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FUZZY TEAMS:

Why do teams disagree on their membership, and what does it mean?

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Abstract

Organizations increasingly rely on teams as fundamental building blocks - a focus mirrored by a long legacy of research on teams. Due to the complexity of team dynamics and processes within teams and small groups, to date such research has yielded an ambiguous or equivocal set of results regarding the determinants of team performance. I suggest that a major confounding factor in such results is the impact of contextual factors on individual members' agreement or disagreement as to the membership of those very teams. The prevalence of such boundary disagreement is likely to continue increasing as more and more organizations structure their work around project-based teams, characterized by short time horizons and multiple overlapping contexts which stand to significantly affect individual members' perceptions and understanding of those teams.

In this research, I introduce and examine the phenomenon of team boundary disagreement. I build upon social categorization to provide a framework for the membership attribution process that leads to team boundary disagreement. In a study of 39 formally-defined, software and product development teams in a multinational software company, I use surveys and interviews to identify antecedents and effects of team boundary disagreement. As hypothesized, I find boundary disagreement exists in the majority (72%) of teams and is predicted by heterogeneity of communication patterns, both level and heterogeneity of task interdependence, and member uniqueness on task-relevant dimensions. I further find teams experiencing boundary disagreement perform significantly poorer than those without – a relationship mediated by shared identity. These findings provide the basis for a discussion of the impacts of boundary disagreement on our understanding of individual perceptual frameworks, extant theories of small groups dynamics, and the relationships between different approaches to understanding teams.

Introduction

One clear conclusion of the long history of research on small group and team dynamics is this: they matter. They matter cognitively as illustrated by examples of recent research on team cognitive processes including transactive memory (Lewis 2003), shared mental models (Mathieu et al. 2000), brainstorming (Sutton and Hargadon 1996), team learning (Wong 2004), innovation (Vera and Crossan 2005), creativity (Taggar 2002) and higher quality output (Postrel 2002). They matter interpersonally, as illustrated by examples of recent research on cohesion (Harrison et al. 1998) support and commitment (Bishop et al. 2000), and psychological safety (Edmondson 1999). Furthermore, research on social identity and categorization finds that membership itself matters (ex. Hogg and Terry 2000) and affects processes, behaviors, and perceptions.

Implicit in this research is the rarely-stated assumption that information about membership is easily accessible (Diehl 1990), unambiguous, and agreed upon. Within the traditional context of longstanding, hierarchically ordered functional teams, this assumption makes sense. Work environments, however, are rapidly changing away from this prior model as people are increasingly engaged in project-based work, in which they are simultaneously members of multiple, rapidly and fluidly shifting, short-term teams. I argue that particularly in these environments, disagreement over team boundaries is very real and calls into question the applicability of the aforementioned membership effects to such teams.

Not limited to the domain of social categorization and identity research, I believe the effects of boundary disagreement go beyond membership to impact team performance. First, disagreement within a team as to who are and are not team members will make it difficult for that team to effectively coordinate its knowledge and efforts. In the face of less-effective coordination of knowledge and work, a team's ability to effectively accomplish its task will most likely suffer. Second, boundary disagreement is apt to give rise to tension, if not outright conflict, due to misunderstandings over assumptions, intentions, and expectations. Consequently, amidst boundary disagreement, interpersonal strain will negatively impact team members' ability to work well together to accomplish their goals. Thus, I believe boundary disagreement will have deleterious effects on team performance.

In this research, I address the following three research questions. First, do teams disagree as to their own membership? Second, if such disagreement exists, what are the sources and mechanism underlying it? Third, and finally, what are the effects of such disagreement on team performance?

Before continuing, it is critical to define the construct of boundary disagreement and the phenomenon it represents. I define boundary disagreement as the extent to which individuals externally validated as members of a team disagree as to who are and who are not members of that team. For the purpose of conceptual clarity, in this study, I define and examine boundary disagreement with respect to the individuals officially and externally identified as members of the team by management – implications of this decision will be further addressed in the discussion. With these definitions in mind, it is important to examine the project-based context within which these processes occur.

Project-based team context

To deal with the rapid pace of change endemic in today's economic climate, increasing product complexity, greater need for customer-focused innovation, and technological uncertainty, organizations are increasingly relying on project-based teams to accomplish their work (Gann and Salter 2000; Hedlund 1994; Hobday 2000; Lundin and Midler; Miles et al. 1997). I define "team" as a formally-identified collection of interdependent individuals working together towards a shared goal (Cohen and Bailey 1997; Hackman 1987; Offermann and Spiros 2001; Sundstrom et al. 1990) and "project-based team" as a one brought together to work on a specified project and disbanded upon its completion.

Given the aforementioned benefits, it is increasingly difficult to find organizations that do not use project-based teams for at least some specific, non-routine and complex (Hobday 2000). In fact, many organizations are structuring all work around highly decentralized, loosely-coupled autonomous project teams (Brown and Duguid 2001; Lindkvist 2004; Turner and Keegan 1999). Such project-based organizations are found in varied industries and organizational contexts (see Prencipe and Tell 2001 for a partial listing) and are the norm in many sectors including technology-based and service-providing firms (DeFillippi and Arthur 1998; Gann and Salter 1998; Hobday 2000; Prencipe and Tell 2001). More and

more prevalent, project based teams manifest many characteristics that make them particularly well-suited to an examination of boundary disagreement.

First, as noted by Prencipe and Tell, project teams are frequently designed around short term, fluid activities (2001). Grabher likewise defined project work as self-contained, complex, and temporary (Grabher 2002) and in his study of an R&D organization, Lindkvist (2004), found project work organized functionally specialized employees around typically short-term project task objectives. This is in contrast to "traditional" forms of work, typically characterized by more long term, stable, functionally-homogenous groups. Whereas an employee working as a team member on a traditional production line is likely to work in the same context for an extended period of time, the nature of project work holds that individuals switch to different contexts with the completion of each project. Further complicating matters, not all team members start and end their work on the project at the same time. In project-based work, individuals often join a team only when their particular expertise is needed and subsequently leave it when their part of the task is complete. The short duration of project team tasks and the piecemeal entrance and exit of parts of the team means the team's work context is in constant flux, making it difficult for individuals to actively stay abreast of their changing cast of teammates.

Not only do individuals switch contexts at project's end, but frequently they work concurrently as members of multiple teams. As project teams are typically constructed to leverage employees' differentiated skills (Lindkvist 2004), more and more individuals (especially those with unique skills) find their time divided across multiple teams, each with a partial claim on their time (see, for example Hobday 2000; Zika-Viktorsson et al. 2006). Overlapping membership introduces a number of complexities into the determination of membership. First, concurrently working on multiple projects means individuals must simultaneously track information regarding multiple project teams, thereby introducing additional complexity and potential for confusion. Second, in many cases, concurrent project teams partially overlap, with subsets of individuals working together on multiple projects. Thus, employees must determine to which team any given information pertains. Third, and finally, different projects manifest different temporal rhythms such that individuals may be active members of a given project and at certain

times and have little interaction with it at others. Thus, the natural ebb and flow of individual

participation in projects may result in more or less information being readily accessible.

Taken together, the project team environment yields a context in which individual understanding

and team dynamics arise from highly specialized and differentiated individuals working on frequently and

fluidly-shifting, partially-overlapping projects comprising what Bresnen et al. label a "partly

indeterminate and shifting organizational terrain" (2004, p: 1537). It should come as no surprise that, as

Lindkvist (2004) notes, given this context, project-based teams may find it difficult to establish shared

understandings and a common knowledge base. Such an environment, therefore, provides an excellent

context within which to examine the categorization processes underlying assessments of membership.

Categorization and sources of boundary disagreement

To understand the process leading to boundary disagreement, we must examine the process by

which team members identify whom they can draw upon for cognitive or affective support. Take, for

example, the situation in which Rob, Sue, and Anna need the input of their teammates on a new protocol

they are developing for the project. Precisely what the input is not particularly important: they may need

people to double-check their calculations, or they may need people to give them a pep-talk before

presenting the protocol to the director of marketing. What is important is that they find teammates, people

whom they know share, and are working towards, the same goals. I argue that to do so, they each engage

in categorization process through which they evaluates the people around them in order to determine who

is and who is not a member of his team.

In categorical thinking, a process of comparison with established categories allow people to both

make sense of, and make predictions about the people, entities, social groups, or events that they

encounter (Fiske and Taylor forthcoming). Thus, categorical thinking provides one of the most powerful,

yet cognitively economical tools people have for coping with the complexity and ambiguity of their

environments (Allport 1954; Bruner 1957, 1958; Gilbert and Hixon 1991; Hogg and Terry 2000; Macrae

and Bodenhausen 2000, 2001). Though people create categorizations for all types of information, of

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particular interest in assessing membership are role-based categorizations, in which an individual ("evaluator") makes inferences about others ("targets") by comparing available information about them with the evaluator's own organized body of knowledge arising from prior experiences with individuals in similar social positions[1]. In Rob, Sue, and Anna's case, they are comparing the characteristic of a given individual with each of their categorizations of "teammate" to assess whether the person in question will fulfill their needs for a teammate. This process of role-based categorization on the part of Rob, Sue, and Anna provides two potential paths to boundary disagreement among them: ambiguity and variation.

First, in the case of ambiguity, multiple evaluators may each be unclear as to whether a given target is or is not a team member.   Research has shown that categories are not always clearly delineated nor mutually exclusive and that social categories, in particular, are "messier" than their non-social counterparts (see, for a discussion, Fiske and Taylor 1991). This is particularly likely to be the case in project-based environments wherein individuals are simultaneously members of multiple, partially-overlapping teams against an equally complex backdrop of rapidly shifting project team recombination. In such cases, an evaluator may find a target fits multiple categories, making it unclear into which category that target should be placed and thereby attributed membership.

Further complicating matters, the complexity of project-based environments also makes it more difficult for evaluators to differentiate potential targets from the background of fluidly-changing others. As categorical person-perception cannot occur if encountering the target does not activate category-based memories (Macrae and Bodenhausen 2000), a target who has not been noticed will not have been previously observed or categorized. Target salience – the extent to which that target is perceived as

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[1] It should be noted that although much prior theorizing on categorization has focused on membership in broad social categories (ex. age, race, sex), research on entitativity finds that people rely on small task and intimacy-based groups as much, if not more in their day-to-day cognitive processes (Lickel et. al. 2000; Pickett et al. 2002; Spencer-Rodgers et al. 2007). Such groups have been found to frame categorization judgments, (Sherman et al. 2002), and the work of Spencer-Rodgers, Hamilton, and Sherman finds people hold stereotypes of task groups that closely resemble those held for social categories (Spencer-Rodgers et al. 2007). Furthermore, research within organizational contexts has found significant effects for team and small-group-based ascribed-role categorization (Polzer et al. 2002; Reynolds et al. 2003; Shah and Dirks 2003)

differentiated from its broader environment (Taylor and Fiske 1978) – is a key determinant of a target's being noticed and thus accessible for cognitive processing (Fiske and Taylor forthcoming). Target differentiation draws and focuses an evaluator's attention, allowing the evaluator to perceive information and use it in elaborative reasoning and complex inferences (Bargh 1984; Burnstein and Schul 1982) like categorical processing. The extent a target manifests salience-producing characteristics like being novel, figural, unusual, or goal relevant (for further discussion, see Fiske and Taylor 1991) will affect the likelihood that target will trigger categorization processes.

Returning to our example, Rob and Sue may both have noticed Ned, but both remain unclear as to whether or not he manifests all the characteristics needed to be considered a member of their team, while Anne may never have noticed him and thus is not able to make that assessment at all. This ambiguity at the individual level is likely to lead to divergent assessments of Ned's membership, and thus boundary disagreement among the three evaluators.

Second, in the case of variation, even when targets trigger categorization processes and evaluators' categorizations are unambiguous, such categorizations may vary across evaluators. The aforementioned complexity of project-based environments, in which evaluators may interact with a given target for the purposes of multiple projects, increases the likelihood that different evaluators will differ in their interactions with a given target. Variation in evaluators' interactions with the target and other teammates will lead to differing role-based categorizations, as those variant interactions lead evaluators to enter different information into their categorization processes. This is likely to ultimately lead to differing categorizations and thus boundary disagreement. Returning to our example, if Rob interacts with and relies on Ellen on a daily basis, it may be clear to him that she is a team member, while Sue, who never interacts with Ellen may be equally sure Ellen is not a member of the team.

Hypotheses

As outlined in the introduction, this study seeks to answer three research questions. First, do people disagree as to the membership of their teams? Second, if such disagreement exists, what are the

sources and mechanism underlying it? Third, and finally, what are the effects of such disagreement on team performance?

Existence of boundary disagreement

In alignment with the outlined research questions, it is important to establish the existence of boundary disagreement. As noted in the previous section, there are three likely paths through which boundary disagreement is likely to arise within the context of project-based team work. First, evaluators may differ in the extent to which a given target triggers their categorization processes, yielding variation in membership attributions and therefore team-level boundary disagreement. Second, the inherent ambiguity of social categories makes it likely that evaluators will find membership attribution a difficult task, leading to differing categorizations and thus team-level boundary disagreement. Third, variations among evaluators in their category relevant experience will lead to differing categorizations and thus team-level boundary disagreement. Taken together, this yields the first hypothesis, that boundary disagreement exists within project-based work teams.

Hypothesis 1: Individuals identified as members of a given team disagree over the

membership of that team.

Antecedents of boundary disagreement

Delving further into the contributors to boundary disagreement, there are a number of factors likely to impact membership attribution through the processes outlined above. In this study, we focus on four factors: two addressing the likelihood of ambiguous categorization (extent of multi-teaming and distinctiveness on task-relevant traits) and two that address the likelihood of divergent categorizations (communication and interdependence) .

Extent of multi-teaming

Turning first to contextual factors, as noted in the discussion of project-based work, teams increasingly work in contexts within which the traditional assumption of "one member, one team" does

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not hold true. The extent to which evaluators are concurrently members of multiple teams introduces a potential source of confusion as they must differentiate across multiple, likely interrelated memberships. As the average number of teams with which a given team member is involved increases, so will boundary disagreement resulting from increased ambiguity.

> *Hypothesis 2a: Multiplicity of team membership will be positively related to team boundary disagreement.*

Beyond the effect of number of teams, to the extent targets are simultaneously members of multiple teams, they will dedicate less time to any one team. This reduces evaluators' opportunities to interact with and categorize them. In addition, to the extent evaluators themselves are simultaneously members of multiple teams, they too will be able to dedicate less of their time to the focal team, with the same net effect of missing out on opportunities to categorize those targets. Given that evaluators' and targets' time dedicated to the focal team are not likely to align perfectly, any reduction in dedicated time is further multiplied.   Thus the percent of time targets dedicate to a team will be negatively related to boundary disagreement.

> *Hypothesis 2b: Percentage of time dedicated to the team will be negatively related to team boundary disagreement.*

Distinctiveness on task-relevant traits

Beyond the effects of the context overall, characteristics of targets themselves also play a key role in determining team boundary disagreement. The large body of research on the effects of diversity in teams and organizations (for a review, see Williams and O'Reilly 1998) suggests that team composition significantly affects intra-team dynamics and is frequently a determinant of team performance. Exploring the relationship between team composition and attributions of membership is therefore particularly relevant to understanding boundary disagreement.

A substantial body of research on diversity, however, has repeatedly shown that there are fundamental differences between distinctiveness with respect to surface-level, overt, ascribed, biological

characteristics like race, gender, and age and that based on deeper level characteristics like attitudes, beliefs and values (Harrison et al. 1998; Harrison et al. 2002; Jackson et al. 1995; Milliken and Martins 1996; Riordan 2000). Variation on surface-level characteristics triggers fundamentally divisive effects, while variation on deep-level characteristics may improve group mental processes by stimulating broader thinking and higher-quality decision-making (Harrison et al. 1998; Jehn and Mannix 2001; O'Reilly et al. 1991). Given the aforementioned importance of achieved over ascribed roles in affecting day to day activity (Lickel et al. 2000; Pickett et al. 2002; Spencer-Rodgers et al. 2007), and the important effects of deep-level diversity on group mental processes, I focus on the effects of deep rather than surface-level characteristics, and all references to target distinctiveness are based on that distinction.

Distinctiveness on a given dimension, as a particular structural form of diversity, increases the novelty of a particular target, which has been consistently identified as an antecedent of target salience (for example, Higgins and King 1987; Moss Kanter 1977). Building on the outlined framework, such novelty-based salience increases a target's accessibility for categorization and likelihood of activating categorization processes. Thus, the more teams have individuals with distinctive task-relevant traits, the more those individuals will be salient and thereby accessible for categorization.

In addition, as project based teams are formed to bring a set of specific talents and abilities to bear on a particular problem, the distinctive task-relevant characteristics of a given team member are likely to be considered to be an integral part of the team. As such, when an evaluator is comparing that target to that evaluator's internal categorizations, the extent to which that target holds the distinctive traits needed by the team reduces the likelihood that team members will perceive any ambiguity that the target should be categorized as a member of the team. As perceptions of a target's distinctive task-relevant traits are not likely to vary across evaluators in a team, as team members are unlikely to incorrectly misclassify a particular core trait once identified. Thus a target's distinctive skills will increase both that target's salience and likelihood of matching the category of team member consistently across all evaluators, thereby reducing boundary disagreement.

Hypothesis 3: Distinctiveness of task-relevant traits will be negatively related to

boundary disagreement.[R2Q(meth#5)]

Communication

Beyond contextual and target-based factors, I believe the processes of the teams themselves will affect boundary disagreement. Research has found that increased communication with a target makes that target more salient, simply by providing more exposure (Iyengar and Kinder 1987). Communication also changes the way in which a target is perceived, as interaction makes targets more figural (complex and noticeable), a characteristic linked to increased salience (McArthur and Post 1977). Finally, increased communication differentiates targets, making them novel compared to the reference group (in this case the rest of the organization) and thereby increasing their salience (Jones and McGillis 1976). Through these effects on target salience, I argue increased task-relevant communication will decreases the likelihood of categorization non-activation and therefore be positively related to membership attribution. Furthermore, to the extent that communication revolves around the team's task, the amount of communication also likely to decrease the ambiguity surrounding a given target's membership as task relevant communication provides information about how a target's work fits with the category of team member, thereby making them more likely to be included. In addition, the act of task-relevant communication itself is highly likely to be a characteristic of the prototypical member of the category of team member and serves as evidence of their active participation in the team. Taken together, this suggests that as task-relevant communication with a set of targets increases, so does the ability and propensity to categorize those individuals as teammates. Furthermore, to the extent this occurs across all team members, it results in a reduction in boundary disagreement. Thus, average amount of communication will be negatively related to boundary disagreement.

Hypothesis 4a: Average dyadic communication within a team will be negatively related

to boundary disagreement.

It is, however, important to recognize that communication is likely to vary across dyads in a team. Such differing communication patterns have been found to exist and affect team dynamics and effectiveness (for example, Bonacich 1987). Also, research on boundary spanning (Aldrich and Herker 1977; Ancona and Caldwell 1992; Friedman and Podolny 1992) is based on an implicit assumption that boundary spanners exhibit substantially different communication patterns than more central team members. Varying team-level communication patterns imply uneven communication at the dyadic level, with multiple evaluators differing in their task-relevant communication with a particular target. As outlined above, this forms the basis of categorizational variation, as differences among evaluators with respect to their relationships to a given target lead to differing evidence of participation in the team, categorizations, and ultimately membership attributions. This suggests that teams with heterogeneous communication patterns will experience higher variance in membership attribution than teams with more homogenous communication. Thus, while I predict average amount of communication will be negatively related to boundary disagreement, heterogeneity in communication patterns will be positively related to boundary disagreement.

> *Hypothesis 4b: Heterogeneity of communication within a team will be positively related*
> *to boundary disagreement.*

Task interdependence

Though reflected in communication, the structure of the task itself and the required task interdependence among team members is also likely to affect team boundary disagreement within project-based teams. Scholars have differentiated among many types of interdependence (for example, Johnson and Johnson 1989; Saavedra et al. 1993; Van der Vegt et al. 2001) broadly categorizable into two types: task and outcome (for an overview and discussion of this categorization, see Wageman 1995). As the aforementioned research on categorization and entitativity both stress the importance of ongoing day-to-day interactions over less proximate team goals as a basis of role-based categorization, in this research I

focus on task interdependence, defined as the degree of task-driven interaction among team members (Shea and Guzzo 1987).

Research has shown that evaluators pay close attention to those who influence their ability to succeed in their task (for example, Erber and Fiske 1984) and tend to ignore those they believe have little impact (Rodin 1987). Relatedly, scholars have found interdependence is positively related to salience (Neuberg and Fiske 1987; Ruscher and Fiske 1990). Thus, to the extent that evaluators are highly task-interdependent on targets, those targets will be more salient and likely to activate the categorization process. Furthermore, task-interdependence directly ties a target to an evaluator with respect to the team's work. To the extent an evaluator relies on a target to complete his or her daily work, the target's categorization as a team member will be less ambiguous. This suggests that as average interdependence in a team increases, so do both the accessibility of targets for categorization processes as well as the likelihood that such processes will result in targets being consistently categorized as teammates. Thus, I expect average task interdependence will be negatively related to boundary disagreement.

Hypothesis 5a: Average dyadic task interdependence within a team will be negatively

related to boundary disagreement.

However, to the extent that a team exhibits variation in its patterns of task-interdependence, such variation will make a given target differently salient to multiple evaluators within the team. Similarly, those evaluators who depend highly on a particular target are far more likely to match that target with their category of team member than will those evaluators who have little to no dependence upon that target. Thus heterogeneity in task interdependence is likely to be related to increased boundary disagreement through both differing activation and variation.

Hypothesis 5b: Heterogeneity of task interdependence within a team will be positively

related to boundary disagreement.

I contend that team boundary disagreement will negatively impact team performance, defined as the "acceptability of output to customers within or outside the organization who receive team products, services, information, decisions, or performance events" (Sundstrom et al. 1990: 122). In their discussion of a systems approach to small group dynamics Arrow, McGrath, and Berdahl note that "confusion about who is and is not a member of the group makes it difficult to coordinate action" (2000: 79). In teams experiencing boundary disagreement, different models of the team's membership are likely to result in a fractured sense of team identity, which has been linked to reduced performance. This link between boundary disagreement and performance is suggested in Mortensen and Hinds' (2002) preliminary work that proposes that teams agreeing on membership are likely to perform better than those that do not.

Hypothesis 6a: Boundary disagreement will be negatively related to team performance.

I explore the mechanisms underlying this relationship, examining the extent to which boundary disagreement affects teams' abilities to accomplish their goals by impeding their ability to effectively manage team resources, intra-team relationships, and internal dynamics. I examine three frequently-cited antecedents of team performance: shared team identity, transactive memory, and intra-team conflict, which I predict mediate the relationship between boundary disagreement and team performance.

First, boundary disagreement affects performance through a reduction in shared team identity. As framed in the introduction, categorization provides the key mechanism through which boundary disagreement occurs and subsequently affects team performance. Building on the categorization processes outlined earlier, research on social identity and self-categorization posits that once individuals have categorized their surroundings, they differentiate between those categorized as "ingroup" (similar) and "outgroup" (dissimilar) (for a review, see Hogg and Terry 2000). Furthermore, individuals ascribe values to these categories and the items within them, with those in the ingroup valued more highly than those in the outgroup (Tajfel and Turner 1986).

Multiple studies have found that when outgroup distinctions occur within as opposed to between teams, team effectiveness suffers as a result of reduced cooperation and increased conflict (see Williams and O'Reilly 1998 for a review). Moore, Kurtzberg, Thompson, and Morris (1999), for example, identified the lack of a shared team identity as a major impediment to rapport, and subsequent consensus, building. This is especially the case within distributed teams, as Hinds and Bailey (2003) argue that teams lacking shared identity are less likely to discuss and work through issues when they occur.

In teams experiencing boundary disagreement, differing perceptions of team membership form a likely basis for intra-team ingroup-outgroup distinctions. Furthermore, as research has shown that prototypes are highly contextual, based on and maintained by features of the immediate context (Fiske and Taylor 1991), differing perceptions of membership will likely lead to misaligned reference groups and thus conflicting prototypes. Unshared identities will arise as teams experiencing boundary disagreement will, by definition, include individuals considered team members (ingroup) by some but not team members (outgroup) by others. Thus, I predict that boundary disagreement will be negatively related to team performance, and that shared identity will mediate that relationship.

Hypothesis 6b: The relationship between boundary disagreement and team performance

will be mediated by shared team identity.

Second, boundary disagreement reduces team performance by impeding the team's ability to effectively manage its knowledge through the formation of an effective transactive memory system. Effective transactive memory systems coordinate content-knowledge and meta-knowledge about the location of that expertise within a group (Wegner et al. 1991). This allows team members to categorize, store and retrieve information in a way that maximizes the team's breadth and depth of knowledge while minimizing redundancy and effort (Hollingshead 2001; Wegner 1987). This has direct performance implications as transactive memory systems reduce the time and effort wasted on coordination miscues, searching for external knowledge and assistance, and misuse of available knowledge sources (Austin 2003), while knowledge of member skill-sets and expertise also allows teams to approach problems more flexibly (Moreland et al. 1996).

Effective transactive memory systems have three key characteristics: specialization, the differentiation of knowledge across members; credibility, trust in the knowledge held by other members; and coordination, the knowledge of who has what expertise and how to access it (Liang et al. 1995; Moreland and Myaskovsky 2000). In teams experiencing boundary disagreement, different understandings of team membership may lead to unintentional redundancies or gaps in information as multiple team members unknowingly store the same information or allow knowledge to slip between the cracks, thereby causing coordination problems. Furthermore, when attributed to particular individuals, these errors may subsequently weaken team members' credibility as knowledge sources. An initial exploration of this relationship (Mortensen and Hinds 2002) argues that agreement on boundaries will reduce obstacles to identifying and allocating expertise within the team. Thus, I believe transactive memory will mediate the negative relationship between boundary disagreement and team performance.

Hypothesis 6c: The relationship between boundary disagreement and team performance

will be mediated by transactive memory.

Third, boundary disagreement reduces team performance as a result of increased conflict. Conflict researchers traditionally divide conflict into three main types: affective, task, and process conflict (for a discussion, see Jehn 1997). Affective conflict arises from the perceived interpersonal incompatibilities that result from clashing personalities and is characterized by anger, frustration, and distrust. Task conflict, arises from an awareness of differences regarding the task and is typically devoid of intense negative interpersonal feelings. Finally, process conflict arises from differences over how to approach the task and typically includes issues of resource allocation. Research has consistently found that affective conflict reduces team performance while results for task conflict have been less consistent, with numerous studies linking limited task conflict to more open and complete discussion of ideas and alternatives (for example, Jehn 1995). However, a recent meta-analysis found that like affective conflict, task conflict generally has a negative effect on team performance (De Dreu and Weingart 2003). Process conflict, more recently introduced than task and affective conflict has not been as extensively explored as either affective or task conflict. However, early studies suggest similarly negative effects (Jehn 1997).

In teams experiencing boundary disagreement, some individuals may be excluded from communications or decisions due to differing perceptions of membership. This, through the fundamental attribution error (Ross 1977), may lead to those individuals assuming they were intentionally excluded, providing a source of strain and affective conflict. Similarly, boundary disagreement may result in a failure to share task-relevant information, leaving certain team members unaware of basic information, new developments, or recent changes and leading to task and process-based conflict. Support for this was reported by Cramton (2001) who found that incomplete or uneven information exchange resulted in increased frustration and conflict. Thus, I expect the negative relationship between boundary disagreement and performance will be mediated by conflict.

Hypothesis 6d: The relationship between boundary disagreement and team performance

will be mediated by conflict.

Methods

I conducted a web-based survey of members of software development teams in a single division of a large, multinational software company. A shorter parallel survey was administered to a small subset of team managers for comparison. To gain a richer understanding of the teams, their work practices, and performance, the surveys were followed by semi-structured interviews with a randomly-selected subset of those surveyed. Though not a prerequisite, in all cases, interviewees had completed the survey prior to being interviewed, thus allowing for clarification of issues raised in the survey. Two separate analyses were carried out, one to assess the relationship between boundary disagreement and its hypothesized antecedents, and the second to examine the relationship between boundary disagreement and performance.

Sample

The teams studied were formal, well-established (not ad-hoc) and project-based. All teams in the sample were explicitly identified and named by the organization (ex. the "Financial Module Interface

Design team") and in all cases there existed an "official" management-sanctioned team roster. For the purposes of data collection, I surveyed those individuals listed on the official manager-provided team rosters, thereby ensuring a consistent starting point and one aligned with that found in prior research.

Initially, 443 individuals in 49 teams were contacted. Teams with responses from less than 60 percent of team members or with fewer than 3 respondents were excluded from the sample, thereby reducing the sample to 39 teams with 378 respondents. Among teams included in the final sample, the mean non-response rate was 19 percent (1.74 individuals per team)[2]. The majority of team members (65%) worked as developers or in related fields (UI design, quality, etc.) creating, maintaining, and supporting highly interdependent code; 27% worked as project or development managers; and the remaining 8% worked in marketing, as technical writers, or other related fields. As per their project-based organizational structure, the mean number of teams of which each respondent was a member was 1.81 and respondents mean percentage of time dedicated to the focal team about which they were being asked was 79.40%. Finally, of the 39 teams in the sample, 27 were geographically dispersed, with members situated in up to five locations per team. The remaining 12 teams were geographically collocated, with all team members in the same location. All respondents validated that they considered themselves members of the teams identified by their managers.

Survey administration

The survey was divided into two phases, administered approximately two weeks apart. The sample for both phases was identical, with both phases of the survey sent to the same set of individuals – those identified by the team manager as members of the team. I used the phase one survey to collect data on team demographics and membership attributions and the phase two survey to gather data on respondents' perceptions of the team and their teammates.

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[2] Though additional information on non-respondents was not available, member and manager interviews suggest these non-respondents were not significantly or systematically different from the rest of the population.

Both phases of survey were tailored to each recipient, such that all questions explicitly identified their team as defined by their manager. For example, all members of the "Alpha" team received surveys in which all questions had the form "How long have you been a member of the Alpha team?" This was done to reinforce in respondents' minds the particular team about which they were responding. The phase two surveys were further customized based on each team's responses to the phase one survey. All questions that referenced individual team members (ex. "how much do you rely on each of the following members of the Alpha team to complete your work") provided lists of team members populated with a superset of all individuals on the initial team manager-provided lists as well those referenced by respondents to the phase one survey[3]. As noted, the sample surveyed in phase two, however, remained identical to that of phase one.

Measures

Analysis 1

I used two approaches to capture respondents' assessments of team membership. First, respondents were asked to list all the members of their team and provided a free-form space in which to do so. Later, when they could no longer return to their freeform answers, respondents were asked to verify or adjust a list of team members provided by their manager. The first question yielded a list of team members that was unbiased by managers' perceptions, but risked recall errors while the second risked a priming effect based on team managers, but reduced the likelihood of recall errors. Though the latter lists were slightly more comprehensive and inclusive than those generated by the freeform question, measures of the amount and form (inclusion vs. exclusion) of the differences between the two sets of lists were not significantly related to the constructs in this study. Thus, given that the verification-format

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[3] To make the survey less cumbersome and reduce non-response, in teams identified by managers as having 10 or more members, the phase two questions that listed team members listed only those individuals referenced by two or more members in the phase 1 survey. As this affects only the most disagreed upon members of large teams (11 of the 39 teams), the resultant data yield a more conservative test of the hypotheses.

question provided strong priming towards agreement in the form of the management-sanctioned list, it was used as a conservative test of the hypotheses.

As there have been no prior studies of boundary disagreement, there were no previously existing measures of boundary disagreement upon which to draw. For each pair of respondents (i,j), their membership attributions regarding every other potential teammate were coded as one if they were different and zero if they were the same, and summed. This sum was then divided by the total number of unique individuals referenced by that pair, yielding a percentage of disagreement. Taking Figure 2 as an example, starting with individuals [A,B,C] identified by the team manager, member A includes the following as team members: [A,B,C,D] while B includes: [A,B,C,F]; A and B therefore disagree upon two [D,F] out of a total of five [A,B,C,D,F] members referenced, yielding a percentage of disagreement of 2/5 = .40. The mean of these disagreement scores across all possible pairs of individuals was then used as the measure of team boundary disagreement, both as the dependent variable in analysis 1, and the independent variable in analysis 2. In the case of the example, this would be mean disagreement scores of [A:B, A:C, B:C], yielding a boundary disagreement score of .42[4].

Insert Figure 2 about here

Alternative calculations considered as measures of boundary disagreement included variations of the measure outlined above in which the denominator included all targets acknowledged by either evaluator or alternatively only those included by either evaluator. Also, versions were created in which missing data for a particular target (i.e. a particular target was intentionally left blank) were coded as either missing or as non-members. In all variations, the pattern of results remained the same. Another alternative calculation addressed the possibility that individuals used a team-based template-driven approach to assessing team membership. This measure was calculated by taking the smaller of the percentage of team members who included or excluded a particular target. For example given five

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[4] To address any potential concerns regarding the nonlinearity inherent in percentage measures, I used an arcsin transformation of the above boundary disagreement measure (see Cohen et al. 2003).

evaluators, if four considered a target to be a team member and one did not, the per-target score would be

calculated as min(.2, .8) or .2 disagreement on that target, with the mean across all targets used as a

calculation of boundary disagreement. This alternative measure yielded a pattern of results that were

similar though slightly weaker than those based on the initial calculation outlined above. As this

conceptualization was a poorer fit for the theoretical model, the first calculation was retained. Finally, in

order to assess the impact of differing team-level patterns of membership inclusion and exclusion, I

created a measure of the ratio of individuals considered core versus peripheral based on their teammates'

attributions of membership. Assignment to core versus periphery was based on the partition-based model

identified by Borgatti and Everett (1999). This measure was found not to have a significant relationship to

the constructs in the study, thus all results presented here are based on the first calculation described.

Finally, it should also be noted that the measure of boundary disagreement was not the result of a

direct survey item measuring perceived disagreement. Instead it was calculated by the researcher based on

respondents objective identification of who was and who was not a member of their team. Respondents

were provided no clues as to the purpose of that identification and the request to identify members of their

team was worded to be as objective and non-valenced as possible. This was done to reduce the possibility

of common methods bias that might otherwise occur, were respondents asked to assess the level of

boundary disagreement in their team. In addition, the separate phases of the survey further helped to

reduce any potential common methods bias between the independent and dependent variables.

To assess multi-team context, I asked respondents to report how many teams they were currently

on and used the team-level mean as a measure of multiplicity of team membership. Similarly, I asked

respondents to report what percent of their time was dedicated to the team in question. The team level

mean was used as a measure of focal team time commitment.

I created the measure of distinctiveness of task-relevant traits based on individual team members'

self-report on two task-relevant characteristics: job category and educational background. I calculated

relational demography scores for each subject on each characteristic as per Tsui, Egan & O'Reilly (1992),

then calculated z-scores on the basis of these numerical demographic heterogeneity scores. I used the

mean of those scores for job category and educational background as the measure of amount of distinctiveness of task-relevant traits. Counter to the spirit of distinctiveness as theorized, the resultant team-level score is weighted in favor of widely distributed heterogeneity rather than uniqueness – a team of the form (3X, 3Y) would be more unique than a team of the form (1X, 5Y). To rectify this, I subtracted all non-zero relational demography scores from one, yielding a team-score that captures distinctiveness as conceptualized in this study.

I asked respondents to "indicate how frequently you interact with each other person across all forms of communication. This includes face to face as well as email, phone, voicemail, videoconference, teleconference, instant messenger, fax, and paper documents." Respondents selected a unit of time (per hour, day, week, month) an entered the frequency of their interaction. The list of target individuals to be rated included all individuals in the manager-sanctioned list as well as the superset of all individuals identified by any respondent within that manager-sanctioned list. I calculated mean levels of communication within each team and used these as measures of average intra-team communication. I used the team-level mean of the Euclidean distance between team members regarding communication with each target as a measure of intra-team communication heterogeneity[5].

To measure task interdependence, I asked respondents to "rate the extent to which you rely upon each team member to accomplish your work" on a five-point scale (1 = "do not rely on at all", 5 = "rely on heavily"). The list of target individuals to be rated was defined identically to that used for the measures of communication. Similarly, as with communication, I used the mean of all task interdependence ratings within a team as a measure of task interdependence within that team. Also following the same procedure as with communication, I used the team-level mean of the Euclidean

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[5] Kolmogorov-Smirnov tests were carried out comparing the distributions of the average communication and heterogeneity of communication to a normal distribution. Average communication was non-normal ($z = 2.03$, $p < .01$,), reflecting skewness of 3.99 (.38) and kurtosis of 17.82 (.74). The natural log yielded a more normal distribution with skewness of .70 (.38) and kurtosis of 1.25 (.74) which passed the Kolmogorov-Smirnov test of normality ($z = .70$, $p > .20$). As the transformation did not affect the pattern of results the transformed variable was used in all subsequent analyses. Kolmogorov-Smirnov tests conducted on the distributions of all other variables in the study yielded values of $p > .2$, indicating normal distributions.

distance between team members regarding interdependence as a measure of intra-team interdependence heterogeneity[6].

Analysis 2

I asked team members to rate their team's performance on seven dimensions (e.g., efficiency, meeting customer/client needs, adherence to schedule/budget) relative to all other teams with which they had experience (Ancona and Caldwell 1992). The mean of respondents five-point Likert scale (1 = "poor", 5 = "excellent") ratings yielded a highly reliable (α = .84) of perceived performance. To validate the accuracy of team member performance ratings, a sub-sample of team managers were surveyed and asked the same question regarding the teams they managed. In cases where a team had multiple managers, the average of the team managers' ratings was calculated (with an inter-rater reliability of .94). Team manager ratings had similar reliability (α = .85), were significantly positively correlated to member ratings (r = .63, p < .01), and demonstrated similar patterns of correlation with all other measures. Given this, and as data were only available from a small sub-sample of team managers, team member ratings were deemed an accurate and adequate representation of team performance. I measured shared team identity using a thirteen item scale adapted from Tyler (1999) in which team members rated statements (e.g., "I see myself as a member of the team") on a five-point Likert scale (1 = "not at all characteristic", 5 = "very characteristic"). The mean of the thirteen items formed a reliable (α = .80) individual-level identity score and inter-rater reliability scores indicated a team-level identity measure was justified given interclass correlation coefficients (sample-wide, mean by team) of (ICC_1 = .30, ICC_2 = .70, r_{wg} = .92).

I measured transactive memory using Lewis' (2003) measure, 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") using a five point Likert scale (1 = "not at all accurate", 5 = "very accurate").

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[6] I explored alternative calculations for heterogeneity of communication and interdependence comprised of the team-level mean of the coefficients of variance between team members regarding each target. As these alternative measures were found to produce the same pattern of results, the Euclidean-distance based calculations were retained as they were deemed easier to interpret.

The mean of these ratings was then calculated to create a reliable ($\alpha = .87$) measure of transactive memory. The mean of all individual-level measures yielded a reliable ($\alpha = .96$) team-level measure of transactive memory. To verify that aggregation to the team-level was justified, I estimated within-group interrater reliability scores based on the formula derived by James, Demaree, and Wolf (1984). The interrater reliability scores indicated that using mean transactive memory scores as a team-level measure of transactive memory was justified ($ICC_1 = .21$, $ICC_2 = .80$, $r_{wg} = .96$).

Finally, I measured affective, task, and process conflict using relationship conflict scales developed by Jehn (1995) and further refined by Jehn and Mannix (2001). Respondents answered nine questions about their team (e.g., "How much conflict is there in the team about task responsibilities?") using a five-point Likert scale (1 = "not at all", 5 = "very much"). As per Jehn's model, I averaged these scores to form indices of affective, task, and process conflict that were deemed reliable ($\alpha = .86$, $\alpha = .79$, and $\alpha = .89$ respectively). Interrater reliability scores of ($ICC_1 = .78$, $ICC_2 = .92$, $r_{wg} = .81$), ($ICC_1 = .50$, $ICC_2 = .75$, $r_{wg} = .86$), and ($ICC_1 = .60$, $ICC_2 = .82$, $r_{wg} = .82$) respectively, further affirmed that these constructs were perceived consistently by the members of each team, thereby justifying aggregation to the level of the team.

Controls

It may be reasonably assumed that as teams increase in size, keeping track of all team members becomes more difficult, thus I included controls for the size of the team. The control for team size was calculated both as the manager-reported team size and as the total number of individuals identified as team members by survey respondents. The two measures of team size were highly correlated (r=.66 p <.001) and yielded a similar pattern of results, thus the measure based on manager-reported team size was used in the reported analyses. A number of additional controls were tested but found not to have significant effects and were thus not included in the reported results in the interest of parsimony and retaining degrees of freedom. These included team-level controls for gender ratio and average member age as well as team age, stage of task completion, geographic distribution (including measures of number of sites, distance,

time-zone overlap, imbalance, and isolation), and a measure of member disagreement with team manager, (calculated as the mean of disagreement between each team member and the team manager). Finally, the set of controls explored for the analysis of the antecedents of boundary disagreement were likewise examined in the context of the analysis of boundary disagreement effects. As none were found to have significant relationships to either mediators or the dependent variable, however, they were removed from the final reported results

Results

Table 1 provides the descriptive statistics for and correlations between the primary variables of interest.

Existence of Boundary Disagreement

Boundary disagreement existed in 28 (72%) out of the 39 teams in the sample, with levels ranging from a low of 0 to a high of .55 (M = .16, s.d. = 16)[7]. Within those teams that experienced boundary disagreement, mean boundary disagreement was .22 (s.d. = .14). This provides evidence of the existence of naturally occurring boundary disagreement, and thus support for hypothesis 1.

> Insert Table 1 about here

Antecedents of Boundary Disagreement

To assess the relationships outlined in hypotheses two through four, I conducted linear regressions with ordinary least squares (OLS) estimates. In my second set of hypotheses (2a, 2b) I predicted that boundary disagreement would be positively related to the mean number of teams on which individuals perceived themselves to be members and negatively related to the percentage of time they dedicated to the team in question. Regressing boundary disagreement on multiplicity of team membership (see table 2, model 6) did not yield a significant relationship (β = -.16, n.s.), while regressing

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[7] All values reported in tables refer to the arcsin transformed measure.

boundary disagreement on percentage of time dedicated did yield a significant negative relationship (β = -.34, $p <.01$). Thus, I find support for hypothesis 2b, but not 2a.

Complementing this quantitative data, I found further support for the effects of time dedication on boundary disagreement. Many respondents referenced confusion or difficulty in identifying team members due to their dedicating less than 100% of their time to the team. When asked how she knew who was and who was not in her team, one respondent noted: *"In the first place the general team definition. We have a fixed number of team members and I know them by name, but sometimes I forget certain persons because they do not work full-time for the MNL team."* Others spoke more generally about the dynamism of their project-based organizations and the fact that changing membership clarity shifted along with changes in the teams themselves. As pointed out: *"the team is in a sense dynamically put together so that the team boundaries are clear [now] but might be open for the next project"*. Thus, data from the interviews provide further support for the effects of the project-based organizational context as a contributor to boundary disagreement.

In my third hypothesis, I predicted that boundary disagreement would be negatively related to distinctiveness on task-relevant traits. Regressing boundary disagreement (see table 2, model 6) on task-relevant traits yielded a significant negative relationship (β = -.27, $p <.01$), thus, I find support for hypothesis 3. This quantitative result was also supported by qualitative interview data. When asked how they determined who was a member of the team, many informants highlighted the importance of functionalities, for example: *"... And then there are the architects... there are some functionalities that are to be used on other projects as well"*. Another person explained the inclusion of a particular teammate by noting: *"He was handling the program manager task but then it was decided to have a special person for AV, for warehouse scenarios and he's been working in the team since August"*. Thus, similar to the previous hypotheses, the qualitative interview data provide further support for hypothesis 3.

In my fourth set of hypotheses (4a, 4b), I predicted that boundary disagreement would be negatively related to level, and positively related to heterogeneity, of communication. While neither was

significant in the complete model (see table 2, model 6), in the model including only the controls (see table 2, model 4), there was a significant negative relationship between boundary disagreement and both average communication and heterogeneity of communication (β = -.44, p <.05 and β = .40, p <.05 respectively). This loss of significance appears to be due, in part, to collinearity between measures of average communication and interdependence (r=.53, p < .01), reflecting an underlying theoretically-justified relationship between the constructs. Thus, I find only partial support for hypothesis 4a and 4b.

Despite the lack of quantitative support for hypothesis 4, I found strong qualitative evidence suggesting that people believed they were determining team membership on the basis of communication patterns. One informant, when asked how s/he knew who was on the team responded: *"Yes, yes, it's no big problem. We have weekly telephone conferences and we [communicate] almost daily. So* it's no *problem."* Another used a multi-stage process in which communication played a major role. As s/he noted: "…*you get emails from these people; and you may get a face but not really a feeling for that person.*" Thus, qualitative interview data further suggests individuals believed they based their decisions on their interactions and communication.

In my fifth set of hypotheses (5a, 5b), I predicted that boundary disagreement would be negatively related to task interdependence and positively related to heterogeneity of task interdependence. Regressing boundary disagreement on level and heterogeneity of task interdependence (see table 2, model 6) found a significant negative relationship between boundary disagreement and task interdependence (β = -.62, p <.01) and a significant positive relationship between boundary disagreement and heterogeneity of task interdependence (β = .54, p <.01), thus I found support for hypotheses 5a and 5b.

The qualitative interview data yielded further evidence of the link between interdependence and membership decisions. When asked how they determined team membership, some individuals focused on their work-related interdependencies as was the case with the following informant: *"So it's a very clearly defined thing. I know whom I could ask for… whom I could ask to help on projects, work on projects that I am responsible for."* Others similarly focused on interdependencies through project responsibilities.

One respondent provided a step-by-step accounting of how s/he attributed membership, including:

"There's 'Chris' who coordinates the activities in Richmond but he's in close contact with the two other guys in my room 'Adrian' and 'Gerry' who are responsible for difference tasks in the database interface area". Others simply indicated that identified responsibilities were the key way in which they determined membership, for example: *"…I know who is responsible for what item."* Thus, the qualitative data provide further evidence of the impact of interdependence on membership attribution.

> Insert Table 2 about here

Effects of Boundary Disagreement

In my sixth hypotheses (6a, 6b) I predicted that boundary disagreement would be negatively related to performance in teams and that the relationship would be mediated by shared identity. Regressing team performance on boundary disagreement yielded a significant negative relationship (β = -.37, p <.05), supporting hypothesis 6a. In hypothesis 6b, I predicted that shared identity would mediate the relationship between team boundary disagreement and team performance. To evaluate the mediation effects outlined in hypothesis 6b, I used Preacher and Hayes' (Preacher and Hayes 2004, 2007) bootstrapped analysis of mediation using 1000 bootstrapped resamples (for discussion of bootstrapped analyses of mediation, see MacKinnon et al. 2002). This analysis yielded a significant relationship between boundary disagreement (IV) and both shared identity and transactive memory (mediators 1 & 2) (β = -.28, p <.05 and β = -.18, p <.05 respectively). No significant relationships were found between boundary disagreement and any of the three measures of conflict, thus no mediation effects for those variables could be tested. I also found a relationship between shared identity (mediator 1) and performance (DV) (β = .33, p <.06) that although not significant to the p <.05 level, was significant at p <.06[8]. Furthermore, the relationship between transactive memory (mediator 2) and performance (DV)

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[8] Running the mediation with shared identity as the only mediator yielded a significant effect for this relationship (β = .52, p <.01), suggesting the weak significance may be due to a loss in explanatory power due to reduced degrees of freedom in the model.

was significant ($\beta = .83$, $p < .001$). Finally, the total effect of the IV on the DV was significant ($\beta = -.27$, $p < .05$) while the direct effect of the IV on the DV was not significant ($\beta = -.07$, n.s) with a model F of 8.79 and an adjusted $r^2 = .55$. Thus transactive memory was found to fully mediate the relationship between boundary disagreement and performance while a strongly suggestive effect was found for a mediating effect of shared identity on the same relationship. None of the three forms of conflict were found to mediate the relationship, thus yielding partial support for hypothesis 6b.

Discussion

This study provides the first examination of boundary disagreement, its antecedents, and its effects on team dynamics, processes, and performance. In so doing, it brings to light a phenomenon that has been largely ignored by both researchers and practitioners, and begins to suggest ways in which its incorporation into our understanding of team dynamics may yield a more nuanced, accurate, and informative model of team dynamics within organizational settings. This is particularly the case within project-based organizations wherein the effects of project-based work will be felt most strongly.

As predicted in my first hypothesis, I found boundary disagreement occurring widely within the teams in my sample. This provides the first evidence of boundary disagreement within the context of project-based-work. In examining the impact of context on boundary disagreement, while I did not find a link between boundary disagreement and the average number of teams members were on, I did find the percentage of time dedicated to a given team was inversely related to boundary disagreement within that team. I believe this finding remains consistent with the overall predicted effect and suggests that to the extent the number of teams an individual is on affects his or her membership attributions, it operates only through the amount of time individuals are able to dedicate to the team. Alternatively, it may provide evidence that the effects of context operate primarily through targets, rather than evaluators, as average percent of time dedicated to the team affects not only evaluator's opportunities to interact with and observe the team but also the target's opportunity to be present in the team. I also found support for my hypothesis predicting distinctiveness of task-relevant traits would offset the ambiguity inherent in project-

based team environments. This further reinforces the link between the ambiguity of project-based teams and boundary disagreement suggested by the second hypotheses. . [R2 3rd to last]

While I found weak and partial support for the link between communication and boundary disagreement, I found strong support for the boundary disagreement – interdependence link. As predicted, mean interdependence was negatively related – and heterogeneity of interdependence positively – to boundary disagreement. Taken in concert with the findings regarding communication, this suggests membership attributions are more strongly driven by task-related rather than affective factors with interaction or social-category homophily based arguments playing a less powerful role. As such, it is not surprising that the effects of communication cannot be differentiated from those of interdependence when they are both included in the model.

Finally, turning to the effects of boundary disagreement, I found boundary disagreement was negatively related to team performance and that relationship was mediated by transactive memory. My analyses also strongly suggested that shared identity also mediated this relationship, though the link between shared identity and performance was slightly weaker than predicted. Contrary to my predictions, boundary disagreement was not significantly related to conflict of any type. The lack of significant relationship between conflict and boundary disagreement may reflect teams' ability to avoid potential issues arising from boundary disagreement through by relying on abstract definitions of the team (ex. "the XYZ Consulting Team") which obscure underlying disagreements as to membership. This issue is discussed further in the discussion of future research.

Taken together, these performance effects suggest that boundary disagreement does negatively impact team performance, by making it more difficult for teams to coordinate their cognitive processes

In exploring the effects of boundary disagreement, I found a negative relationship between boundary disagreement and performance. That relationship was fully mediated by transactive memory and the findings strongly suggested a mediating relationship for shared identity as well. This suggests that while boundary disagreement may lead to poorer team performance, this relationship operates in part through processes well-established in the teams literature.

The lack of significant relationship between conflict and boundary disagreement may reflect teams ability to address issues arising from boundary disagreement through by relying on abstractions of the team.

[R1-C04]

Implications

Implications for theory: Project-based work

First, these findings provide new insights for our understanding of project-based organizations and the broader phenomenon of multiple-team membership. As noted by Hobday (2000), many existing studies of project-based work success and failure work have not explored intra-project dynamics, ignoring the interpersonal relationships which often drive performance. The small number of exceptions have typically focused at the level of the individual (ex Leroy and Sproull 2004), system or community (ex. Lindkvist 2005; Marks et al. 2005), or across levels (Mortensen et al. 2007). Despite this recent growth, this remains a minimally studied domain, particularly at the level of the team.

In this study, I begin to address this gap by highlighting a key team-level interpersonal dynamic occurring within project-based, multiple-team environments. I begin to unpack the intra-team dynamics occurring among members of a project-based team and illustrate how contextual factors of the project-based context may interact with intra-team behaviors like communication and interdependence to shape not only interpersonal relationships but team-level dynamics as well. Beyond the specific intra-team dynamics noted, these findings reinforce the need for more research on intra-team dynamics within multiple-team contexts.

More broadly, I believe this research has implications beyond project-based organizations. Central to the idea of project-based work is increased fluidity and flexibility of teams. This basic notion,

that boundaries must be flexible and change over time to better adapt to their environment, is not new

(Arrow and McGrath 1995; Ziller 1965), nor I would argue is it uniquely a characteristic of project-based

work. Given the increased prevalence of project-based teams, even in organizations that are not entirely

project-based, boundary disagreement may be a reality even for teams that are not, themselves, project-

based. Furthermore, although project-based teams provide a context within which membership may be

particularly difficult to assess, it is not clear the phenomenon is limited solely to those contexts. Thus

even in cases where project-based teams are not being used, I believe boundary disagreement may be a

factor in ultimate success. The existence of boundary disagreement in such contexts, however, remains a

question for future research.

Implications for theory: Groups and teams

I believe the findings of this study also suggest that it may be valuable to reassess existing

theories in the light of boundary disagreement. Taking team norms as an example, scholars have built on

Bandura's (1977) social learning theory to argue that individuals look to teammates to learn the norms

governing behavior in their team (Bettenhausen and Murnighan 1985). These, in turn, delineate

appropriate and inappropriate behaviors and attitudes, often with strong effects (for example, Barker

1993). Disagreement on team membership may cause individuals to look to different sets of people to

learn expected behaviors, resulting in confusion or conflict over the team's behavioral norms, both of

which may lead to coordination issues and other antecedents of reduced performance.

These findings thus suggest we reevaluate existing theories in the light of boundary disagreement

and in relevant cases measure and control for its effects. In particular, I suggest we reassess theories in

which the identification with, or perception of, an abstraction representing a team might impact the results

of the study. For example, absent an understanding of boundary disagreement, research on minority and

majority influence in teams may be confounded if there is variation in the target group against which

minority and majority status is assessed. Similarly, returning to our example of team norms, considering

boundary disagreement in future research on norms would provide a more accurate understanding of the

way people learn existing norms and how that affects their subsequent understanding thereof. In contrast, boundary disagreement is not likely to be relevant for a study of communication patterns unless there is a theoretical justification for perceptions of team membership impacting those patterns. Without that justification, I believe boundary agreement is a reasonable simplifying assumption.

Implications for methodology

It is also important to consider a study's methodological approach as a key determinant of a researcher's ability to capture and recognize existing boundary disagreement or replicate it in experimental settings. I would argue, in fact, that study design is one of the reasons boundary disagreement has remained largely unstudied to date. Much of our understanding of membership effects has come from social psychological experiments which McGrath et al. noted have been "laboratory research on ad hoc groups working for short periods of time" (2000: 96). In such situations, random assignment to condition artificially eliminates boundary disagreement. As boundary disagreement is likely to be difficult to replicate in laboratory settings, the simplifying assumption of boundary agreement may be taken into account in future experimental work. In field studies, team membership has often been explicitly delineated by providing membership lists which respondents are not given the opportunity to validate (for example, Ancona and Caldwell 1992). Lacking this validation and the comparison process it entails, there has been no way for such studies to uncover existing disagreement on team membership. In those cases where membership has not been delineated, boundary disagreement has typically gone unmeasured or in some cases has been identified as measurement or recall error. I argue such results may in fact arise from accurate measurement of a prevalent phenomenon with predictable and substantial effects on team performance. It is important that future field research capture individual membership perceptions either directly or by allowing respondents to individually validate membership lists.

Implications for practice

Beyond the aforementioned implications for theory and research practice, this study holds implications for managers and members of teams within project-based and multiple-team environments. This study suggests that, as was the case in this field setting, "official" team rosters do not guarantee a common understanding of the team. However, this research suggests that this may not result solely from differences between formal and informal networks. Stemming from early work by Roethlisberger and Dickson (1939) and Dalton (1959) such research posits that in organizations there exist informal networks of interconnections that may or may not align with the formal organizational structures (Krackhardt and Stern 1988; Lincoln and Miller 1979). While it may be tempting to explain away boundary disagreement as a reflection of conflicting formal and informal organizational structures, it is important to note that boundary disagreement deals with differences among team members' perceptions of the team, not between team members' perceptions and the formal organizational structure. As such, boundary disagreement reflects an internal clash among the socially-constructed perspectives held by team members.

This suggests that the negative effects of boundary disagreement identified in this study cannot simply be ameliorated through clearer delineation of team membership, as may be the initial inclination of most managers. The powerful effects of the distinctiveness of task-relevant traits and interdependence patterns suggest that the primary means of shaping perceptions of membership may be through the design of the work itself, rather than managerial efforts to clarify the supposed "correct" model of the team.

Future directions

As the analysis of the antecedents and effects of boundary disagreement presented here provide a first look into boundary disagreement, it opens and suggests many potentially fruitful areas of research, two of which are discussed below.

Structures of boundary disagreement

In this study I explored the antecedents and effects of boundary disagreement within teams, but did not delve into the structure of the resulting boundary disagreement and subsequent effects of that structure on team processes. Of particular interest, is the potential impact of boundary disagreement-based subgroups. In some teams, particularly larger ones, one might expect team members to adhere to one of a small number of consistently-held alternative team models, based on similar interaction patterns. One might expect, for example, that individuals group based on similar job functions or phases of the project, as these similarities are likely to yield similar interdependence patterns. Alternatively, though calculated and found not to have a significant effect in this study, differentiating between core and peripheral members on the basis of boundary disagreement may yield additional insights into the antecedents and effects of boundary disagreement. Finally, intra-team structure may interact with boundary disagreement, as subgroup dynamics occurring within boundary-disagreement-delineated sub-teams may impact boundary disagreement and its effects. I believe the results of this study justify further exploration and analysis of the structures of boundary disagreement within teams.

Awareness and mechanisms of ambiguity and variation

This study builds on prior work on role-based categorization to examine the phenomenon of boundary disagreement. In so doing, I trace two alternate paths to team level boundary disagreement, arising through ambiguity and variation. The existence of both mechanisms within this organization was suggested by interview data in which some respondents noted: *"it changes all the time. So you never know really who is in what group"* or more simply: *"No, [membership] is not very clear"* while others were very definitive saying: *"…of course I know who are members of my team"* and *"Yeah, it's very clearly defined … I think it is very clear"*. In the context of this first examination of the phenomenon, the two mechanisms are treated similarly. It is not clear, however, whether they have differentiable effects. One might expect, for example, that teams within which boundary disagreement arises primarily through ambiguity may not feel the negative effects thereof as strongly as do those in which disagreement arises

due to directly conflicting viewpoints. This highlights an important dimension of boundary disagreement that was not explicitly addressed in this study: the role of awareness. The interviewee quoted above as saying it was very clear was further asked if she thought most people in the team had the same understanding. She responded *"Uh-huh. I think it's quite clear to everyone"*. Comments like this suggest that at least among those individuals who felt team membership was unambiguous, it was assumed that the entire team shared the same model of the team.

It is important to recognize the role of the abstraction in helping teams cope with, or remain oblivious to, existing boundary disagreement. By thinking about and referring to the team as an abstraction (ex. "the alpha project team") team members mask existing heterogeneity in their conceptualizations of the team. As a result, team members may remain unaware of the existence of boundary disagreement even when it is severe. Based on the evidence provided by the interviews, it appears that even in cases where subjects noted boundaries were not clear, they did not realize the implication that they and their colleagues might disagree. Instead, team members worked in and successfully discussed their team in the abstract, unaware of differing underlying models on which that abstraction was mapped.

Unfortunately, an examination of the differential effects of ambiguity versus variation-based disagreement cannot be tested with the data in this study. However, one might expect that a lack of awareness may be critical to many of the effects identified in this study as outcomes of boundary disagreement. Difficulties in the formation of effective transactive memory systems, for example, arise not only because team members have differing understandings of team membership, but because they are unaware that their understandings differ. Knowing how teammates differ in their perceptions of team membership, or even just that they do, might allow individuals to compensate. This compensation could occur through storing redundant information or correctly attributing errors, thereby maintaining a source's credibility. Furthermore, awareness of boundary disagreement may allow for potential beneficial effects like increased creativity as teams draw on divergent pools of contributors. I believe this study suggests

research into the differential mechanisms of ambiguity and variation as well as the related issue of awareness is warranted and may provide valuable further insights into the phenomenon.

Limitations

Team-based constructs

The study of boundary disagreement presents a particularly tricky methodological issue, as the existence of boundary disagreement brings into question how to define the team for the purposes of assessing the effects of such boundary disagreement. Boundary disagreement calls into question the ability to accurately measure team-level constructs, as doing so is based on a particular definition of the team. Though not ideal, I chose to measure these team-level constructs based on the initial team member list provided by the team manager. While the existence of boundary disagreement raises questions regarding the accuracy of such group-level measures, I do not believe it entirely invalidates such measures. Instead it suggests that an additional boundary-disagreement-based adjustment must be taken into account. Thus, team-level constructs can be considered proxies for the actual boundary-disagreement-adjusted values. In addition, such constructs provide a link to ongoing discussions among scholars and practitioners that assume agreement on team membership. I therefore believe further research on a case-by-case basis is needed to assess the validity of team-level constructs in the light of boundary disagreement. Such research should be coupled with future research towards the creation of broader mathematical or methodological adjustments to team-level measures that would allow for more accurate assessment of team-level constructs within the context of boundary disagreement.

Analytic Context

Although a sample size of approximately 40 teams is in line with existing field research on groups and teams (see, for example, Hinds and Mortensen 2005), it may raise some concern for models predicting mediation effects. Though assessments of effective sample sizes suggest the finding of a mediation effect is reasonable in this context, additional research with larger sample sizes is warranted to

further validate this model. Also, although the theoretical framework guiding this study suggests its applicability to all types of teams, it must be noted that the teams included in this study consisted primarily of computer programmers, a highly educated and traditionally autonomous group. Finally, though driven by theoretically-grounded framework, as a correlational field study, the causality of the identified relationships is cannot be proven, thus suggesting that further longitudinal research is warranted, drawing upon larger samples and other types of teams.

Conclusion

By questioning a fundamental assumption underlying existing field research on teams, this study provides a first look at the phenomenon of boundary disagreement, its antecedents and its effects on team performance. In so doing, it begins to address a gap in our understanding outlined by Guzzo and Dickson's call for research "to clarify issues of inclusion and exclusion by virtue of team boundaries, how boundaries relate to effectiveness, and how the nature of boundaries might shape the effects of interventions intended to raise team performance" (1996: 332). The recognition of boundary disagreement as a consequence of team members' categorization processes, illustrates and reinforces how teams shape their collective perception and understanding of their environment based on their relevant experiences.

In this study, I find boundary disagreement is facilitated by the inherent ambiguity of project-based work, wherein individuals frequently must divide their time between multiple, fluidly shifting, partially-overlapping teams. Membership that is distinctive on task-relevant dimensions is found to be negatively related to this ambiguity, suggesting that it allows team members to be more clearly differentiated from non-team members. I also find that characteristics of the relationships among team members like communication and interdependence also relate to boundary disagreement, by providing more contextual information while at the same time introducing sources of variance in assessments of membership. I further find interdependence to have greater impact than communication, suggesting appears individuals socially construct their definitions of their team and that team boundary disagreement

results from a social construction of a task-focused reality. This divergent social construction is further

linked to reduced team performance through reductions in transactive memory and shared team identity.

      This study brings to light the existence, sources, and effects of boundary disagreement, thereby

providing scholars and practitioners with a means to better interpret the dynamics of teams and the

individual members comprising them within today's complex and heavily project-based organizations.

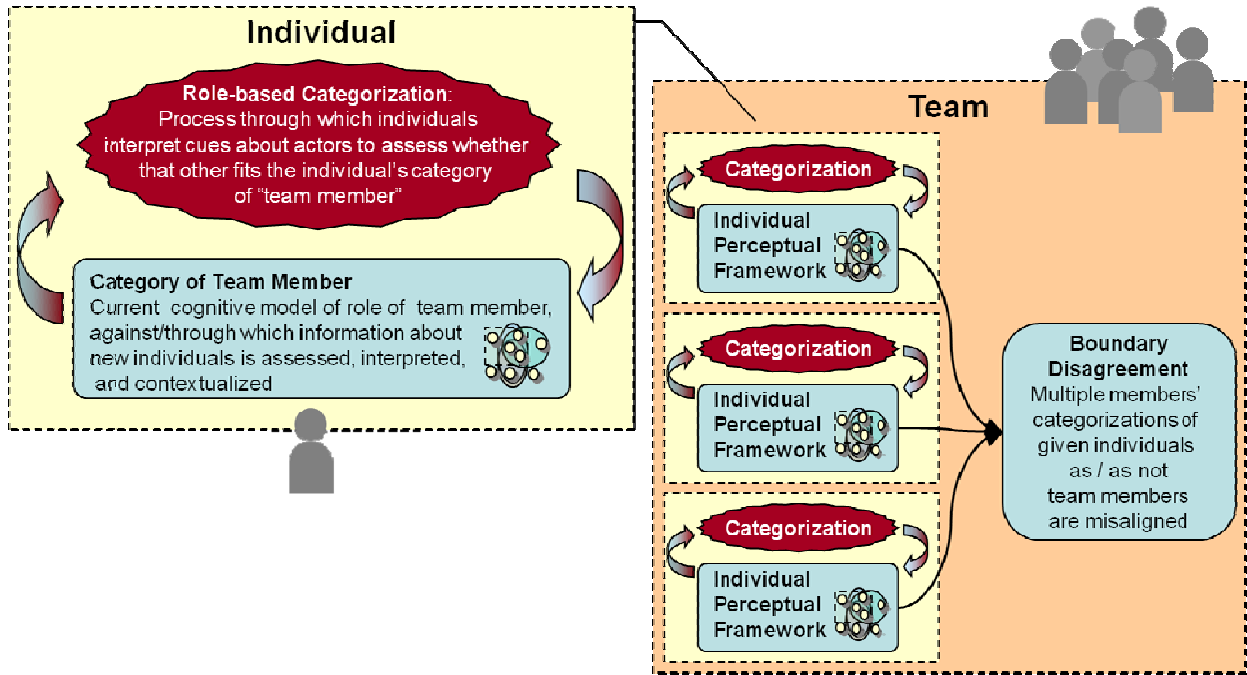**Figure 1: Individual sensemaking process and team boundary disagreement**
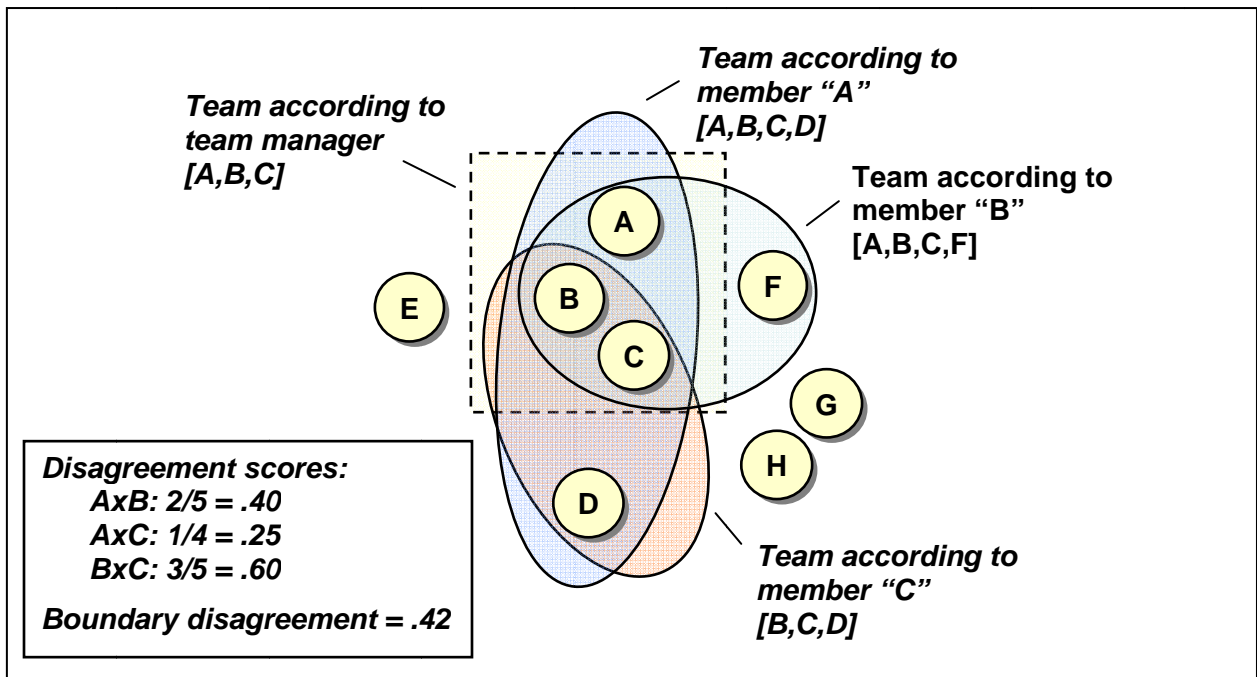

Figure 2: Boundary disagreement calculation example

Table 1: Descriptive statistics and correlations between key variables

Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Boundary Disagreement	0.67	0.52														
2 Team Size	12.85	6.30	0.53 **													
3 Number of teams per member	1.96	0.70	0.05	-0.07												
4 Percent of time dedicated	79.37	17.21	-0.39 *	-0.04	-0.38 *											
5 Distinctive task-relevant traits	0.20	0.08	-0.20	0.26	-0.29	0.29										
6 Communication (Average)	0.61	0.37	-0.36 *	-0.44 **	-0.20	0.33 *	0.09									
7 Communication (Heterogeneity)	32.56	40.49	0.18	0.07	-0.18	0.12	-0.01	0.54 **								
8 Interdependence (Average)	2.55	0.44	-0.62 **	-0.54 **	-0.03	0.02	0.07	0.53 **	0.00							
9 Interdependence (Heterogeneity)	4.50	2.70	0.46 **	0.74 **	-0.01	-0.11	0.32 *	-0.13	0.11	-0.13						
10 Performance	3.75	0.38	-0.37 *	-0.23	0.04	0.24	0.09	0.06	-0.21	0.16	-0.29					
11 Shared Identity	3.90	0.40	-0.36 *	-0.10	-0.13	0.20	0.06	0.07	0.00	0.16	-0.26	0.62 **				
12 Transactive Memory	3.81	0.29	-0.33 *	-0.21	-0.13	0.18	0.08	0.07	-0.17	0.19	-0.23	0.75 **	0.62 **			
13 Affective Conflict	2.05	0.55	0.26	0.08	0.30	-0.20	-0.10	0.08	0.17	-0.05	0.29	-0.52 **	-0.67 **	-0.70 **		
14 Task Conflict	2.39	0.44	0.06	0.13	0.16	-0.10	-0.03	0.14	0.02	0.05	0.25	-0.44 **	-0.46 **	-0.62 **	0.74 **	
15 Process Conflict	2.22	0.44	0.23	0.13	0.29	-0.08	-0.08	-0.09	-0.11	-0.13	0.22	-0.47 **	-0.73 **	-0.63 **	0.80 **	0.68 **

* p < .05, ** p < .01

Table 2: OLS estimates for regressions predicting boundary disagreement

Variable	1	2	3	4	5	6
Team size	0.53 **	0.51 **	0.63 **	0.31	-0.24	-0.19
Number of teams per member		-0.07				-0.16
Percent of time dedicated		-0.40 **				-0.34 **
Distinctive task-relevant traits			-0.35 **			-0.27 **
Communication (Average)				-0.44 *		-0.06
Communication (Heterogeneity)				0.40 *		0.17
Interdependence (Average)					-0.68 **	-0.62 **
Interdependence (Heterogeneity)					0.55 **	0.54 **
Adjusted R^2	0.27	0.38	0.36	0.35	0.51	0.70
F	14.75 **	8.66 **	11.86 **	7.68 **	14.33 **	12.05 **
Df	1 37	3 35	2 36	3 35	3 35	8 30

* $p < .05$, ** $p < .01$

Note: Values are standardized

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Measures of multiple team context

Membership attribution (source of BD measure) [H1-6d]

- *Please indicate which of the following individuals you consider to be a current member of the TEST Team. Using the radio buttons provided, please indicate which of the following individuals you consider to be a current member of the TEST Team.*

Number of teams per member [H2a]

- *Please list the names of all teams of which you consider yourself to be a member.*

(Team lists were then coded for number of unique teams listed)

Percent of time dedicated [H2b]:

- *Please enter the percentage of your overall work time that is committed to the ALPHA Team relative to all other teams of which you may be a member.*

  For example:
  If the ALPHA Team is the only team you are on, enter 100, if you spend one quarter of your time on work related to the ALPHA Team and the rest on work relevant to other teams, enter 25

Distinctive Task Relevant Traits [H3]:

- *In what area have you received most of your education?*
    a. *Business or Industrial Engineering - (e.g. Finance, Marketing, Accounting)*
    b. *Computer Science*
    c. *Engineering - (e.g. Electrical, Mechanical, Civil)*
    d. *Humanities - (e.g. Art, History, Literature, Music, Languages, Philosophy)*
    e. *Natural Sciences - (e.g. Biology, Chemistry, Physics, Mathematics)*
    f. *Social Sciences - (e.g. Anthropology, Sociology, Economics, Psychology, Political Science)*

- *Which category most accurately fits your current job?*
    a. *Development Architect*
    b. *Development Manager*
    c. *Developer (Application/Technology)*
    d. *Product Manager / Business Developer*
    e. *User Interface Designer*
    f. *Quality Manager*
    g. *Information Developer / Technical*
    h. *SJH Member*
    i. *Product Marketing*
    j. *Other*

Communication [H4a & b]:

- *We would like to get a sense for how frequently you interact with each other person in your team. Please indicate how frequently you interact with each other person across all forms of communication. This includes face to face as well as email, phone, voicemail, videoconference,*

teleconference, instant messenger, fax, and paper documents. Please select the unit of measurement which best fits the majority of your responses (e.g. per hour, per day, per week, per month, or per year).

[pull-down list: *per hour, per day, per week, per month, or per year*]

Please complete the following table, based on the unit you just selected.
For example, if you selected "Per week", then enter the number of times <u>per week</u> that you interact with each person. Please use decimals when appropriate.

Interdependence [H5a & b]:

- *Please rate the extent to which you rely upon each team member using the following scale, in other words, the extent to which you depend on that person to accomplish your work:*
  (1 = Do not rely on at all and 5 = Rely on heavily)

Performance [H6 a-d]:

- *Compared with other projects you have worked on in the past and other projects with which you are familiar, please rate your perception of performance of the ALPHA Team on the dimensions listed below using the following scale:*
  (1 = Poor, 5 = Excellent)

<u>Statement</u>
  a. Efficiency
  b. Quality
  c. Technical innovation
  d. Adherence to schedule / budget
  e. Work excellence
  f. Meeting client or customer needs
  g. Contributing something of value to GlobalCo

Transactive Memory [H6a]:

- *For us to understand the relationships within project teams, it is important for us to understand how team members coordinate their work. As noted before, even though a "right" answer may not be evident, please answer each question to the best of your ability, giving your "best guess" for all questions. Please rate how accurate these statements are with respect to your work group. (1 = Not at all, 5 = Very Much)*
  a. *Each team member has specialized knowledge of some aspect of our project.*
  b. *I have knowledge about an aspect of the project that no other team member has.*
  c. *Different team members are responsible for expertise in different areas.*
  d. *The specialized knowledge of several different team members is needed to complete the project deliverables.*
  e. *I know which team members have expertise in specific areas.*
  f. *I am comfortable accepting procedural suggestions from other team members.*
  g. *I trust that other members knowledge about the project is credible.*
  h. *I am confident relying on the information that other team members bring to the*
  i. *When other members give information, I don't need to double-check it for myself.*
  j. *I do not have faith in other members' "expertise". (reversed)*
  k. *The TEST Team works together in a well-coordinated fashion.*
  l. *The TEST Team has very few misunderstandings about what to do.*
  m. *The TEST Team needs to backtrack and start over a lot. (reversed)*

    n.   We accomplish the task smoothly and efficiently.
    o.   There is much confusion about how we will accomplish the task. (reversed)

Shared Identity [H6b]:

- *Please read each statement below and respond to it by expressing the extent to which you believe the statement applies to you (1 = Not at all, 5 = Very Much).*

Statement
    a. I feel loyal toward the ALPHA Team.
    b. I see myself as a member of the ALPHA Team.
    c. I am pleased to be a member of the ALPHA Team.
    d. I can count on the ALPHA Team to help me when I need help.
    e. The ALPHA Team is willing to help me solve problems.
    f. I would accept almost any type of job assignment to keep working for the ALPHA Team.
    g. I am proud to tell others that I am part of the ALPHA Team.
    h. I would recommend to close friends that they join the ALPHA Team.
    i. I am proud to think of myself as a member of the ALPHA Team.
    j. When someone praises the accomplishments of the ALPHA Team, I feel it is a personal compliment to me.
    l. I help others in the ALPHA Team who have heavy work loads.
    m. I often think about quitting my job.
    n. I will probably look for a new job outside within the next year.

Conflict [H6c]:

- *Please answer the following questions about the extent to which differences in opinion and disagreements occur within in the ALPHA Team (1 = Not at all, 5 = Very Much).*

Statement
    a. How often do people in the ALPHA Team have conflicting opinions about the project you are working on?
    b. How much conflict of ideas is there in the ALPHA Team?
    c. How often do you disagree about resource allocation in the ALPHA Team?
    d. How much conflict is there in the ALPHA Team about task responsibilities?
    e. How much relationship tension is there in the ALPHA Team?
    f. How frequently do you have disagreements within the ALPHA Team about the task of the project you are working on?
    g. How much emotional conflict is there in the ALPHA Team?
    h. How often are there disagreements about who should do what in the ALPHA Team?
    i. How often do people get angry when while working in the ALPHA Team?

Controls

Freeform assessment of membership [Control]:

- *We would like to verify who you consider to be the members of your team. Please take a moment to list all the current members of the ALPHA Team. Please list as many team members as you can remember. Enter each person on a new line and for each person enter their first name followed by their last name.*
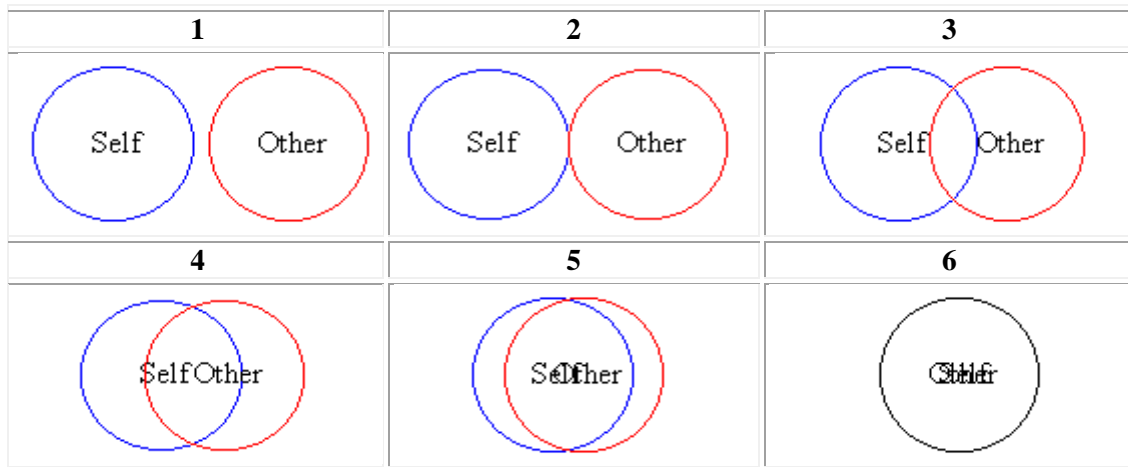
For example:

Jen Foster
Bob Carter
Sarah Petersen
Tim Fitzpatrick
Ed Hunter

Number reported to

- *Many teams are organized using a matrix-structure in which team members report to, and are held accountable to, multiple individuals. Taking a software product design team as an example, software engineers may report to the project lead as well as to a lead engineer - both within the team. Please identify how many different people you report to regarding the work you do within the ALPHA Team.*

Interpersonal closeness [Control]:

- *The relationship between two people can be represented pictorially by two circles. The more the circles overlap, the more closely related the two people are.*

1	2	3
Self Other	Self Other	Self Other

4	5	6
SelfOther	SelfOther	Other

For each of the people listed below, please select the number that corresponds to the picture that most accurately represents your relationship to them. For example, if you have no relationship with person A, then select the button for 1 in the row for person A.
(1 = very distant, 6 = very close)

Membership roster

- *The list of team members provided in this survey was based on the responses of you and your teammates on the Phase 1 survey. We realize that your perception of the team may differ somewhat from this list. Please take a moment to identify which individuals from the following list you would consider to be members of the ALPHA Team and which you would not.*