuals categorize themselves and others on the basis of the characteristics that are most distinctive at a given moment (Cota and Dion 1986; Hogg and Turner 1987) and that most differentiate them (Cohen and Swim 1995; Nelson and Miller 1995). Geographic subgroups are highly salient and clear differentiators in GDTs, triggering intra-group social categorization on the basis of team members' physical location. Thus, individuals are likely to attribute ingroup status to team members at the same location and outgroup status to those at distant locations. The role of subgroup boundaries as a likely basis for categorization was suggested by Polzer et al. (2006) and Cramton and Hinds (2005) explicitly compared categorization based on subgroups with categorization based on other, typically demographic dimensions. In the case of both Polzer et al. and Cramton and Hinds, however, categorization was based on, and limited to, balanced configurations in which all sites contained the same number of members – a configuration that, as noted, rarely exists in the wild.

Beyond the general effects of subgroups, *imbalance* in the relative size of subgroups will have additional effects on categorization and subsequent GDT dynamics. Research suggests that social minorities categorize more strongly due to their greater strategic need for solidarity (Hogg 2001; Simon 1992), thus strengthening the categorization effects for minorities. In addition, unevenness in the size of subgroups heightens minority subgroups' perceptions of inequity and defensiveness, while exacerbating majority subgroups' perceptions that the minority constitutes a problematic roadblock, increasing the general tension, politicization, and conflict between minority and majority subgroups (Mannix 1993). In contrast, though there may be tension between balanced subgroups, their equal size adds a certain equilibrium to



the situation, keeping that tension in check. Since neither subgroup can outvote the other in a balanced configuration, they are less likely to engage in direct conflict and more likely to coordinate their knowledge and activities more carefully. Thus, we believe that configurational imbalance plays a critical, distinct, and as yet unexamined role.

Though teams with a collocated cluster of members and a geographic *isolate* might be considered as the extreme case of imbalance and those isolates might be classified along with other minority subgroups, we do not consider them as such. We believe there is a qualitative difference between the experience of a geographic subgroup – even one with only two members – and the experience of a geographically isolated individual. As a collection of collocated teammates, geographic subgroups provide a context for face-to-face and more unplanned interactions that isolated members lack. Although interaction among ingroup members is not a necessity for ingroup formation, such interaction is likely to increase individuals' identification with that group (Ashforth and Mael 1989) and may provide a basis for categorization (Hogg and Turner 1985; Turner 1984). Isolates, however, lack such interactions with local teammates, which would otherwise reinforce their own local distinctiveness and, thus, differentiate them from distant others. Furthermore, isolates provide a weak basis for ingroup/outgroup differentiation for the rest of their team and, therefore, fail to trigger strong ingroup categorizations among their teammates. Thus, in contrast to teams with both balanced and imbalanced subgroups, we believe that isolates will not trigger negative categorization-driven effects and may, in fact, trigger distinctly positive effects on the basis of their isolated status.

To examine the effects of such configuration-based categorization, we focus on four team dynamics known to be critical to team functioning (Arrow et al. 2001) and GDT success (Hinds and Mortensen 2005): identification, transactive memory, conflict, and coordination problems. In the following four sections, we hypothesize about the effects of the three basic configurations outlined above (a. subgroups, b. imbalance, and c. isolates) on each dynamic (1. identification, 2. transactive memory, 3. conflict, and 4. coordination problems). In short, we believe subgroups trigger social categorization that harms team-wide identification and transactive memory and heightens conflict and coordination problems. We further be-

lieve those effects are more severe for minority subgroups, but not for isolates, who trigger effects that are distinct from those of sites with a collocated minority. We summarize these hypotheses in Table 1.

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## **Identification**

Researchers studying identity in teams have repeatedly found that identification with the team is a key antecedent of effective functioning and success (Fiol and O'Connor 2005). For example, Brown and Wade (1987) found that groups lacking a distinct identity performed more poorly than those with established identities. Moore, Kurtzberg, Thompson, and Morris (1999) also identified the lack of a shared team identity as a major impediment to rapport building and a team's ability to reach consensus. Research regarding GDTs has found similar effects. For example, Hinds and Bailey (2003) argue that the members of teams with low identification are less likely to discuss issues when they occur, thereby impeding their ability to work through and resolve those issues effectively.

We believe geographically-defined subgroups within a team will be the most salient basis for identification, in turn causing members to identify less with the team as a whole. Many researchers have found that individuals hold multiple, overlapping, and often nested identities (Ashforth and Mael 1989; Brewer 1995). The existence of multiple identities necessitates a ranking process through which some identities are considered more salient and, thus, more likely to be invoked than others. Within organizational settings, this process is based on both the subjective importance attributed to an identity and its relevance to the current situation (Ashforth and Johnson 2001). Generally speaking, research has shown that lower order identities are more subjectively important and relevant to the situation than higher-order identities (Brewer 1995; Lawler 1992). Ashforth and Johnson (2001) build on van Knippenberg and van Schie (2000), giving four reasons that all apply to geographic subgroups. First, a geographic subgroup is more likely to form an individual's primary group than is the overall team due to greater intra-subgroup versus team-level interaction. Second, shared experience and context leads to greater perceived similarity and

consequently greater entitativity (Brewer and Harasty 1996) with members of the same geographic subgroup, and through that to a subgroup-level identity. Third, as individuals balance the need for assimilation and distinctiveness (Brewer 1991), subgroups provide more intimate settings with greater distinctiveness and exclusivity than a team-level identity. Finally, as organizations continue moving toward flatter, more laterally-linked work environments, individuals rely increasingly on more fluid and lower bases of identity (Stroh et al. 1994). Taken together, this suggests that individuals are more likely to identify with their geographic subgroups at the cost of identifying with the, overarching team. Thus, we hypothesize:

***Hypothesis 1A:*** Teams with geographically-defined subgroups will report lower identification with the team than teams without such subgroups.

Imbalance in the size of a team's subgroups increases these effects, which will be felt particularly strongly by the members of the minority. Research suggests that social minorities exhibit stronger categorization effects as a result of their greater need for solidarity and affiliation (Hogg 2001; Simon 1992), resulting in an even greater tendency by minority members to favor subgroup over team-level identification. Compounding this effect are findings that the existence of minorities may also prompt majority members to exaggerate within-group commonalities and between-group differences (Tajfel and Wilkes 1963). We expect, however, that the effects will be stronger for minority members as majority members may seek to exert their numerical dominance by co-opting the team-level identity and claiming it as their own. This suggests that minority status will strengthen minority subgroup members' focus on subgroup rather than team-level identity, thus we expect the members of minority subgroups will identify less with the team than will their majority counterparts:

***Hypothesis 1B:*** Among teams with geographically-defined subgroups, members of minority subgroups will identify less with the team than members of majority or balanced subgroups.

In contrast, we do not believe the same categorization effects will be triggered in teams with geographic isolates, as they do not form a meaningful basis for identification. Though some research building on Kanter's (1977b) work suggests that the negative effects found for minorities are likely to be even stronger for solos (Heilman 1980; Taylor 1981), this work typically confounds category bases with status.

Studies of equal or high-status solos find no negative effects and, in fact, some positive effects of solo status. For the isolates themselves, research has found that lower-order identities can be too exclusive, thus threatening the desire for inclusiveness which partially motivates the identification process (Brewer 1991). Self-identifying as isolates would leave individuals with no ingroups, so isolates are more likely to invoke higher-order identities (Ashforth and Johnson 2001). Furthermore, even if they choose to identify with their isolate status, they lack the reinforcement that would otherwise be provided by one or more collocated teammates. As research has shown, individuals look to their immediate social interactions to form and maintain social prototypes (Fiske and Taylor 1991), which form the basis of their ingroup and differentiate it from their outgroup. Without collocated colleagues to form their ingroup, isolates are likely to identify with the next-most-relevant group – i.e., the team as a whole. In support of this, in recent work on demographically-based tokenism, Loyd, White, and Kern (2008) argued that groups with duo token members are likely to experience greater self-categorization and less cohesion than similar groups with solo token members.

For the non-isolated team members, we would expect high identification with the team, because they constitute the vast majority of it and because a lone isolate at the other site is likely to trigger a weak outgroup response, if any at all. Furthermore, an isolate's identification with the entire team is likely to prompt him or her to engage in positive, pro-social team communication and other beneficial behaviors (for a discussion, see Hogg and Terry 2000). To the extent these behaviors are perceived by the rest of the team, they are likely to engender a reciprocal response yielding greater identification and inclusiveness.

Thus, we expect that:

***Hypothesis 1C:*** Teams with geographic isolates will experience higher levels of identification with the team than teams with balanced or imbalanced subgroups.

### **Transactive Memory**

Transactive memory systems are multi-member cognitive systems which groups of individuals efficiently organize, store, retrieve, and share information (Lewis 2003). In effective transactive memory systems, team members use their awareness of other members' domains of expertise to maximize the

breadth and depth of the team's collective knowledge, while minimizing redundancy and effort (Brandon and Hollingshead 2004; Hollingshead 2001; Moreland et al. 1996; Wegner 1987). This is accomplished by differentiating, identifying, and integrating members' domains of expertise (Nonaka and Takeuchi 1995). Successful transactive memory systems reflect three basic characteristics. First, knowledge is specialized – differentiated across members. Second, knowledge is credible – members trust in the knowledge held by others. Third, knowledge is coordinated – members know who has what expertise and how to access it (Liang et al. 1995; Moreland and Myaskovsky 2000).

We believe subgroup boundaries will serve as an impediment to knowledge coordination and reduce the perceived credibility of team members outside an individual's subgroup – thus, hindering the development of effective transactive memory systems. Because categorization exaggerates perceived similarities within groups, it renders members less uniquely identifiable (Taylor et al. 1978) and makes the recognition of specialized knowledge more difficult. Also, bias toward ingroup interaction will result in individuals having less exposure to, and thus information about, outgroup members' knowledge – knowledge that again is perceived as less differentiated. When specialized knowledge is identified, given that outgroups arouse more negative affect and less trust (Kramer and Brewer 1984), outgroup members' knowledge is likely to be viewed as less valuable and credible by ingroup members. Finally, even if identified and viewed as credible, the inclination to assume that outgroup members' will be competitive rather than cooperative (Schopler and Insko 1992) reduces the likelihood that individuals will coordinate knowledge with outgroup members. Thus, transactive memory is likely to suffer in subgroup configurations as a result of intra-team social categorization and its resultant reductions in source credibility and coordination, yielding our next hypothesis:

***Hypothesis 2A:*** Teams with geographically-defined subgroup configurations will report less effective transactive memory than teams without such subgroups.

Imbalance in subgroups will reinforce members' reticence to share information necessary for effective transactive memory formation, thus further reducing the likelihood of effective transactive memory within imbalanced teams, and particularly for the members of minority subgroups. Research in

collocated groups indicates that people tend to seek consensus and respond negatively to potentially deviant minorities (Hogg 2001). These negative responses will lead minority subgroups to distance themselves from, and be distanced by, majority subgroup teammates – beyond that resulting from simple out-group categorization. This distancing will result in both the minority and majority subgroups restricting communication with each other, which will cause individuals in numerical minorities to know less about their majority counterparts and, thus, perceive their majority teammates as less credible. Similarly, majority subgroup members will learn less about their minority teammates, but sheer numbers will give them knowledge about a greater percentage of the team's members. As a result, we hypothesize that:

***Hypothesis 2B:*** Among teams with geographically-defined subgroups, members of minority subgroups will experience less effective transactive memory than members of majority or balanced subgroups.

The reverse, however, will occur in teams with geographic isolates, who will both give and receive information more readily within the team. As with identification, in contrast to teams with geographic subgroups (balanced and imbalanced), teams with geographic isolates trigger weak, if any, categorization, and as such, avoid its negative impacts on team member coordination and credibility. Furthermore, the inherent novelty and uniqueness of a geographic isolate increases his or her salience to the other members of the team (see Fiske and Taylor 1991 for a discussion), making that individual and his or her knowledge more readily accessible and distinctive to teammates seeking information. This increases the likelihood that an isolated individual's knowledge will be located and utilized effectively. Conversely, an isolate's physical separation from the rest of the team forces that individual to engage more actively in information seeking behaviors in order to keep abreast of team activities. This increases the likelihood that an isolate will be able to locate and utilize knowledge held by distant teammates effectively. Thus, we hypothesize that:

***Hypothesis 2C:*** Teams with geographic isolates will experience more effective transactive memory than teams with balanced or imbalanced subgroups.

## **Conflict**

Researchers have differentiated among three types of conflict: affective (interpersonal), task, and process conflict (see Jehn 1997 for a discussion). We believe subgroup differences will serve as a basis for inter-subgroup conflict. Driving this, the categorization of individuals as outgroup members brings with it derogation (Tajfel 1982), which is likely to result in affective conflict. In addition, Hewstone (1990) found that outgroup members were attributed more personal responsibility for negative outcomes, thus increasing the likelihood of affective conflict. We expect similar increases in both task and process conflict as a result of reduced interaction and information sharing across subgroups. Cramton (2001) found evidence of this in a study of distributed student teams in which conflict frequently arose due to incomplete or uneven information exchange. Thus, we hypothesize:

***Hypothesis 3A:*** Teams with geographically-defined subgroup configurations will report more conflict than teams without such subgroups.

Any inter-site tensions will be magnified in contexts where members perceive a power imbalance, and will be felt particularly strongly by members of the minority. Power imbalances in general have been found to produce strong negative emotions and conflict (Sell et al. 2004). Based on these findings and three other streams of research, we expect that conflict will be perceived more strongly (negatively) by members of minority subgroups. First, Social Impact Theory (Latane et al. 1979) states that larger groups engender more social loafing by making individual contributions less easily distinguishable. This suggests that those in majority subgroups will loaf more, likely causing resentment among the minority subgroup members. This, in turn, will engender conflict over motivation and effort levels that will be especially pronounced for minority subgroup members. Second, conflicts are manifested most prominently in terms of competition for recognition, status, and power (Brewer 2001). In imbalanced teams, the minority subgroup will tend to seek recognition, status, and power, while the majority subgroup will struggle to protect it. Minority status also increases competition between members of the minority subgroup (Ellemers et al. 2004). This intra-subgroup competition occurs due to those minority members perceiving an advantage

in being solo (Kanter 1977a) and trying to distance themselves from other minority members to avoid being categorized by the majority (Phillips and Loyd 2006). Third, given their size, majority subgroups tend to perceive themselves as more influential. Absent any special expertise, however, they lack the authority to justify that perceived influence (Hogg 2001). Members of minority subgroups are likely to perceive this gap, prompting resentment and thereby reducing their identification with the team as a whole. Taken together, social impact theory, resource competition, and perceived inequality lead us to hypothesize that:

***Hypothesis 3B:*** Among teams with geographically-defined subgroups, members of minority subgroups will experience higher levels of conflict than members of majority or balanced subgroups.

However, isolates will not trigger the same inter-site tensions as subgroup conditions, and increased intentionality of communication with the isolate may reduce potential issues when they arise. The lack of categorization in teams with isolates reduces the likelihood of the inter-site tensions that prompt conflict between sites. In addition, isolates' identification with the entire team is likely to prompt increased interaction with distant teammates. This interaction helps compensate for meaning lost due to the use of mediating technologies (Zack 1993) and helps teams catch and resolve concerns before they escalate (Kiesler and Cummings 2002). As noted by Cramton (2001) and Hinds and Mortensen (2005), such communication across sites can considerably reduce inter-site conflict. Thus, the lack of inter-site categorization-driven tensions, coupled with increased interaction leads us to hypothesize that:

***Hypothesis 3C:*** Teams with geographic isolates will experience less conflict than teams with balanced or imbalanced subgroups.

### **Coordination Problems**

For teams to accomplish their tasks successfully, they must coordinate their work by managing the dependencies among task components, resources, and personnel (Malone and Crowston 1994). We believe the existence of subgroups will impede cross-site coordination as members focus on the needs of their site over those of the team as a whole. Research has shown that ingroup/outgroup distinctions are likely to lead members to exhibit competitive rather than cooperative behavior (Brewer and Kramer 1986;



Schopler and Insko 1992), thereby reducing the likelihood that they will coordinate their efforts effectively. Furthermore, the lack of contextual information resulting from ingroup homophily and corresponding outgroup avoidance (Coser 1956; Sherif et al. 1961) is likely to leave team members confused about or unaware of distant teammates' activities and work processes (Cramton 2002; Grinter et al. 1999; Hoegl and Proserpio 2004). Lacking this contextual information, teams find it more difficult to coordinate their work, accomplish their tasks (Clark and Brennan 1991; Fussell and Krauss 1992), and resolve coordination problems when they arise (Cramton 2002; Kraut et al. 2002). Thus, we next hypothesize:

***Hypothesis 4A:*** Teams with geographically-defined subgroup configurations will report more coordination problems than teams without such subgroups.

Making these effects stronger, imbalance introduces the possibility of lopsided coordination efforts which will be born disproportionately by members of the minority. Effective coordination depends heavily on good communication. Given the threats to team identification, the lower transactive memory, and higher conflict described above, and given the ability of majority members to out-vote majority members on coordination-related decisions about schedules, deadlines, task assignments, etc., members of minority subgroups are likely to experience more significant coordination problems than members of majority or balanced subgroups. In her examination of the effects of power imbalance on resource allocation, Mannix (1993) argues that members of imbalanced groups are likely to take on a competitive rather than cooperative stance, which leads to a spiraling effect in which all members behave competitively in an effort to protect their own interests. Thus, we hypothesize that:

***Hypothesis 4B:*** Among teams with geographically-defined subgroups, members of minority subgroups will experience higher levels of coordination problems than members of majority or balanced subgroups.

Isolates, however, introduce little additional coordination overhead and may, in fact, serve to motivate greater and more effective coordination among other members of the team. Teams with isolates will share additional coordination-relevant contextual information because they lack the inter-site categorization effects and have increased interaction arising from the isolates' identification with the entire team. Furthermore, it is possible that isolates may serve valuable informational roles in teams by acting as dev-

il's advocates and thereby prompting teammates to assess their task strategy more effectively (Valacich and Schwenk 1995). Absent the intergroup tensions arising from subgroup configurations, the increased salience of an isolate's solo status will make all members more likely to recognize the need for, and enact, explicit coordination mechanisms. Thus, given the lack of inter-subgroup categorization and the potential coordination-benefits of devil's advocacy and isolates' increased salience, we hypothesize that:

***Hypothesis 4C:*** Teams with geographic isolates will experience fewer coordination problems than members of teams with balanced or imbalanced subgroups.

## **Methods**

### **Sample**

To test our hypotheses, we conducted a quasi-experimental study in which we assigned subjects to 62 teams with six members each (two additional teams with only five members were dropped from our analyses). Our subjects were undergraduates enrolled in two semester-long organizational behavior courses taught by the authors at two medium-sized universities – one in the United States and one in Canada. We obtained demographic and background information about the students from the universities' registrars and a survey we administered at the beginning of the semester. The subjects' average age was 20.5; 93.1 percent of them were majoring in business or management-related fields; 62.1 percent grew up in the U.S., 19.9 in Canada, and 17.9 percent in 14 other countries; 48.7 percent were women; all spoke fluent English and 77.7 percent spoke it at home.

We divided the 62 teams among four distinct geographic configurations: collocated teams consisted of six members all at the same geographic location (6-0); distributed-with-isolate teams consisted of five members at one site, working with one team member at the distant site (5-1); distributed-imbalanced teams consisted of four members at one site and two at the other (4-2); and distributed-balanced teams were evenly split, with three members at each of the two sites (3-3). Within the constraint of the number of subjects available at each location, we strove for roughly equal numbers of teams in each configuration, resulting in 19 collocated teams, 15 distributed-with-isolate teams, 11 distributed-

imbalanced teams, and 17 distributed-balanced teams. We treated teams with reciprocal configurations (e.g., 4 members in Canada and 2 in the U.S. vs. 2 in Canada and 4 in the U.S.) as functionally equivalent.

As we noted earlier, prior work has highlighted the importance of both spatio-temporal and socio-demographic differences among sites. Because all subjects in the study were located in one of two locations, that were within the same time zone and too far apart to allow for face-to-face interaction, our experimental setting controlled for spatial and temporal distance among team members. With respect to socio-demographic dimensions, we assigned students to teams to minimize potential faultlines wherein the geographic subgroups coincided with socio-demographic subgroups based on gender, ethnicity, age, nationality, education (major), or primary language. In general, we were successful in avoiding the creation of faultlines. Of the 62 teams, there was only one in which education aligned with geographic subgroup (the geographically isolated member was also the only non-management major); two in which language aligned with geographic subgroup (the only geographically isolated member was also the only 1<sup>st</sup>-language French speaker); and four in which gender aligned with subgroup (the Canadian members were all females and the U.S. members were all males). Besides these seven teams, there were no others where geographic subgroups aligned with demographic subgroups on the basis of gender, ethnicity, age, nationality, education, or primary language. We re-ran our analyses with these seven teams removed and found no change to the pattern of our results. Therefore, we present data for all 62 teams.

To explore the effects of subgroups on GDT dynamics, we considered the four configurations in two basic categories depending on whether they had geographically-defined subgroups (Figure 1). The first category included the two conditions with geographically-defined subgroups – i.e., the distributed-balanced (3-3) and distributed-imbalanced (4-2) configurations. The second category included the two conditions without such subgroups – i.e., the collocated (6-0) and distributed-with-an-isolate (5-1) configurations. We used these categories for our tests of Hypotheses 1A, 2A, 3A, and 4A. To compare the experience of team members in the numerical minority with non-minority members, we examined the data at the subgroup level in our tests of Hypotheses 1B, 2B, 3B, and 4B. Finally, we compared the expe-

riences of GDTs with isolates to GDTs with balanced and imbalanced subgroup configurations in our tests of Hypotheses 1C, 2C, 3C, and 4C.

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Insert Figure 1 about here  
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### **Procedures, Task, and Data Collection**

Subjects worked in their teams to complete a final written deliverable. They had slightly more than three weeks from the time they received their team rosters until the time their reports were due. Each team selected a topic from the course (drawing from a list we provided or proposing a related topic of their own) and had to expand on it in an 8-10 page written report. Sample topics included conflict management, innovation, diversity, leadership development, and knowledge management. We asked teams to summarize the current state of knowledge about their topic based on business press and academic sources. With that background research as a guide, teams had to describe how the topic is currently handled or manifested in at least two real organizations. These descriptions could be based on public sources, but we required teams to interview at least two employees in their two focal organizations. Students were encouraged to use organizations to which they had direct access to facilitate these interviews, which could be conducted face-to-face, by phone, or via email. Though some teams used small, local organizations or franchises, most focused on large, national or international corporations (e.g., Home Depot, Fidelity, Bank of Montreal, Amazon) about which business or general press coverage was readily available.

Apart from the list of potential topics and a required one paragraph description of their chosen topic and target organizations due one week into the project, we provided no other structure for the teams, forcing them to take responsibility for their own schedule, roles, responsibilities, task strategies, and work processes. In this sense, they met key criteria for “real teams” not simply “co-acting groups” (Hackman 1990). We designed the task to be multiplex (Arrow et al. 2001) requiring creativity, decision-making, coordination, and cooperation among team members. Given the amount of work required and the need to interview people in two off-campus organizations, it would have been difficult for any one member to do

the whole project, but neither we nor the task dictated how interdependently subjects had to work, leaving it up to them to determine their own division of labor (Wageman and Gordon 2005).

Because employees working in real organizations generally choose from a wide range of communication technologies (Watson-Manheim and Bélanger 2007), we provided teams in our study with a realistic “communication portfolio” (Lee et al. 2007). Both distributed and collocated teams received the email addresses of all teammates and had free access to audio and video conferencing. We also allowed subjects to use any media to which they had access, including: audio and video conferences, 1-to-1 telephone calls, instant messaging, email, and face-to-face meetings among some or all collocated teammates. Though it was possible for teams to create their own listservs using free, publicly available tools (e.g., Yahoo Groups), we did not provide teams with listservs in order to avoid biasing them toward all-team communication. This feature of our design contrasts with many previous experimental and quasi-experimental studies (including Polzer et al. 2006) in which teams were provided with listservs, discussion boards, or chat rooms and their communications were constrained to one of those media. Though this made it impossible for us to archive the teams’ communications, we opted to favor realism by maximizing the choices available to them and minimizing the constraints on their communication – whether team-wide or in subgroups. We also asked subjects to report on the frequency with which they used different media.

Even among collocated teams, email was by far the most frequently used medium (used an average of 5.62 times per week per student). Face-to-face communication was the next most frequently used medium at an average of 1.98 times per week, followed by instant messaging at 1.41 times per week. Telephone (1-to-1 or conference) and video conferencing were rarely used (.54 and .01 times per week on average, respectively). Communication among collocated teammates was more frequent in general, but the relative frequencies by media were the same as overall team-wide communication (i.e., email was most frequent followed by FTF, IM, and telephone). Students were required to complete these team projects as a class assignment. Their experiences doing the projects provided a basis for subsequent class discussions and at the end of the term they were required to write reflection papers on their experiences

working in the teams. Students could also use their work on the projects as input for a final class assignment (which was not part of the study). When we started this study, previous research led us to believe that certain configurations would do worse than others. Thus, ethical concerns kept us from evaluating students on their performance in the teams. However, the close integration with class discussions and the reflection paper assignment helped motivate students to engage actively in the team projects.

In addition to the background survey administered at the beginning of the term, we conducted a web-based survey immediately after students submitted their projects, asking about their perceptions of and interaction with each of their teammates and their teams in general. We assured them that: 1) their responses were confidential, 2) they would not be seen by their teammates, 3) they would not be seen by us until after their grades had been determined, and 4) they would not influence those grades. In this way, we sought to obtain candid responses, which we analyzed at the individual, subgroup, and team level.

### **Dependent Variables and Measures**

We examined four dependent variables (identification, transactive memory, conflict, and coordination), all of which have been found to have strong ties to team performance (Arrow et al. 2001).

*Identification.* As Hinds & Mortensen (2005) did, we used Aron's (1992) pictorial measure of interpersonal closeness and adapted it to team level to assess identification. We adapted this measure to the team-level by providing team members with a set of six graphical representations of relationships between "self" and "other" and asking them to select the number corresponding to the picture that most closely matched their relationship with their team (1 = very distant, 6 = very close). The mean of all team members' individual ratings was used as a team-level measure of identification with the team.

*Transactive memory.* We used Lewis' (2003) measure of transactive memory, asking respondents to rate the accuracy of 15 statements about their team (e.g., "I have knowledge about an aspect of the project that no other team member has" and "I trust that other members knowledge about the project is credible") using a five point Likert scale anchored by 1 = "Not at all accurate" and 5 = "Very accurate." We used the individual-level mean across all 15 statements as a measure of transactive memory, with high reliability ( $\alpha = .93$ ). The mean of all team members' individual ratings was our team-level measure of

transactive memory and the mean of the individual ratings of all team members at the same location was our measure of subgroup-level perceptions of team transactive memory.

*Conflict.* We measured conflict using relationship conflict scales developed by Jehn (1995) and further refined by Jehn and Mannix (2001). Respondents answered nine questions about conflict frequency (e.g., “How much conflict is there in the team about task responsibilities?”) using a five-point Likert scale anchored by 1 = “Not at all” and 5 = “Very much.” We averaged these scores according to Jehn’s model to form indices of affective, task, and process conflict as well as a measure of overall conflict, all with high reliability ( $\alpha = .94$ ,  $\alpha = .85$ ,  $\alpha = .89$ , and  $\alpha = .86$ , respectively). The measures of affective, task, and process conflict were highly correlated with each other (average correlation = .81,  $p < .01$ ) and with the measure of overall conflict (average correlation = .93,  $p < .01$ ). In our initial analyses, each type of conflict produced similar patterns of results, so we report results based on the measure of overall conflict. We used the mean of all team members’ individual ratings as team-level measures of conflict. To create ratings of subgroup-level perceptions of overall team conflict, we used the mean of the individual ratings of all team members at the same location.

*Coordination problems.* Lastly, we measured coordination problems using respondents’ ratings of the extent to which they faced a set of five coordination challenges (e.g., “incompatibility between different team members’ tools and/or work processes”) on their team (as in Hinds and Mortensen 2005). They responded using a 5-point Likert scale (1 = not at all, 5 = very much). We calculated a mean of the five items to create an individual-level measure of coordination problems with high reliability ( $\alpha = .86$ ). We used the mean across all members in the team as a measure of team-level coordination problems and the mean across all members at a given location as a measure of subgroup-level coordination problems.

## Results

We present descriptive statistics for each of our measures in Table 2.

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Insert Table 2 about here  
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To test our hypotheses, we conducted a series of ANOVAs. To test H1A, H2A, H3A, and H4A, we compared *team-level* ratings for configurations with and without subgroups (i.e., 3-3 and 4-2 vs. 6-0 and 5-1, respectively). To test H1B, H2B, H3B, and H4B, we divided the sample into teams with and without subgroups and then compared *site-level* ratings of each of the constructs for minority vs. non-minority subgroups. This yielded ANOVAs of 2s vs. 3s and 4s for the subgroup condition and 1s vs. 5s and 6s for the non-subgroup configurations. Finally, to test H1C, H2C, H3C, and H4C, we compared *team-level* ratings of distributed teams with and without isolates (5-1 vs. 3-3 and 4-2, respectively)

In our first set of hypotheses (H1A, H2A, H3A, and H4A), we argued that teams with subgroups will perform more poorly than those without them on four dimensions: identification, transactive memory, conflict, and coordination problems. ANOVAs comparing subgroup vs. non-subgroup teams supported these hypotheses. First, teams with subgroups had lower identification than non-subgroup teams ( $M = 3.03$  vs.  $M = 3.75$  respectively) and that difference was significant ( $F = 23.83$ ,  $df = 60$ ,  $p < .001$ ). Second, teams with subgroups had significantly lower transactive memory than non-subgroup teams ( $M = 3.42$  vs.  $M = 3.79$  respectively and  $F = 9.24$ ,  $df = 60$ ,  $p < .01$ ). Third, teams with subgroups had higher conflict than non-subgroup teams ( $M = 2.21$  vs.  $M = 1.76$  respectively), which was also statistically significant ( $F = 9.90$ ,  $df = 60$ ,  $p < .01$ ). Fourth and finally, teams with subgroups had significantly more coordination problems than teams without subgroups ( $M = 2.94$  vs.  $M = 2.51$  respectively and  $F = 9.51$ ,  $df = 60$ ,  $p < .01$ ). Thus, we find support for H1A, H2A, H3A, and H4A.

In our second set of hypotheses (H1B, H2B, H3B, and H4B), we suggested that members of minority subgroups would have more negative experiences than those in majority subgroups. These minority subgroup dynamics often began with majority subgroups' claims to sheer numerical power. As one subject reported after the completion of her project, "When we started [to] work with them, we were optimistic ... but then [our four teammates at the other site] threatened to 'out-vote' us on several key decisions. The two of us here had little we could do in response and things devolved from there." ANOVAs comparing numerical minority subgroups (two people per site) with numerical non-minority subgroups (three and four people per site) partially supported this hypothesis. As shown in Table 2, among teams with sub-



group configurations, teams with geographic minorities reported significantly lower identification than non-minorities ( $M = 2.32$  vs.  $M = 3.15$ , respectively;  $F = 11.41$ ,  $df = 54$ ,  $p < .01$ ). Furthermore, geographic minorities reported lower transactive memory than non-minorities ( $M = 2.99$  vs.  $M = 3.48$ , respectively;  $F = 4.66$ ,  $df = 54$ ,  $p < .05$ ). Geographic minorities also reported more coordination problems than non-minorities ( $M = 3.39$  vs.  $M = 2.87$  respectively), but the significance of that difference was only suggestive ( $F = 3.82$ ,  $df = 54$ ,  $p < .06$ ). Finally, although minority configurations did report higher conflict than non-minority teams ( $M = 2.53$  vs.  $M = 2.16$  respectively), that difference was not significant ( $F = 1.93$ ,  $df = 54$ , n.s.). Thus, we find strong support for hypotheses 1B and 2B, suggestive support for 4B, but no support for hypothesis 3B.

In our third set of hypotheses (H1C, H2C, H3C, and H4C), we suggested that members of teams with geographic isolates would have less negative experiences than those in teams with subgroup configurations – either balanced or unbalanced. ANOVAs comparing distributed-with-isolates vs. distributed-without-isolates teams supported these hypotheses. Teams with an isolate reported significantly higher identification than did teams with subgroups ( $M = 3.71$  vs.  $M = 3.03$ ;  $F = 15.49$ ,  $df = 41$ ,  $p < .01$ , respectively). Furthermore, teams with isolates had more effective transactive memory systems than those with balanced or imbalanced subgroups ( $M = 3.79$  vs.  $M = 3.55$ , respectively;  $F = 4.81$   $df = 41$ ,  $p < .01$ ). Teams with isolates also reported lower conflict than teams with balanced or imbalanced subgroups ( $M = 1.69$  vs.  $M = 2.21$ , respectively;  $F = 7.35$ ,  $df = 41$ ,  $p < .01$ ). Lastly, teams with isolates reported significantly fewer coordination problems than their counterparts with balanced or imbalanced subgroups ( $M = 2.51$  vs.  $M = 2.94$  respectively) and that difference was also significant ( $F = 4.84$ ,  $df = 41$ ,  $p < .10$ ). Thus, we find strong support for hypotheses 1C, 2C, 3C, and 4C.

## **Discussion**

We began this work noting that research and theory on GDTs has focused on issues of spatio-temporal dispersion and socio-demographic differences, with almost no examination of the configurational characteristics of those teams. To gain further insights into such characteristics, we designed this study

to answer the question: “How do different configurations affect the dynamics of GDTs?” and verify our assumption that, controlling for spatio-temporal dispersion and socio-demographic differences, differences in geographic configuration affect the dynamics of GDTs. We found that not only did configuration significantly affect GDT dynamics, but also that a key determinant of those dynamics was the existence of geographically-defined subgroups. We found that such subgroups led to significant negative outcomes with respect to identification, transactive memory, conflict, and coordination problems. We also found that members of minority subgroups were at a significant disadvantage with respect to identification and transactive memory (and, marginally, coordination problems) when compared to their non-minority counterparts. This supports our underlying theoretical framework, which holds that minority subgroup members bear the brunt of the tensions in their teams. Furthermore, this highlights the extent to which team members’ experiences may vary across sites within the same team, based solely on differences in configuration. Finally, we found that teams with geographic isolates avoided the negative dynamics experienced by teams with subgroups, suggesting that they might, in fact, experience some surprisingly positive outcomes for both the isolates and their distant, collocated teammates.

### **Addressing Alternative Explanations**

Two potential alternative interpretations and explanations for our results involve the role of isolates and minority status. First, it is plausible that the positive results for teams with isolates were due to the collocated five team members ignoring or excluding their distant, isolated teammate, as was apparently the case in Bos et al’s (2004) simulations; 5-1 teams might devolve into de facto 5-0 teams, leaving isolates with little room to contribute to or influence their teams. However, further examination of the data indicates that this was not the case. We asked all subjects to rate the contribution and influence of, and their communication with, each teammate. Isolates’ collocated teammates did not rate the isolates significantly lower in terms of contribution to the team than they rated their collocated teammates ( $M = 3.85$  vs.  $M = 3.81$ , respectively,  $F = .06$ ,  $df = 83$ , n.s.), influence on the team ( $M = 3.49$  vs.  $M = 3.46$ , respectively,  $F = .01$ ,  $df = 44$ , n.s.), or communication with the team ( $M = 1.67$  vs.  $M = 1.88$ , respectively,  $F = .14$ ,  $df = 83$ , n.s.). Isolated members were not simply excluded from communication, and they were

able to contribute to and influence the team. As one subject who was part of a five-person collocated subgroup reported after completion of the project, “We could have just ignored [John, our geographically isolated teammate], but we didn’t want to leave John out completely and he turned out to be an influential member of the team even though he was far away from the rest of us. If anything, he forced us to be more explicit about how we were going to work together to ensure that he wasn’t left out.” This may help explain why collocated subgroups were not perceived as more dominant in Pena et al’s recent study (2007).

Second, we suggested that the effect of minority status occurs only within teams with subgroups, (not those with isolates, which some might consider “extreme minorities”). This raises the question of whether all forms of minority status have an effect in all teams, with that effect just being stronger in teams with subgroups than teams with isolates. If this were the case, we would expect the experience of isolates to parallel the negative experience of minority members in subgroup conditions, reporting less identification and less effective transactive memory, more conflict and coordination problems. Our data, however, clearly showed that this was not the case.

### **Implications**

Our findings have several theoretical, empirical, and practical implications. First, our research holds implications for theories of social categorization. We provide evidence for the effect of social categorization based on seemingly minimal differences in geographic subgroup configuration. Furthermore, we believe that although the subgroups in this study were based on geographic location, these results may be more broadly generalizable to subgroups based on other dimensions (e.g., demography). Loyd, White, and Kern’s (2008) recent findings regarding demographically-based tokens – i.e., that duo token members experience greater self-categorization and less cohesion than singleton token members – provide support for our findings regarding imbalance. This suggests an extension of the substantial body of research on the effects of demography on social categorization beyond mean levels to more systematically address the effects of different configurations.

Second, our work highlights the importance of geographic configuration as a key construct to be measured and accounted for in studies of GDTs. Prior research has attributed many of the negative effects

of GDTs (e.g., less identification, communication, trust, transactive memory, and common knowledge; and more conflict) to intra-team spatio-temporal and socio-demographic differences. While we do not discount the importance of such differences, our data show that “mere” configuration is enough to trigger problems associated with dispersion in teams. By leveraging existing research on social categorization, we provide a theoretical framework with which to examine and understand the effects of GDT configuration. The findings regarding imbalance and geographic isolates also may provide insights regarding existing theories of minority influence and tokenism outside the domain of GDTs.

Third, relating this research to the small body of prior work on GDT configuration, our findings extend the work of Polzer et al. (2006) and provide a boundary condition to their argument that larger subgroups foster stronger faultlines. In our study, five-person sites did not evidence stronger faultline effects than their four-person counterparts. We attribute this result to the five-person sites failing to trigger subgroup-level categorization or imbalance-related tension. We do not counter Polzer’s claim that larger subgroups foster stronger faultlines, but do note that a site must constitute a subgroup to trigger these effects. We also believe that our work, coupled with that of Polzer et al., suggests an additional dimension along which faultlines may emerge – i.e., geographically-defined subgroups. Though such subgroups may align with subgroups based on other dimensions (e.g., culture, language, nationality), as is especially the case in many global organizations, they need not do so to affect team dynamics. This suggests that geographically-based subgroups may play an important role by either aligning with (and, thus, reinforcing) or spanning (and, thus, weakening) faultlines formed by these other dimensions.

Our findings also provide insights into the role and impact of isolates in GDTs. A large body of research on tokenism and solo status suggests that isolates face special pressures, stronger majority/minority boundaries, entrapment in stereotypical roles, and general social isolation (Kanter 1977a; Kanter 1977b), and geographic isolation also has been suggested to exacerbate feelings of social or professional isolation (Cooper and Kurland 2002; Vega and Brennan 2000). In contrast, isolates in our study experienced fewer negative dynamics than their non-isolated counterparts, and contribution, influence, and communication data suggest they were not socially isolated. Therefore, our findings support and ex-

tend recent research on GDT configuration in which Cramton and Hinds (2005) speculate, and Polzer et al. (2006) find, that teams comprised solely of isolates do better than those with balanced subgroups. This consistent contrast to the established tokenism and social isolation literatures suggests that geographic isolates in GDTs may be uniquely different from the socio-demographic isolates which have been studied in traditional teams.

Beyond illustrating how geographic isolates may not trigger critical categorization processes and may thus avoid the negative dynamics experienced by subgroups, we found teams with isolates had dynamics on par with or better than their collocated counterparts. This suggests that such isolates may serve unique, beneficial roles for their team, potentially acting as devil's advocates or, as evidenced in subjects' comments, prompting small (but valuable) increases in mindful coordinating activities among all team members (including subgroups of collocated members). The roles of isolated team members remain an important issue for further study, especially in field settings where the effective integration of geographic isolates is often vital, but perhaps more difficult than in our quasi-experimental context. The impact of other configurations that include isolates (e.g., 4-1-1 and 3-1-1-1 just within six-person teams) is also worthy of further study. Teams with multiple isolates may find the isolated members bonding to form cross-site subgroups, thereby offsetting some of the effects of being the only team member at a given site.

Turning next to empirical implications, our findings highlight two key issues. Traditional, dichotomous approaches to studying teams as either dispersed or collocated mask the configuration-based effects highlighted in this study. Inattention to issues of configuration in prior GDT research introduces a confound, which we believe may account for many of the field's equivocal findings. To understand and develop robust theories about GDTs, we need to treat configuration as a separate and distinct dimension of dispersion (O'Leary and Cummings 2007). By taking configuration into account, we believe that scholars can gain increased clarity regarding the relationships between dispersion and the concepts under examination, as several have recently done (Raab and Ambos 2008; Staples and Webster 2008).

Second, our research highlights the value of subgroup-level analyses in teams research. We found that geographic minority subgroups differed significantly from their non-minority counterparts, while

team-level minority configurations showed no such difference. This illustrates the significant within-team differences that may exist on the basis of subgroups – be they defined configurationally, demographically, or otherwise. Thus, our study further highlights the importance of examining team phenomena at multiple levels -- team, subgroup, and individual.

Finally, turning to practitioners, this research illustrates the importance of sensitivity to geographically-defined subgroups in GDTs, particularly if such subgroups are not balanced. Our research suggests that teams with isolates may avoid the negative dynamics found in GDTs with subgroups. While complementing the work of Polzer et al. (2006), this finding runs counter to conventional wisdom that isolation is inherently negative. In fact, this research suggests that creating collocated subgroups with “strength-in-numbers” may do more harm than good by promoting ingroup/outgroup categorization within teams and thereby reducing team effectiveness. This research also highlights the need for managers to think more carefully about how to reduce the likelihood that social categorization leads to subgroup identification rather than identification with the team as a whole (Brewer and Brown 1998). Social categorization research suggests that increasing the salience of the superordinate group is an effective means of reducing categorization-based tensions (Hornsey and Hogg 2000). Work on the contact hypothesis (Pettigrew 1998) emphasizes the benefits of increased interactions as a means of overcoming these effects.

### **Limitations, Boundary Conditions, and Domains for Future Research**

Through this quasi-experimental study, we were able to control for spatio-temporal distance and a number of potential confounds like demographic characteristics. In so doing, however, we made it impossible to assess the impact of broader contextual factors on the constructs in question. For example, we might expect variation in organizational culture, rules, norms, and roles to guide individual team members’ behavior in GDTs. Furthermore, we created a task that required involvement by all members, with no ex ante variation in members’ expertise or roles. In addition, we limited our analysis to six-member teams dispersed between a maximum of two locations. Naturally-occurring GDTs in organizational contexts frequently have more than six members and may vary in their dispersion between a single location and as many sites as there are members. Finally, though long in comparison to many laboratory experi-

ments, the projects used in this study were completed in a relatively short period compared to many real organizational projects. Team dynamics evolve over time and we might expect longer-lived GDTs to adopt processes that overcome or ameliorate some of the negative dynamics we identified. Given these limitations, we believe further research exploring GDT configuration and its effects on naturally occurring organizational teams is warranted.

We also believe these limitations highlight important boundary conditions for the applicability of our findings and, thus, we urge caution generalizing beyond them. The generalizability and scalability of our findings remains to be tested with: teams of varying sizes (Menon and Phillips 2008); teams with more sites; teams with more varied (and potentially conflicting) expertise (Boh et al. 2007), roles, goals, and incentives; teams whose members have prior experience working with each other (Espinosa et al. 2007); and teams with more variance on spatio-temporal or socio-demographic dimensions. Research on these topics would help extend beyond the boundary conditions of the work presented here, wherein we focus on the effects of configuration alone.

### **Conclusion**

By stepping away from traditional GDT issues like spatio-temporal and socio-demographic distances, our study stresses the importance of considering geographic configuration as a distinct and potentially influential dimension of dispersion. We found that GDT dynamics were strongly affected by configuration-driven categorization effects, independent of the spatial, temporal, and socio-demographic dimensions of dispersion, which have been studied more often. Geographically-based subgroups, especially imbalanced ones, and the existence of geographic isolates have significant effects on team dynamics and should be accounted for in practice and in future research on GDTs.

**Table 1: Summary of Hypothesized Effects**

<b>Hypotheses</b>	<b>Dependent variables</b>	<b>Focus</b>	<b>Level of analysis</b>	<b>Effects</b>
1a, 2a	Identification and Transactive Memory (TM)	Subgroups	Team	Teams with subgroups have less identification and less effective TM than those without
1b, 2b		Minorities	Subgroup	Minority subgroups have less identification and less effective TM than majority subgroups
1c, 2c		Isolates	Team	Isolates have more identification and more effective TM than balanced or imbalanced subgroups
3a, 4a	Conflict and Coordination Problems	Subgroups	Team	Teams with subgroups have more conflict and coordination problems than those without
3b, 4b		Minorities	Subgroup	Minority subgroups have more conflict and coordination problems than majority subgroups
3c, 4c		Isolates	Team	Isolates have less conflict and coordination problems than balanced or imbalanced subgroups



**Table 2: Means, Standard Deviations, and Correlations**

Condition	Variable	M	SD	1.	2.	3.
All Teams (n = 62)	1 Identification	3.42	0.68			
	2 Transactive Memory	3.62	0.51	0.58 **		
	3 Conflict	1.96	0.60	-0.44 **	-0.75 **	
	4 Coordination problems	2.70	0.58	-0.51 **	0.76 **	-0.79 **
Distributed Balanced Teams (3-3; n = 17)	1 Identification	3.07	0.44			
	2 Transactive Memory	3.47	0.51	0.37		
	3 Conflict	2.19	0.64	-0.41	-0.86 **	
	4 Coordination problems	2.91	0.60	-0.42	0.78 **	-0.70 **
Distributed Imbalanced (4-2; n = 11)	1 Identification	2.96	0.55			
	2 Transactive Memory	3.34	0.58	0.67 *		
	3 Conflict	2.23	0.72	-0.81 **	-0.71 *	
	4 Coordination problems	2.97	0.70	-0.66 *	0.77 **	-0.90 **
Distributed with Isolate (5-1; n = 15)	1 Identification	3.71	0.65			
	2 Transactive Memory	3.79	0.51	0.48		
	3 Conflict	1.69	0.46	0.01	-0.62 *	
	4 Coordination problems	2.51	0.58	-0.32	0.67 **	-0.74 **
Collocated (6-0; n = 19))	1 Identification	3.78	0.66			
	2 Transactive Memory	3.79	0.37	0.54 *		
	3 Conflict	1.82	0.46	-0.15	-0.58 **	
	4 Coordination problems	2.51	0.36	-0.32	0.66 **	-0.69 **

\*p < 0.05, \*\*p < 0.01

**Figure 1: Team Configurations with and without Subgroups and Imbalance**

		Subgroup	
		No	Yes
Imbalanced	No	Collocated (6-0)	Distributed- balanced (3-3)
	Yes	Distributed- with-isolate (5-1)	Distributed- imbalanced (4-2)

## References

- Allen, T.J. 1977. *Managing the Flow of Technology*. MIT Press, Cambridge, MA.
- Armstrong, D.J., P. Cole. 2002. Managing Distances and Differences in Geographically Distributed Work Groups. P. Hinds, S. Kiesler, eds. *Distributed Work*. MIT Press, Cambridge, MA, 167-212.
- Aron, A., E.N. Aron, D. Smollan. 1992. Inclusion of other in the self scale and the structure of interpersonal closeness. *Journal of Personality & Social Psychology* **63**(4) 596-612.
- Arrow, H., J.E. McGrath, J.L. Berdahl. 2001. *Small Groups As Complex Systems: Formation, Coordination, Development, and Adaptation*. Sage Press, Thousand Oaks, CA.
- Ashforth, B.E., S.A. Johnson. 2001. Which hat to wear? The relative salience of multiple identities in organizational contexts. M.A. Hogg, D.J. Terry, eds. *Social identity processes in organizational contexts*. Psychology Press, Philadelphia, PA, 31-48.
- Ashforth, B.E., F. Mael. 1989. Social Identity Theory and the Organization. *Academy of Management Review* **14**(1) 20-39.
- Axtell, C.M., S.J. Fleck, N. Turner. 2004. Virtual Teams: Collaborating Across Distance. *International Review of Industrial and Organizational Psychology* **19** 205-248.
- Baba, M.L., J. Gluesing, H. Ratner, K.H. Wagner. 2004. The Contexts of Knowing: Natural History of a Globally Distributed Team. *Journal of Organizational Behavior* **25**(5) 547-587.
- Bhappu, A.D., M. Zellmer-Bruhn, V. Anand. 2001. The effects of demographic diversity and virtual work environments on knowledge processing in teams. M. Beyerlein, D. Johnson, S. Beyerlein, eds. *Advances in the Interdisciplinary Study of Work Teams*, 149-165.
- Boh, W.F., Y. Ren, S. Kiesler, R. Bussjaeger. 2007. Expertise and collaboration in the geographically dispersed organizations. *Organization Science* **18**(4) 595-612.
- Bos, N., N.S. Shami, J.S. Olson, A. Cheshin, N. Nan. 2004. In-group/out-group effects in distributed teams: an experimental simulation *Proceedings of the 2004 ACM conference on Computer supported cooperative work*. ACM Press, Chicago, 429-436.
- Brandon, D.P., A.B. Hollingshead. 2004. Transactive Memory Systems in Organizations: Matching Tasks, Expertise, and People. *Organization Science* **15**(6) 633-644.
- Brewer, M.B. 1991. The social self: On being the same and different at the same time. *Personality and Social Psychology Bulletin* **17**(5) 475-482.
- Brewer, M.B. 1995. Managing diversity: The role of social identities. S.E. Jackson, M.N. Ruderman, eds. *Diversity in work teams: Research paradigms for a changing workplace*. American Psychological Association, Washington, DC, 47-68.
- Brewer, M.B. 2001. Social psychology of intergroup relations. N.J. Smelser, P.B. Baltes eds. *International Encyclopedia of the Social & Behavioral Sciences* Pergamon Press, 7728-7733.
- Brewer, M.B., R. Brown. 1998. Intergroup relations. D. Gilbert, S.T. Fiske, G. Lindzey, eds. *The Handbook of Social Psychology*. McGraw Hill, Boston, 554-594.

- Brewer, M.B., A.S. Harasty. 1996. Seeing groups as entities: The role of perceiver motivation. E.T. Higgins, R.M. Sorrentino, eds. *The interpersonal context* Guilford, New York, 347-370.
- Brewer, M.B., R.M. Kramer. 1986. Choice behavior in social dilemmas: Effects of social identity, group size, and decision framing. *Journal of Personality and Social Psychology* **50** 543-549.
- Brown, R., G. Wade. 1987. Superordinate goals and intergroup behaviour: The effect of role ambiguity and status on intergroup attitudes and task performance. *European Journal of Social Psychology* **17**(2) 131-142.
- Campbell, D.T. 1958. Common Fate, Similarity and Other Indices of the Status of Aggregates of Persons as Social Entities. *Behavioral Science* **3**(1) 14-25.
- Clark, H.H., S.E. Brennan. 1991. Grounding in communication. L.B. Resnick, J.M. Levine, S.D. Teasley, eds. *Perspectives on socially shared cognition*, 1st ed. American Psychological Association, Washington, DC, 127-149.
- Cohen, L.L., J.K. Swim. 1995. The Differential Impact of Gender Ratios on Women and Men: Tokenism, Self-Confidence, and Expectations. *Personality and Social Psychology Bulletin* **21**(9) 876-884.
- Cooper, C.D., N.B. Kurland. 2002. Telecommuting, Professional Isolation, and Employee Development in Public and Private Organizations. *Journal of Organizational Behavior* **23**(4) 511-532.
- Coser, L.A. 1956. *The Functions of Social Conflict*. Free Press, New York.
- Cota, A.A., K.L. Dion. 1986. Salience of gender and sex composition of ad hoc groups: An experimental test of distinctiveness theory. *Journal of Personality & Social Psychology* **50** 770-776.
- Cramton, C.D. 2001. The mutual knowledge problem and its consequences for dispersed collaboration. *Organization Science* **12** 346-371.
- Cramton, C.D. 2002. Finding Common Ground in Dispersed Collaboration. *Organizational Dynamics* **30**(4) 356-368.
- Cramton, C.D., P.J. Hinds. 2005. Subgroup dynamics in internationally distributed teams: Ethnocentrism or cross-national learning? B.M. Staw, R.M. Kramer, eds. *Research in Organizational Behavior*. JAI Press, Greenwich, CT, 231-263.
- Cummings, J.N. 2004. Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization. *Management Science* **50**(3) 352-364.
- Cummings, J.N. 2005. Team configuration data provided via personal communication with the authors, January 4th.
- DeSanctis, G., P. Monge. 1999. Introduction to the special issue: Communication processes for virtual organizations. *Organization Science* **10**(6) 693-703.
- Ellemers, N., H. van den Heuvel, D. de Gilder, A. Maass, A. Bonvini. 2004. The underrepresentation of women in science: Differential commitment or the queen bee syndrome? *British Journal of Social Psychology* **43** 315-338.

- Espinosa, J.A., E. Carmel. 2003. The impact of time separation on coordination in global software teams: a conceptual foundation. *Software Process: Improvement and Practice* **8**(4) 249-266.
- Espinosa, J.A., J.N. Cummings, J.M. Wilson, B.M. Pearce. 2003. Team Boundary Issues Across Multiple Global Firms. *Journal of Management Information Systems* **19**(4) 157-191.
- Espinosa, J.A., C. Pickering. 2006. The Effect of Time Separation on Coordination Processes and Outcomes: A Case Study *Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06)*, 25-35.
- Espinosa, J.A., S.A. Slaughter, R.E. Kraut, J.D. Herbsleb. 2007. Familiarity, Complexity, and Team Performance in Geographically Distributed Software Development. *Organization Science* **18**(4) 613-630.
- Fiol, C., E. O'Connor. 2005. Identification in face-to-face, hybrid, and pure virtual teams: Untangling the contradictions. *Organization Science* **16** 19-32.
- Fiske, S.T., S.E. Taylor. 1991. *Social Cognition*, 2nd ed. McGraw-Hill, New York.
- Fussell, S.R., R.M. Krauss. 1992. Coordination of knowledge in communication: Effects of speakers' assumptions about what others know. *Journal of Personality and Social Psychology* **62**(3) 378-391.
- Gibson, C.B., J. Gibbs. 2006. Unpacking the Concept of Virtuality: The Effects of Geographic Dispersion, Electronic Dependence, Dynamic Structure, and National Diversity on Team Innovation. *Administrative Science Quarterly*. **51**(3) 451-495.
- Griffith, T.L., J.E. Sawyer, M.A. Neale. 2003. Virtualness and Knowledge in Teams: Managing the Love Triangle of Organizations, Individuals, and Information Technology. *MIS Quarterly* **27**(2) 265-288.
- Grinter, R.E., J.D. Herbsleb, D.E. Perry. 1999. The geography of coordination: Dealing with distance in R&D work *Proceedings of International ACM SIGGROUP Conference on Supporting Group Work (GROUP '99)*. ACM, Phoenix, AZ, 306-315.
- Hackman, J.R. 1990. *Groups That Work (and Those That Don't): Creating Conditions for Effective Teamwork*. Jossey-Bass, San Francisco, CA.
- Hamilton, D.L., Sherman, S. J., Lickel, B. . 1998. Perceiving social groups: The importance of the entitativity continuum. C. Sedikides, J. Schopler, C.A. Insko, eds. *Intergroup cognition and intergroup behavior*. Erlbaum, Hillsdale, NJ, 47-74.
- Hardin, A.M., M.A. Fuller, R.M. Davison. 2007. I Know I Can, But Can We? Culture and Efficacy Beliefs in Global Virtual Teams. *Small Group Research* **38**(1) 130-155.
- Harrison, D.D., K.J. Klein. 2007. What's the Difference? Diversity Constructs as Separation, Variety, or Disparity in Organizations. *Academy of Management Review* **32**(4) 1199-1228.
- Heilman, M.E. 1980. The impact of situational factors on personnel decisions concerning women: Varying the sex composition of the applicant pool. *Organizational Behavior & Human Performance* **26** 386-395.
- Hertel, G., S. Geister, U. Konradt. 2005. Managing Virtual Teams: A Review of Current Empirical Research. *Human Resource Management Review* **15** 69-95.

- Hewstone, M.R.C. 1990. The "ultimate attribution error?" A review of the literature on intergroup causal attribution. *European Journal of Social Psychology* **20** 311–335.
- Hinds, P., S. Kiesler. 2002. *Distributed Work*. MIT Press, Cambridge, MA.
- Hinds, P.J., D.E. Bailey. 2003. Out of Sight, Out of Sync: Understanding Conflict in Distributed Teams. *Organization Science* **14**(6) 615-632.
- Hinds, P.J., M. Mortensen. 2005. Understanding Conflict in Geographically Distributed Teams: The Moderating Effects of Shared Identity, Shared Context, and Spontaneous Communication. *Organization Science* **16**(3) 290-307.
- Hoegl, M., L. Proserpio. 2004. Team Member Proximity and Teamwork in Innovative Projects. *Research Policy* **33** 1153-1165.
- Hogg, M.A. 2001. Social categorization and group behavior. M.A. Hogg, R.S. Tindale, eds. *Group processes*. Blackwell Publishers, Malden, MA, 56-85.
- Hogg, M.A., D.J. Terry. 2000. Social identity and self-categorization processes in organizational contexts. *Academy of Management Review* **25**(1) 121-140.
- Hogg, M.A., J.C. Turner. 1985. Interpersonal attraction, social identification and psychological group formation. *European Journal of Social Psychology* **15**(1) 51-66.
- Hogg, M.A., J.C. Turner. 1987. Intergroup behaviour, self-stereotyping and the salience of social categories. *British Journal of Social Psychology* **26** 325-340.
- Hollingshead, A.B. 2001. Cognitive interdependence and convergent expectations in transactive memory. *Journal of Personality and Social Psychology* **81** 1080-1089.
- Hornsey, M.J., M.A. Hogg. 2000. Assimilation and diversity: An integrative model of subgroup relations. *Personality and Social Psychology Review* **4**(2) 143-156.
- House, R., D.M. Rousseau, M. Thomas-Hunt. 1995. The Meso Paradigm: A Framework for the Integration of Micro and Macro Organizational Behavior. *Research in Organizational Behavior* **17** 71-114.
- Jarvenpaa, S.L., D.E. Leidner. 1999. Communication and trust in global virtual teams. *Organization Science* **10**(6) 791-815.
- Jehn, K.A. 1994. Enhancing effectiveness: An investigation of advantages and disadvantages of value-based intragroup conflict. *International Journal of Conflict management* **5** 223-238.
- Jehn, K.A. 1995. A multimethod examination of the benefits and detriments of intragroup conflict. *Administrative Science Quarterly* **40**(2) 256-282.
- Jehn, K.A. 1997. A Qualitative Analysis of Conflict Types and Dimensions in Organizational Groups. *Administrative Science Quarterly* **42**(3) 530-557.
- Jehn, K.A., E.A. Mannix. 2001. The Dynamic Nature of Conflict: A Longitudinal Study of Intragroup Conflict and Group Performance. *Academy of Management Journal* **44**(2) 238-251.
- Kanter, R.M. 1977a. *Men and women of the corporation*. Basic Books, New York.

- Kanter, R.M. 1977b. Some Effects of Proportions on Group Life: Skewed Sex Ratios and Responses to Token Women. *American Journal of Sociology* **82**(5) 965-990.
- Kiesler, S., J.N. Cummings. 2002. What do we know about proximity and distance in work groups? A legacy of research. P.J. Hinds, S. Kiesler, eds. *Distributed Work*. MIT Press, Cambridge, MA, 57-82.
- King, J.L., R.L. Frost. 2002. Managing Distance Over Time: The Evolution of Technologies of Dis/Ambiguation. P. Hinds, S. Kiesler, eds. *Distributed Work*. MIT Press, Cambridge, MA, 3-26.
- Kirkman, B.L., J.E. Mathieu. 2005. The Dimensions and Antecedents of Team Virtuality. *Journal of Management* **31**(5) 700-718.
- Klein, K.J., S.W.J. Kozlowski. 2000. From Micro to Meso: Critical Steps in Conceptualizing and Conducting Multilevel Research. *Organizational Research Methods* **3**(3) 211-236.
- Kramer, R.M., M.B. Brewer. 1984. Effects of group identity on resource utilization in a simulated common dilemma. *Journal of Personality and Social Psychology* **46** 1044-1057.
- Kraut, R.E., S.R. Fussell, S.E. Brennan, J. Siegel. 2002. Understanding the effects of proximity on collaboration: Implications for technologies to support remote collaborative work. P.J. Hinds, S. Kiesler, eds. *Distributed work*. MIT Press, Cambridge, MA, 137-162.
- Krebs, S.A., E.V. Hobman, P. Bordia. 2006. Virtual Teams and Group Member Dissimilarity. *Small Group Research* **37**(6) 721-741.
- Latane, B., K.D. Williams, S.G. Harkins. 1979. Many hands make light the work: The causes and consequences of social loafing. *Journal of Personality and Social Psychology* **37** 822-832.
- Lau, D.C., J.K. Murnighan. 1998. Demographic diversity and faultlines: The compositional dynamics of organizational groups. *Academy of Management Review* **23**(2) 325-340.
- Lawler, E.E. 1992. Affective attachments to nested groups: A choice process theory. *American Sociological Review* **57** 327-339.
- Lee, C.S., M.B. Watson-Manheim, A. Ramaprasad. 2007. Exploring the Relationship Between Communication Risk Perception and Communication Portfolio. *IEEE Transactions on Professional Communication* **50**(2) 130-146.
- Lewis, K. 2003. Measuring Transactive Memory Systems in the Field: Scale Development and Validation. *Journal of Applied Psychology* **88**(4) 587-604.
- Liang, D.W., R.L. Moreland, L. Argote. 1995. Group versus individual training and group performance: The mediating factor of transactive memory. *Personality and Social Psychology Bulletin* **21** 384-393.
- Lloyd, D.L., J. White, M. Kern. 2008. Duo Status: Disentangling the Complex Interactions within a Minority of Two. K.W. Phillips, E. Mannix, M.A. Neale, eds. *Research on Managing Groups and Teams*. JAI Press, Amsterdam, 75-92.
- Malone, T.W., K. Crowston. 1994. The Interdisciplinary Study of Coordination. *ACM Computing Surveys* **26**(1) 87-119.

- Mannix, E.A. 1993. Organizations as resource dilemmas: The effects of power balance on coalition formation in small groups. *Organizational Behavior & Human Decision Processes* **55** 1-22.
- Martins, L.L., L.L. Gilson, M.T. Maynard. 2004. Virtual teams: What do we know and where do we go from here? *Journal of Management* **30**(6) 805-835.
- Massey, A.P., M.M. Montoya-Weiss, Y.T. Hung. 2003. Because time matters: Temporal coordination in global virtual project teams. *Journal of Management Information Systems* **19** 129-155.
- Menon, T., K.W. Phillips. 2008. Getting Even vs. Being the Odd One Out: Conflict and Cohesion in Even- and Odd-Sized Groups *Working Paper*. University of Chicago GSB, Chicago, IL.
- Moore, D.A., T.R. Kurtzberg, L.L. Thompson, M.W. Morris. 1999. Long and Short Routes to Success in Electronically Mediated Negotiations: Group Affiliations and Good Vibrations. *Organizational Behavior & Human Decision Processes* **77**(1) 22-43.
- Moreland, R.L., L. Argote, R. Krishnan. 1996. Socially shared cognition at work: Transactive memory and group performance. A.M. Brower, ed. *What's social about social cognition? Research on socially shared cognition in small groups*. Sage, Thousand Oaks, CA, 57-84.
- Moreland, R.L., L. Myaskovsky. 2000. Exploring the performance benefits of group training: Transactive memory or improved communication? *Organizational Behavior & Human Decision Processes* **82** 117-133.
- Mortensen, M., P.J. Hinds. 2001. Conflict and shared identity in geographically distributed teams. *International Journal of Conflict management* **12**(3) 212-238.
- Mullen, B., L. Hu. 1989. Perceptions of ingroup and outgroup variability: A meta-analytic integration. *Basic and Applied Social Psychology* **10** 233-252.
- Nelson, L.J., Miller. 1995. The distinctiveness effect in social categorization: You are what makes you unusual *Psychological Science* **6** 246-249.
- Nonaka, I., H. Takeuchi. 1995. *The Knowledge Creating Company*. Oxford University Press, New York.
- O'Leary, M.B., J.N. Cummings. 2007. The Spatial, Temporal, and Configurational Characteristics of Geographic Dispersion in Teams. *MIS Quarterly* **32**(3) 433-452.
- O'Leary, M.B., W.J. Orlikowski, J. Yates. 2002. Distributed Work over the Centuries: Trust and Control in the Hudson's Bay Company, 1670-1826. P. Hinds, S. Kiesler, eds. *Distributed Work*. MIT Press, Cambridge, MA, 27-54.
- Olson, G.M., J.S. Olson. 2000. Distance Matters. *Human-Computer Interaction* **15**(1) 139-179.
- Pena, J., J.B. Walther, J.T. Hancock. 2007. Effects of Geographic Distribution on Dominance Perceptions in Computer-Mediated Groups. *Communication Research* **34**(3) 313-331.
- Pettigrew, T.F. 1998. Intergroup contact theory. *Annual Review of Psychology* **49** 65-85.
- Phillips, K.W., D.L. Loyd. 2006. When surface and deep-level diversity collide: The effects on dissenting group members. *Organizational Behavior & Human Decision Processes* **99**(2) 143-160.



- Polzer, J.T., B. Crisp, S.L. Jarvenpaa, J.W. Kim. 2006. Extending the Faultline Concept to Geographically Dispersed Teams: How Colocated Subgroups Can Impair Group Functioning. *Academy of Management Journal* **49**(4) 679-692.
- Powell, A., G. Piccoli, B. Ives. 2004. Virtual teams: A review of current literature and directions for future research. *The DATA BASE for Advances in Information Systems* **35** 6-39.
- Raab, K.J., B. Ambos. 2008. Isolation and Separation in Teams: An Analysis of Configurations and their Impact on Knowledge Flows. *Paper presented at the 28th Annual SMS Conference, Cologne, Germany.*
- Richman, A., K. Noble, A. Johnson. 2002. *When the Workplace is Many Places: The Extent and Nature of Off-Site Work Today.* WFD Consulting, Watertown, MA.
- Rutkowski, A.-F.o., C. Saunders, D. Vogel, M. van Genuchten. 2007. "Is It Already 4 a.m. in Your Time Zone?" Focus Immersion and Temporal Dissociation in Virtual Teams. *Small Group Research* **38**(1) 98-129.
- Saunders, C.S., C. van Slyke, D.R. Vogel. 2004. My time or yours? Managing time visions in global virtual teams *Academy of Management Executive*, 19-31.
- Schopler, J., C.A. Insko. 1992. The discontinuity effect in interpersonal and intergroup relations: Generality and mediation. W. Stroebe, M. Hewstone, eds. *European Review of Social Psychology.* Wiley, Chichester, England, 121-151.
- Sell, J., M.J. Lovaglia, E.A. Mannix, C.D. Samuelson, R.K. Wilson. 2004. Investigating Conflict, Power, and Status within and among Groups. *Small Group Research* **35**(1) 44-72.
- Sherif, M., O.J. Harvey, B.J. White, W.R. Hood, C.W. Sherif. 1961. *Intergroup conflict and cooperation. The Robbers Cave Experiment.* Institute of Group Relations, Norman, OK.
- Sherman, S.J., D.L. Hamilton, A.C. Lewis. 1999. Perceived entitativity and the social identity value of group memberships. D. Abrams, M.A. Hogg, eds. *Social Identity and Social Cognition.* Blackwell, Oxford, UK, 80-110.
- Simon, B. 1992. The perception of ingroup and outgroup homogeneity: Reintroducing the intergroup context. *European Review of Social Psychology* **3** 1-30.
- Staples, D.S., J. Webster. 2008. Exploring the effects of trust, task interdependence and virtualness on knowledge sharing in teams. *Information Systems Journal* **18**(6) 617-640.
- Stroh, L.K., J.M. Brett, A.H. Reilly. 1994. A decade of change: Managers' attachment to their organizations and their jobs. *Human Resource Management* **33** 531-548.
- Tajfel, H. 1982. *Social identity and intergroup relations.* Cambridge University Press, Cambridge, UK.
- Tajfel, H., J.C. Turner. 1986. The social identity theory of intergroup behavior. S. Worchel, ed. *Psychology of Intergroup Relations*, 2nd ed. Nelson-Hall Publishers, Chicago, 7-24.
- Tajfel, H., A. Wilkes. 1963. Classification and quantitative judgement. *British Journal of Psychology* **54** 104-114.

- Taylor, S.E. 1981. A categorization approach to stereotyping. D.L. Hamilton, ed. *Cognitive processes in stereotyping and intergroup behavior*. Erlbaum, Hillsdale, NJ, 83-114.
- Taylor, S.E., S.T. Fiske, N.L. Etcoff, A.J. Ruderman. 1978. Categorical bases of person memory and stereotyping. *Journal of Personality and Social Psychology* **36**(778-793).
- Turner, J.C. 1984. Social identification and psychological group formation. H. Tajfel, ed. *The social dimension: European developments in social psychology, vol. 2*. Cambridge UP, Cambridge, UK, 518-538.
- Valacich, J.S., C. Schwenk. 1995. Devil's advocacy and dialectical inquiry effects on face-to-face and computer-mediated group decision making. *Organizational Behavior & Human Decision Processes* **63**(2) 158-173.
- Van den Bulte, C., R.K. Moenaert. 1998. The effects of R&D team co-location on communication patterns among R&D, marketing, and manufacturing. *Management Science* **44**(11) S1-S18.
- Van Knippenberg, D., E.C.M. van Schie. 2000. Foci and correlates of organizational identification. *Journal of Occupational and Organizational Psychology* **73** 137-147.
- Vega, G., L. Brennan. 2000. Isolation and Technology: The Human Disconnect. *Journal of Organizational Change Management* **13**(5) 468-481.
- Wageman, R., F.M. Gordon. 2005. As the Twig Is Bent: How Group Values Shape Emergent Task Interdependence in Groups. *Organization Science* **16**(6) 687-700.
- Watson-Manheim, M.B., F. Bélanger. 2007. Communication Media Repertoires: Dealing with the Multiplicity of Media Choices. *MIS Quarterly* **31**(2) 267-293.
- Webster, J., D.S. Staples. 2006. Comparing Virtual Teams to Traditional Teams: An Identification of New Research Opportunities. *Research in Personnel and Human Resources Management* **25** 181-215.
- Wegner, D.M. 1987. Transactive memory: A contemporary analysis of the group mind. G.R. Goethals, ed. *Theories of Group Behavior*. Springer-Verlag, New York, 185-203.
- Wilson, J.M., M.B. O'Leary, A. Metiu, Q.R. Jett. 2008. Perceived Proximity in Virtual Work: Explaining the Paradox of Far-but-Close. *Organization Studies* **29**(7) 979-1002.
- Zack, M.H. 1993. Interactivity and Communication Mode Choice in Ongoing Management Groups. *Information Systems Research* **4**(3) 207-239.