Fuzzy teams:

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

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Abstract

The organizational team is ubiquitous and team membership is far-reaching in its effects, recognized by scholars and practitioners as affecting cognition, dynamics, processes, and performance. While team membership is straightforward in traditional contexts, organizations’ increasing reliance on partially-overlapping, fluidly shifting project-based teams increases the likelihood of “boundary disagreement” in which individual disagree on the membership of their teams. In a study of 39 formally defined software and product development teams, I build on social categorization to examine the processes in project-based work that lead to team boundary disagreement. I find boundary disagreement is predicted by the amount of time dedicated to the team, level and patterns of interdependence, and members’ task-relevant uniqueness. Mediated transactive memory, it is negatively related to team performance. I discuss the impacts of boundary disagreement on our theories, of team dynamics and performance as well as our methods and management practice.
One clear conclusion of the long history of research on small group and team dynamics is this: membership matters. Many of our seminal theories on group dynamics, from Festinger’s (1954) early work on social comparison through to the present, rest upon the belief that an individual’s social context is important. Cognitively, identifying the members and non-members of a team helps us to establish the organizational reference group from which we learn appropriate behavioral norms (Lawrence, 2006). Socially, recognized membership has a psychological impact beyond its role in delineating social context (for a review, see Hogg & Terry, 2000), that affects individuals’ self-conceptions (Abrams & Hogg, 2003), attitudes (Terry, Hogg, & Duck, 1999), beliefs (Chen & Kenrick, 2002), and behaviors (Moreland, 1985) as well as team-level factors including structure (Arrow & McGrath, 1995) and both intra- (Chatman, Polzer, Barsade, & Neale, 1998) and inter-team dynamics (Tajfel & Turner, 1986). This led Lickel and colleagues to note that: “much of what people consider important, from the work they accomplish to the emotions they feel, is influenced by their membership in groups.” (2000: p223). That membership, within traditional contexts of longstanding, hierarchically ordered functional teams, membership, is straightforward and largely unproblematic.

The nature of work, however, is changing. Increasingly, people increasingly engage in project-based work, where they are simultaneously members of multiple short-term teams that change rapidly and fluidly. Particularly in these environments, “boundary disagreement,” defined as the extent to which individuals who are externally designated as members of a team disagree regarding actual team membership,¹ can – and I argue does – occur. This calls into question the degree to which the aforementioned membership effects apply to such teams.

¹ For conceptual clarity, I define boundary disagreement with respect to individuals officially and externally identified as team members by management; implications of this decision are addressed in the discussion.
Furthermore, such boundary disagreement is likely to reduce team performance by hindering the establishment of team identity and the effective coordination of knowledge and efforts – both key antecedents to effective task accomplishment.

In this research, I provide the first empirical examination of boundary disagreement, addressing three research questions: First, do teams disagree as to their own membership? Second, if such disagreement exists, what are its fundamental sources and mechanisms? Third, how does such disagreement affect team performance? With these research questions in mind, it is important to consider the project-based context within which these processes occur.

Project-Based Team Context

With the rapid pace of change, increasing product complexity, and greater need for customer-focused innovation of today’s economic climate, organizations increasingly rely on “project-based” teams that are assembled to work on a specific project and disbanded upon its completion (Brown & Duguid, 2001; Hobday, 2000; Prencipe & Tell, 2001). Highlighting the inconstant nature of such work, scholars characterize it consistently as “short-term and fluid” (Prencipe & Tell, 2001) or “self-contained, complex, and temporary” (Grabher, 2002) and involving specialized employees organized around “short-term project objectives” (Lindkvist, 2004). Such work requires that individuals switch to different contexts as each project is completed. Furthermore, not all team members start and end their work on the project at the same time – entering and leaving as their particular expertise is or is not needed. Moreover, individuals frequently 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 (see, for example Hobday, 2000). Increasing the complexity of membership, the extent of
overlap between any two teams can range substantially in overlap from none to complete, and may even shift over time as different projects manifest different temporal rhythms such that individuals may be active members of a given project at certain times and have little interaction with it at others. The short duration of project team tasks, the piecemeal entrance and exit of members, and the varying and shifting overlap of teams themselves means that each individual’s work context is in constant flux and lacks exclusivity.

The project-based team environment is thus a context in which specialized and differentiated individuals work on partially-overlapping projects that shift frequently and fluidly, creating what Bresnen et al. call a “partly indeterminate and shifting organizational terrain” (2004, p: 1537). Project-based teams may therefore find it difficult to establish shared understanding and a common knowledge base (Lindkvist, 2004). This calls into question the rarely-stated assumption in research and practice that information about membership is easily accessible (Diehl, 1990), unambiguous, and commonly held. This environment thus provides an ideal context in which to examine the processes underlying assessments of membership.

Categorization as a Source of Boundary Disagreement

It is well-established that in ambiguous situations (such as those described above), people refer to their surrounding social systems to interpret and make sense of their environments (Salancik & Pfeffer, 1978). Despite recent work on the processes through which individuals choose informational referents (ex. Lawrence, 2006), we know relatively little about the process of selecting referent others (Shah, 1998). Research on social categorization, however, may help explain the process by which team members identify teammates to whom they can refer.

In categorical thinking, individuals compare those they encounter with established categories in order to comprehend and make predictions about them (Fiske & Taylor, 2008).
Grouping individuals into categories provides a very powerful, yet cognitively economical tool for coping with environmental complexity and ambiguity (Hogg & Terry, 2000; Macrae & Bodenhausen, 2000). Particularly relevant to assessments of membership, in role-based categorization, an “evaluator” makes inferences about a “target” by comparing available information with the evaluator’s own organized body of knowledge arising from prior experiences in similar social positions.2

This categorization process may lead to boundary disagreement through multiple avenues. First, the complexity of project-based environments makes it more difficult for evaluators to differentiate potential targets from the constantly shifting background of others. Categorical person-perception cannot occur if encountering the target does not activate category-based memories (Macrae & Bodenhausen, 2000), so an unnoticed target will not have been previously observed or categorized. Target “salience” – the extent to which that target is perceived as differentiated from its broader environment – determines a target’s being noticed and thus accessible for cognitive processing (Fiske & Taylor, 2008). Target differentiation focuses an evaluator’s attention, allowing the evaluator to store information used in complex inferences (Burnstein & Schul, 1982) such as categorical processing. The extent to which a target manifests salience-producing characteristics like novelty, rarity, or goal relevance (see Fiske & Taylor, 2008) will affect the possibility that it triggers categorization processes.

Second, even if salient, a target’s status may be ambiguous for any given evaluator.

2 Though much categorization theorizing focuses on membership in broad social categories (ex. age, race, sex), entitativity research finds people rely on small task and intimacy-based groups as much, if not more for day-to-day cognitive processes (ex. Lickel et. al. 2000). Such task groups frame categorization and generate stereotypes that closely resemble those held for social categories (ex. Spencer-Rodgers et al. 2007; Polzer et al. 2006).
Categories are not always distinct nor mutually exclusive and social categories in particular are messier than their non-social counterparts (see Fiske & Taylor, 2008). Project-based environments wherein individuals are simultaneously members of multiple, partially-overlapping teams – against an equally complex backdrop of shifting project team recombination – are especially prone to such messiness and a target may fit multiple categories, making categorization and membership attribution uncertain.

Third, even when a target triggers categorization processes and evaluators’ categorizations are unambiguous, categorizations may vary across evaluators. Complex project-based environments, in which evaluators may interact with a given target on multiple projects, increase the likelihood that multiple 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 mean evaluators use different information in their categorization processes. Ultimately, this social categorization process is likely to lead to differing categorizations and thus boundary disagreement.

Given the nature of project-based work and of the categorization process, we would expect boundary disagreement to exist in project-based contexts. Building on the outlined mechanisms, in the following section, I predict factors likely to lead to such disagreement.

**Hypotheses**

This study seeks to answer three research questions. First, do people disagree on their team’s membership? Second, if such disagreement exists, what are the sources and mechanism underlying it? Third, how does such disagreement affect team performance? Given the nature of the study design and analyses, I do not provide an explicit hypothesis test for the first question.
First, boundary disagreement is, at its core, a team-level phenomenon. It is a team’s disagreement regarding its own membership. That said, it clearly relies on individual members’ processes of membership attribution which, in the case of boundary disagreement, do not align. However, given that disagreement exists at the level of the team, and its effects arise as a result of team-level processes, in this study, I focus on the level of the team rather than on individual-level membership attribution decisions.

Second, I argue that boundary disagreement occurs as part of an ongoing, iterative, and reflexive cycle of interpretation and social construction. Teams’ patterns of relationships shape perceptions of the team which, in turn, influence future relationships. Similarly, while boundary disagreement is hypothesized to affect certain emergent team states and processes, the strength and pattern of each of those are in turn likely to shape future boundary disagreement. The identification of certain factors as antecedents and others as effects reflects the clarity and expected strength of the mechanisms linking those constructs in one direction versus another.

**Antecedents of Boundary Disagreement**

Many factors likely affect membership attribution through the processes outlined above. In this study, I focus on three, highlighting the mechanisms outlined above: two addressing categorization ambiguity (time dedicated to the team and task-relevant trait distinctiveness) and one affecting the likelihood of divergent categorizations (interdependence).

**Time dedicated to the team**

As noted, project-based teams increasingly work in contexts within which the traditional assumption of “one member, one team” does not apply. Instead, teams are composed of membership that is likely to be only partially dedicated to any given team. Being composed of members who dedicate only part of their time to the team is likely to blur or obscure team
boundaries, increasing ambiguity-based boundary disagreement. As members dedicate less time to any one team, they reduce evaluators’ opportunities to interact with and categorize them. In addition, as evaluators themselves simultaneously belong to multiple teams, they too will dedicate less of their time to the focal team, with the same net effect of missed opportunities to categorize the targets. Given that evaluators’ and targets’ time dedicated to the focal team are unlikely 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.

H1. Mean percentage of their time that members dedicate to a team will be negatively related to team boundary disagreement.

**Distinctiveness on task-relevant traits**

Beyond the effects of a team’s context, characteristics of its membership also drive team boundary disagreement. Given diversity research which finds that team composition significantly affects intra-team dynamics and performance (for a review, see Williams & O'Reilly, 1998), it is important to consider the relationship between team composition and perceptions of membership. The presence of highly distinct members – a particular structural form of diversity – increases the novelty of the members of a team, a consistent antecedent of salience (ex. Higgins & King, 1987). Novelty-based salience increases the membership’s accessibility for categorization and likelihood of activating those processes. Thus, as teams have more members with distinctive task-relevant traits, the team’s membership will be more salient and 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, task-relevant distinctiveness is likely to be considered to integral to the goal of the team. This goal relevance, driven by the extent members possess
distinctive traits needed by the team, in turn reduces the likelihood of any ambiguity in the categorization process. Membership is likely to hold consistent perceptions of task-relevant distinctiveness, because they are likely to correctly classify core traits once identified. Thus distinctive skills will increase both salience and likelihood of consistently matching the category of team member, thereby reducing boundary disagreement.

H2. Average distinctiveness on task-relevant traits will be negatively related to team boundary disagreement.

**Task interdependence**

Beyond contextual and membership-based factors, intra-team relationships and processes will also affect boundary disagreement. Task interdependence, in particular, is likely to affect boundary disagreement both directly and indirectly through its effects in shaping interaction. Research shows people pay close attention to those who influence their ability to succeed in their task (for example, Erber & Fiske, 1984) and tend to ignore those whom they believe have little impact (Rodin, 1987), which suggests interdependence will be positively related to salience (Neuberg & Fiske, 1987). In addition, interdependence will typically require greater interaction, which research finds increases salience by providing more exposure (Iyengar & Kinder, 1987); making targets more figural (complex and noticeable), a characteristic linked to increased salience (McArthur & Post, 1977); and differentiating targets from the reference group (in this case the rest of the organization) making them appear novel (Jones & McGillis, 1976). Thus, greater interdependence will lead to greater salience and likelihood of activating the categorization process. Furthermore, task-interdependence directly increases members’ goal relevance and relevance to the team, reducing ambiguity and further increasing the likelihood of inclusion. This suggests that increasing average interdependence in a team will increase both
accessibility for categorization and likelihood categorization as members. When this occurs throughout the team, boundary disagreement is reduced, thus I expect average interdependence will be negatively related to boundary disagreement.

H3a. Average dyadic task interdependence within a team will be negatively related to team boundary disagreement.

Interdependence, however, is not likely to be uniform throughout the team. Differing interdependence patterns are common and affect team dynamics and effectiveness (for example, Bonacich, 1987). Research on boundary spanning (Ancona & Caldwell, 1992a) similarly assumes that boundary spanners exhibit substantially different patterns of interdependence than more central team members. Varying team-level interdependence patterns imply uneven interdependence among members. At the individual level, we would expect multiple evaluators will differ in their interdependence with a particular target, perceiving differing relationships with that target based on differing evidence of team participation, categorizations, and ultimately membership attributions. Thus, I hypothesize that heterogeneity of interdependence patterns will be positively related to boundary disagreement.

H3b. Heterogeneity of task interdependence within a team will be positively related to team boundary disagreement.

Effects of Boundary Disagreement

I contend that 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, De Meuse, & Futrell, 1990: 122). In teams experiencing boundary disagreement different models of, or confusion around, the team's membership result in a fractured sense of team identity and
difficulty in coordinating action (Arrow, McGrath, & Berdahl, 2000), subsequently reducing performance. Mortensen and Hinds' (2002) preliminary work finds that teams agreeing on membership outperform those that do not, further supporting a link between boundary disagreement and poor performance.

H4a. Boundary disagreement will be negatively related to team performance.

I explore the mechanisms underlying this relationship, examining the extent to which boundary disagreement impedes teams’ ability to manage their resources, intra-team relationships, and internal dynamics effectively and thus affects the accomplishment of their goals. In particular, I examine a frequently cited antecedent of team performance: the formation of an effective transactive memory, which I predict will mediate the relationship between boundary disagreement and team performance.

I predict boundary disagreement reduces team performance by impeding the team’s formation of an effective transactive memory system to manage its knowledge. Effective transactive memory systems coordinate content-knowledge and meta-knowledge about the location of that expertise within a group (Wegner, Erber, & Raymond, 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). Team performance improves because transactive memory systems reduce time and effort wasted on coordination miscues, searches for external knowledge and assistance, and misuse of available knowledge (Austin, 2003), while knowledge of member skill-sets and expertise allows teams to approach problems more flexibly (Moreland, Argote, & Krishnan, 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, Moreland, & Argote, 1995). In teams experiencing boundary disagreement, different understandings of team membership may lead to unintentional redundancies or gaps in information and thereby cause coordination problems. When attributed to particular individuals, these errors may subsequently weaken various team members’ credibility as knowledge sources. An initial exploration of this relationship (Mortensen & 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.

H4c. The relationship between team boundary disagreement and team performance will be mediated by transactive memory.

Methods

I conducted a survey and interview-based study of software development teams in a single division of a large, multinational software company. A web-based survey was used to capture team-member responses and a shorter parallel survey was administered to a small subset of team managers for comparison. To provide a better understanding of the teams' work practices and perceptions, I followed the surveys with semi-structured illustrative interviews of a randomly-selected subset of those surveyed.

Survey Data Collection

The teams studied were formal, well-established (not ad-hoc) and project-based. The organization explicitly identified and named all teams in the sample (ex. the “Financial Module team”) and in all cases an official, management-sanctioned team roster existed. That official roster was used to bound the survey sample in both study phases, thereby ensuring a consistent
starting point and aligning with prior research (I address this decision in the discussion).

Initially, 443 individuals in 49 teams were contacted. Excluding teams with less than 60 percent of members responding or with fewer than 3 respondents reduced the sample to 39 teams (378 respondents). The mean non-response rate for teams in the final sample was 19 percent (1.74 per team), with interviews suggesting non-respondents were not systematically different from the rest of the population. The majority of team members (65%) worked as developers or in related fields (user interface 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. The mean number of teams of which each respondent was a member was 1.81. Of the 39 teams in the sample, 27 were geographically dispersed, with team members in as many as five locations. All respondents agreed that they considered themselves members of the teams identified by their managers.

The survey was divided into two phases, administered approximately two weeks apart, but sent to the same set of individuals – those identified on the official management-sanctioned team roster. 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. Both survey phases 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?” to reinforce 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. As noted, the sample surveyed in phase two, however, remained identical to that of phase one.

**Survey Measures**

I used two approaches to capture respondents’ assessments of team membership. First, respondents were asked to list all the members of their team in a free-form space. Later, without reference 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. Although the latter lists were slightly more 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. The verification-format question, providing strong priming towards agreement with the management-sanctioned list, was used as the basis of the boundary disagreement measure, thereby providing a conservative data source.

With no prior studies of boundary disagreement, there were no prior calculations of boundary disagreement upon which to draw. The membership attributions of each pair of respondents \((i,j)\), regarding every other potential teammate were coded as one if different and zero if the same, and summed. This sum was then divided by the total number of unique

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3 To make the survey less cumbersome and increase response rates, in large 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. Affecting only the most disagreed-upon members of large teams (11 of the 39 teams), the resultant data conservatively test the hypotheses.
individuals referenced by that pair, yielding a percentage of disagreement. Taking figure 1 as an example, with individuals [A,B,C] identified by the team manager, member A includes as team members: [A,B,C,D], while B includes: [A,B,C,F]. A and B 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, the mean disagreement scores of [A:B, A:C, B:C], yield a boundary disagreement score of .42. To address the nonlinearity inherent in percentage measures, I used the following transformation of the above boundary disagreement measure (see: Cohen, Cohen, West, & Aiken, 2003): 

$$A = \arcsin(\sqrt{P})$$

I tested alternative calculations, including variations in which the denominator included all targets acknowledged by either evaluator or only those included by either evaluator and in which missing data for a particular target (i.e. a target was intentionally left blank) were coded as either missing or as non-members. All variations yielded the same pattern of results. To address the possibility that individuals used a team-based template-driven approach to assessing membership, I calculated a measure by taking the smaller of the percentage of team members who included or excluded a particular target. For example if four of five evaluators considered a target as a team member and one did not, the per-target score would be calculated as $\min(.2, .8)$, with the mean across all targets as a measure of boundary disagreement. This yielded results similar to but slightly weaker than those based on the calculation in the text. As this alternative calculation was a poorer fit for the theoretical model, I retained the initial calculation. Finally, to assess the impact of differing team-level patterns of membership inclusion and exclusion, I measured the ratio of individuals considered core versus peripheral, based on their teammates’
attributions of membership from the partition-based model of Borgatti and Everett (1999). This measure had no significant relationships to the constructs in the study and was thus not used.

Importantly, the measure of boundary disagreement did not result from a direct survey item measuring perceived disagreement. Rather, it was calculated based on respondents’ objective identification of the members of their team. Respondents were provided no clues about the purpose of that identification. This approach reduced the possibility of common methods bias that might otherwise occur if respondents were asked to assess a characteristic of their team. The separate phases of the survey further reduced potential common methods bias between the independent and dependent variables.

Turning to the predictors of boundary disagreement, to assess time dedicated to the team, I asked respondents to report the percentage of their time that 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 task-relevant distinctiveness based on relational demography scores of members' self-report of job category and educational background. I used the mean of z-scored values of relational demography scores (Tsui, Egan, & O'Reilly, 1992) for job category and educational background to measure the distinctiveness of task-relevant traits. Counter to the spirit of distinctiveness as theorized, the resultant score favors widely distributed team heterogeneity over uniqueness – a team of the form (3X, 3Y) would be more unique than a team of the form (1X, 5Y). I thus subtracted all non-zero scores from one, yielding a score that captures distinctiveness as conceptualized in this study. 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
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 used mean within interdependence as a measure of average intra-team interdependence and the team-level mean of the Euclidean distances between team members regarding interdependence with each target as a measure of intra-team interdependence heterogeneity.⁴

Turning next to the hypothesized outcomes of boundary disagreement, to measure performance, 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 & Caldwell, 1992a). The mean of respondents’ five-point Likert scale (1 = “poor”, 5 = “excellent”) ratings yielded a highly reliable estimate (α = .84) of perceived performance. To validate the accuracy of team member performance ratings, a sub-sample of team managers was asked the same question regarding the teams they managed. When 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. To measure shared team identity, I used a 13-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 = "extremely characteristic").

⁴ Alternative calculations for interdependence heterogeneity, comprised of the team-level mean of the coefficients of variance between team members regarding each target produced the same pattern of results, thus the Euclidean-distance based calculations were retained as they were deemed easier to interpret.
5 = "very characteristic"). The mean of the 13 items formed a reliable ($\alpha = .80$) individual-level identity score and inter-rater reliability scores indicated that combining them into a team-level identity measure was justified given interclass correlation coefficients (sample-wide, mean by team) of ($ICC_1 = .30$, $ICC_2 = .70$, $r_{wg} = .92$). Finally, 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"). 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 inter-rater reliability scores based on the formula derived by James, Demaree, and Wolf (1984). The inter-rater reliability scores indicated that the team-level measure of transactive memory was justified ($ICC_1 = .21$, $ICC_2 = .80$, $r_{wg} = .96$).

I also included a number of controls in my analyses. 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. Additional controls were tested but not found to have significant effects and were excluded from the reported results in the interest of parsimony and retaining degrees of freedom. These included team-level controls for mean number of teams members were on, 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 was found to have significant relationships to either mediators or the dependent variable, they were removed from the final reported results.

**Illustrative Interviews**

To provide further insights into my context, I conducted illustrative interviews with a randomly-selected subset of 18 individuals. In all cases, interviewees had completed the survey prior to being interviewed, allowing issues raised in the survey to be clarified. The interviews were semi-structured, conducted around a set of open-ended questions aimed at better understanding informants’ perceptions of their teams and team membership. They were carried out face-to-face in the company offices and ranged from 35-75 minutes in length (mean of 45) and were recorded and subsequently transcribed.

I coded the transcribed interviews using qualitative analysis software (NVivo) and analyzed for relevant themes centered on the experiences of team members and their perceptions of their teams and membership. I iteratively coded interview transcripts following empirical grounded theory procedures (Strauss & Corbin, 1998). I initially free-coded interviews to identify emergent themes and as these themes emerged, they were used to refine both the existing coding scheme and existing codes. This iterative process of coding, refining, and recoding ultimately led to the final body of qualitative data used to inform the survey results.
Results

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)\(^5\). 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 (see table 1 for descriptive statistics and correlations).

Antecedents of Boundary Disagreement

To assess the relationships outlined in hypotheses one through four, I conducted linear regressions with ordinary least squares (OLS) estimates. In my first hypothesis I predicted that boundary disagreement was negatively related to mean percentage of time dedicated. I regressed boundary disagreement on the measure of time dedicated and found a significant negative relationship (\(\beta = -.37, p < .01\)), supporting hypothesis 1.

The qualitative data shed further light on the effects of time dedicated to the team on boundary disagreement. Many respondents noted difficulty recalling team members who spent less than 100% of their time on the team. When asked how she identified her team members, 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 how membership clarity shifted along with changes in the teams

\(^5\) All values reported in tables refer to the arcsin transformed measure.
themselves. One 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.” The interview data thus echo the link between the project-based context and boundary disagreement.

In my second hypothesis, I predicted that boundary disagreement would be negatively related to task-relevant distinctiveness. Regressing boundary disagreement (see table 2, model 5) on task-relevant traits yielded a significant negative relationship (β = -.36, p <.01), supporting hypothesis 2. This was reflected in the interview data as well. When asked how they determined who was a member of the team, many informants highlighted the importance of functions, 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, the qualitative interview data further support hypothesis 2.

In my third set of hypotheses (3a, 3b), 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 5) found a significant negative relationship between boundary disagreement and task interdependence (β = -.69, p <.01) and a significant positive relationship between boundary disagreement and heterogeneity of task interdependence (β = .55, p <.01), thus I found support for hypotheses 3a and 3b.

6 To ensure the interdependence effects were not driven solely by communication, parallel analyses were conducted on measures of level and heterogeneity of communication. Highly correlated with the measures of interdependence (r=.53, p<.01) the resultant measures yielded parallel, but statistically weaker results (communication disappeared
The qualitative interview data further reflected the link between interdependence and membership decisions. When asked how they determined team membership, some individuals focused on their work-related interdependencies as did 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 different tasks in the database interface area.” Others simply indicated that identified responsibilities were the primary 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.

**Effects of Boundary Disagreement**

In my fourth hypotheses (4a & b) I predicted that boundary disagreement would be negatively related to performance in teams and that the relationship would be mediated by shared identity and transactive memory. Regressing team performance on boundary disagreement yielded a significant negative relationship ($\beta = -0.37$, $p < 0.05$), supporting hypothesis 4a. In hypotheses 4b, I predicted that transactive memory would mediate the relationship between team boundary disagreement and team performance. To evaluate the mediation effects outlined in hypothesis 4b, I used Preacher and Hayes’ (Preacher & Hayes, 2004) bootstrapped analysis of
mediation using 1,000 bootstrapped re-samples (for discussion of bootstrapped analyses of mediation, see MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). This analysis yielded a significant relationship between boundary disagreement (independent variable [IV]) and transactive memory (mediator) ($\beta = -.18, p < .05$). Furthermore, the relationship between transactive memory (mediator) and performance (DV) 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, thus yielding support for hypothesis 4b.

**Discussion**

This study provides the first systematic examination of boundary disagreement, its antecedents, and its effects on team performance. Occurring widely within the teams in my sample, boundary disagreement was driven by contextual ambiguity, as percentage of time dedicated to the team was inversely related to disagreement. Distinctiveness of task-relevant traits offset the potential ambiguity inherent in project-based team environments, reinforcing the link between target characteristics and assessments of membership suggested by my first hypothesis. Mean interdependence was negatively related – and heterogeneity of interdependence positively – to boundary disagreement, thereby providing support for the role of interdependence in determining individual evaluators’ membership attribution decisions. In turn, I found boundary disagreement was negatively related to team performance and that relationship was mediated by transactive memory. This suggests that boundary disagreement does negatively impact team performance and that this relationship operates through processes well-established
in the teams literature, by making it more difficult for teams to coordinate their cognitive processes. Before discussing the implications of this study, it is important to address the relationship between boundary disagreement and other emergent processes and states.

**Differentiating boundary disagreement from related constructs**

To justify the introduction of a new construct of boundary disagreement it is important to differentiate it from existing related constructs. In particular, it must be differentiated from the effects of boundaries that are fluid, weak, or informal. Research on groups has repeatedly noted that boundaries are often flexible and change over time to better adapt to their environment (Arrow & McGrath, 1995; Ziller, 1965). Relatedly, research on tight versus loose coupling argues that teams can be tightly or loosely coupled horizontally through task interdependence (Kiggundu, 1983) and vertically through differing leadership styles (Manz & Sims, 1987), as well as ranging with respect to how shared their goals and reward mechanisms are (Deutsch, 1949). While it may be tempting to argue that boundary disagreement is, in fact, merely a reflection of teams being less well-bounded, it is important to note that while theories of dynamic and open boundaries and loose coupling allow members to have multiple models of team membership, they assume clearly defined and agreed upon boundaries at any one point in time team. In contrast, boundary disagreement holds that at a single point in time, team members disagree as to where to draw the team's boundaries.

There is a long history of research stemming from early work by Roethlisberger and Dickson (1939) and Dalton (1959) that examines the relationship between formal and informal networks of interaction within organizations. This research posits that in organizations there exist informal networks of interconnections that may or may not align with the formal organizational structures (Krackhardt & Stern, 1988; Lincoln & 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 between perspectives held by team members.

**Implications**

**Implications for theory: groups and teams**

The findings of this study suggest potentially powerful ways to reassess prior theory. Research on boundary-spanning (Ancona & Caldwell, 1992a), for example, found that boundary-spanners undertake unique and important roles such as scout or guard which in turn help their teams better manage their relationship with the broader environment. In their seminal work, Ancona and Caldwell methodologically eliminated boundary disagreement, noting that “the questionnaires distributed to each team included a list of team members to ensure that individuals had a common referent.” (1992b, p: 639). However, the existence of boundary disagreement raises important questions. First, it may be the case that some of the individuals identified as boundary-spanners were interacting with individuals they themselves considered to be internal to the team. Taking, for example, activities identified as part of the role of ambassador may, in fact, be interactions that individual, externally-labeled a “boundary spanner”, considered to be within the team. Second, scholars and practitioners face potential problems in using boundary spanning theory to predict behavior. If, for example, one expects a team member to enact the role of guard in relation to a given target, that prediction is likely to fail if the guard in question considers that target to be a team member and thus has no reason to control his or her access to information. Reassessing and potentially reinterpreting boundary spanning in the light of fuzzy team
boundaries therefore is warranted.

Similarly, research has argued that individuals look to teammates to learn team norms (Bettenhausen & Murnighan, 1985), in turn, using these to affect and control behavior (for example, Barker, 1993). Boundary disagreement raises the possibility that the perceived “team” used as the basis for identifying existing norms may, in fact vary within the team, resulting in confusion or conflict over the team's behavioral norms. Beyond potentially hindering team performance, this may yield greater fluidity and change in norms as teams adjust them to reconcile differences. Thus, considering the formation and propagation of team norms in light of boundary disagreement also seems warranted.

More generally, boundary disagreement is likely to affect theories in which the identification with, or perception of, an abstraction representing a team is important. As outlined, boundary spanning relies on members perceiving of the team as an entity which must be protected and coordinated and requires scouting and ambassadorial activities. Similarly, norms exist to the extent that one can identify an entity for which such norms are appropriate or required. In these cases, boundary disagreement will play a role if members fail to recognize the different underlying models masked by that abstraction. 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. Absent that justification, agreement on team boundaries is a reasonable simplifying assumption.

**Implications for theory: project-based work**

These findings also 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 & Sproull, 2004), system or community (ex. Marks, Dechurc, Mathieu, Panzer, & Alonso, 2005), or across levels (Mortensen, Woolley, & O'Leary, 2007). Despite these, it remains a minimally studied domain, particularly at the level of the team.

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 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 in project-based multiple-team contexts.

More broadly, this research has implications beyond project-based organizations. Though fluidity and flexibility of teams is central to project-based work, the notion, that boundaries must be flexible and change over time to better adapt to their environment, is not new (Arrow & McGrath, 1995), nor 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, remains a question for future research.

Implications for methodology

This study illustrates that a study’s methodological approach is 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. As noted, in field studies, team membership has often been explicitly delineated by providing respondents with membership lists they are not given the opportunity to validate (ex. Ancona & Caldwell, 1992a). Lacking this validation and the comparison process it entails, such studies have been unable to uncover existing disagreement. In those cases where membership has not been delineated, boundary disagreement has typically gone unmeasured or has been identified as measurement or recall error. 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**

This study also has implications for both team managers and members. Given the negative effects of boundary disagreement on team processes like transactive memory and ultimately performance, at first glance it may appear that managers and members should put their efforts into reducing boundary disagreement. It is, however, important to recognize that such negative effects arise from members being unaware that they differ in their mental
representations of the team, not necessarily because of the different representations themselves. Furthermore, efforts to reduce boundary disagreement raise a number of important issues.

First, a likely approach is to aggressively and actively seek to "clarify" membership through increased communication about official team membership (ex. published rosters etc.). Beyond the inherent difficulty in identifying the “correct” definition of the team, disseminating this information and keeping it up to date however, would require significant effort and coordination, especially in the context of fluidly-shifting project-based work. Second, given this context, and this study's findings that boundary disagreement is driven primarily by the nature and structure of the work, rather than available information, there is no guarantee that increased information will successfully reduce boundary disagreement. Even worse, in such cases, efforts to increase communication may primarily succeed in creating a false sense that membership has been clarified. This, in turn, may lead to overconfidence that exacerbates boundary-disagreement based confusion and conflict and strengthens the negative effects of boundary disagreement. Third, to the extent efforts to reduce boundary disagreement are successful, it is unclear that this necessarily positive. This study suggests problems in performance and transactive memory come about not because members have different models of the team, but because they are unaware that they hold such divergent models of the team. Furthermore, though not explored here, there may be potential benefits of boundary disagreement as a source of creativity-inducing variation.

Thus I would encourage managers and members to pay monitor attention to boundary disagreement and to focus their efforts on educating members not of the "right" model of the team, but of the likelihood of boundary disagreement occurring and its likely effects on team dynamics and ultimately performance. Armed with that knowledge, team members may,
themselves, be able to assess and discount confusion or disagreement that arises from members working with differing underlying perceptions of the team.

**Future Research**

The analysis of the antecedents and effects of boundary disagreement presented here opens and suggests many areas of research, two of which are discussed below: structures of boundary disagreement and awareness and mechanisms of ambiguity and variation.

**Structures of boundary disagreement**

In this study I explore the antecedents and effects of boundary disagreement, but do not examine the structure of the resulting boundary disagreement or its subsequent effects on team processes. One might expect some teams to manifest a small number of consistently-held alternative team models, based on similar interaction patterns. For example, members may group based on similar job functions or phases of the project, as such similarities likely yield similar interdependence patterns. Alternatively, examining differing forms of core/periphery structure (ex. single vs. multi-core, imbalanced vs. uniform periphery) may yield additional insights into 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. The results of this study suggest 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, when
talking about team structure: “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”. While, in this first examination of the phenomenon, the two mechanisms are treated similarly, it is not clear if 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’”. Such comments suggest that among those individuals who felt team membership was unambiguous, it was assumed that the entire team shared the same model.

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 adjust. This compensation could occur through storing redundant information or correctly attributing errors, thereby maintaining a source's credibility. Awareness of boundary disagreement may also 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

The study of boundary disagreement presents a 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 accuracy of team-level constructs, as measuring them is inherently based on a particular definition of the team. In this study, I chose to measure team-level constructs based on the initial team member list provided by the team manager, as a means to provide a consistent starting point and to provide a link to ongoing discussions among scholars and practitioners that assume agreement on team membership. In light of the findings of this study, this raises questions regarding the accuracy of such team-level measures which I do not believe entirely invalidate such measures, but instead suggests that an additional boundary-disagreement-based
adjusted must be taken into account. Thus, team-level constructs used in this study can be considered proxies for the actual boundary-disagreement-adjusted values.

Regarding the analytical context, although a sample size of 39 teams is in line with existing field research on groups and teams (see, for example, Hinds & 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 is not tied to any particular type of team, the teams included in this study consisted primarily of computer programmers, a highly educated and traditionally autonomous group. Also, while the project-based nature of these teams makes them an excellent context in which to examine boundary disagreement, it is unclear to what extent and how these findings might generalize to less project-focused teams. Finally, though driven by a theoretically-grounded framework, as a correlational field study, the causality of the identified relationships cannot be proven. To gain this understanding will require longitudinal data collection and analyses mapping the evolution of relationships over time. Even so, the inherent reflexivity of the relationships between boundary disagreement and its antecedents and effects makes assessing causality particularly difficult, requiring complex process models of the causal mechanisms contributing to and arising from boundary disagreement. Thus further longitudinal research drawing upon larger samples and other types of teams is warranted.

Conclusion

The nature of collaboration is changing, and this shift towards more broadly-scoped, fluidly-shifting, and structurally-interdependent work brings with it new challenges. Boundary disagreement is one such challenge, and this study provides a first look at the phenomenon, 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). This study also suggests that boundary disagreement - often considered indicative of measurement or recall error - is in fact a real, ongoing dynamic process of perception and collective social construction, with important implications for team performance and current and future theories of team dynamics.
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Terry, D. J., Hogg, M. A., & Duck, J. M. (1999). Group membership, social identity, and


### Tables

**Table 1: Descriptive statistics and correlations between key variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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</thead>
<tbody>
<tr>
<td>Boundary Disagreement</td>
<td>0.67</td>
<td>0.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Team Size</td>
<td>12.85</td>
<td>6.30</td>
<td>0.53**</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Teams per member</td>
<td>1.96</td>
<td>0.70</td>
<td>0.05</td>
<td>-0.07</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Percent time dedicated</td>
<td>79.37</td>
<td>17.21</td>
<td>-0.39*</td>
<td>-0.04</td>
<td>-0.38*</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Distinctive relevant traits</td>
<td>0.20</td>
<td>0.08</td>
<td>-0.20</td>
<td>0.26</td>
<td>-0.29</td>
<td>0.29</td>
<td></td>
<td></td>
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<tr>
<td>Interdependence (Average)</td>
<td>2.55</td>
<td>0.44</td>
<td>-0.62**</td>
<td>-0.54**</td>
<td>-0.03</td>
<td>0.02</td>
<td>0.07</td>
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</tr>
<tr>
<td>Interdependence (Heterogeneity)</td>
<td>4.50</td>
<td>2.70</td>
<td>0.46**</td>
<td>0.74**</td>
<td>-0.01</td>
<td>-0.11</td>
<td>0.32*</td>
<td>-0.13</td>
<td></td>
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<tr>
<td>Performance</td>
<td>3.75</td>
<td>0.38</td>
<td>-0.37*</td>
<td>-0.23</td>
<td>0.04</td>
<td>0.24</td>
<td>0.09</td>
<td>0.16</td>
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<td>Transactive Memory</td>
<td>3.81</td>
<td>0.29</td>
<td>-0.33*</td>
<td>-0.21</td>
<td>-0.13</td>
<td>0.18</td>
<td>0.08</td>
<td>0.19</td>
<td>-0.23</td>
<td>0.75**</td>
</tr>
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</table>

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

Values are standardized and boundary disagreement refers to transformed measure: $\frac{min(P^2)}{max(P^2)}$.
### Table 2: OLS estimates for regressions predicting boundary disagreement

<table>
<thead>
<tr>
<th>Variable</th>
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<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team size</td>
<td>0.51</td>
<td>**</td>
<td>0.50</td>
<td>**</td>
<td>0.61</td>
</tr>
<tr>
<td>Percent of time dedicated</td>
<td>-0.37</td>
<td>**</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Distinctive relevant traits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interdependence (Average)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interdependence (Heterogeneity)</td>
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<tr>
<td>Adjusted $R^2$</td>
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<td>0.36</td>
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<td>0.34</td>
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<td>$F$</td>
<td>12.67</td>
<td>**</td>
<td>11.48</td>
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<tr>
<td>Df</td>
<td>1</td>
<td>36</td>
<td>2</td>
<td>35</td>
<td>2</td>
</tr>
</tbody>
</table>

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

This table reports standardized values and transformed measure of boundary disagreement:

$$A = 2\arccos\sqrt{\frac{p}{2}}$$
Table 3: OLS estimates for regressions testing mediation effect on performance

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Mediator</td>
<td>β of mediator</td>
<td>β of DV (performance)</td>
<td>β of mediator</td>
</tr>
<tr>
<td>Transactive memory</td>
<td>-.18 *</td>
<td>-.37 *</td>
<td>.83 **</td>
</tr>
</tbody>
</table>

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

Note: Values are standardized β’s
Figure 1: Boundary disagreement calculation example

Disagreement scores:
- $A\times B: 2/5 = .40$
- $A\times C: 1/4 = .25$
- $B\times C: 3/5 = .60$

Boundary disagreement =