ANTECEDENTS AND CONSEQUENCES OF TEAM BOUNDARY DISAGREEMENT

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ABSTRACT

Existing research and theory on groups and teams is built on the underlying assumption that the members of teams agree as to who are and who are not their teammates. In a study of 43 software development teams in a large multinational software company, I question this assumption and provide a first examination of the phenomenon of intra-team boundary disagreement and the mechanisms underlying it. I use a web-based survey and semi-structured interviews to identify both antecedents and effects of boundary disagreement. I find evidence that patterns of interdependence and workflow act as antecedents of boundary disagreement, while contrary to my hypotheses, no significant relationship existed between communication patterns and boundary disagreement. I also provide evidence that teams experiencing boundary disagreement perform significantly lower than those without – a relationship mediated by transactive memory, shared team identity, and affective conflict.

Interviewer: *Is it very clear to you exactly how you bound the team – who you think is in the team, and who is not?*

Claire: *Yeah, it's very clearly defined … I think it is very clear.*

Interviewer: *Do you think that most people within the team have a similar viewpoint in terms of who is a member of the team?*

Claire: *Uh-huh. I think it's quit clear to everyone…*

Interview with 'Claire', Development team member

A fundamental assumption in scholarly research on groups and teams is that team members not only know, but agree upon the membership of their teams. As evidenced by the above quote, this assumption is further mirrored in the daily understandings of team members in organizations. Despite Claire's self-reported awareness, I discovered substantial disagreement across her team as to who were and who were not considered team members. This study challenges the assumption that team members agree upon team membership, providing evidence that "boundary disagreement" not only occurs, but substantially affects both team processes and outcomes.

The recognition of boundary disagreement calls into question the validity and scope of many of the existing theories regarding group dynamics; a brief examination of two particularly relevant theories is illustrative. In research on small group norms, scholars argue that norms within a team or small group have a strong effect upon the members of that team, delineating appropriate and inappropriate behaviors and attitudes (see, for example: Barker, 1993; Feldman, 1984). These norms form as individuals look to those around them to learn what roles are expected of them and to gain an understanding of the norms that govern behavior in their team (Bettenhausen & Murnighan, 1985). If there is disagreement on team membership, team

members may look to different sets of people to learn their roles and the team's norms, which may result in confusing and potentially conflicting understandings of the team's behavioral norms. In another example, theorists of boundary spanning explain how the members of a team take on implicit or explicit roles to negotiate the location of, and flow of information over, the team's boundaries (see, for example: Aldrich & Herker, 1977; Ancona, 1990; Ancona & Caldwell, 1992; Friedman & Podolny, 1992). The existence and proper management of these roles has subsequently been shown to have substantial effects ona team effectiveness (Ancona et al., 1992). The existence of boundary disagreement raises the possibility that an individual identified as a boundary spanner may, in fact, be interacting solely with people whom he considers teammates. Conseself-reported quently, he may fail to perform the boundary spanning roles expected by his teammates and predicted by theories of boundary-spanning. These two brief examples illustrate some of the potential impacts of boundary disagreement on existing theories of teams and small groups.

Before continuing, it is important to define both "team" and "boundary disagreement". I use the term "team" to refer to a collection of interdependent individuals working together towards a shared goal. This definition is based on that put forth by Alderfer (1977) and built upon by numerous researchers (Cohen & Bailey, 1997; Hackman, 1987; Offermann & Spiros, 2001; Sundstrom, De Meuse, & Futrell, 1990). Often, in organizational behavior, the term "team" further implies embedding within an organizational context, thus differentiating it from the concept of small groups as found in the social psychological literature (see: Arrow et al., 2000)[1].

[1] It is important to note that boundary disagreement applies to all collections of individuals in which members have a sense of belonging to the collective. Existing theory on small groups is therefore both applicable to

Lacking prior boundary disagreement research upon which to draw, I define the term "boundary disagreement" as the extent to which members of a team disagree as to which individuals are, and which are not members of that team. The only prior research on boundary disagreement is a preliminary study conducted by Mortensen and Hinds (2002) in which evidence of boundary disagreement was found in a sample of 24 product development teams in five companies. Mortensen and Hinds' study, however, was not designed with the intention of testing for boundary disagreement. Furthermore, with few exceptions (for example: McGrath, Arrow, & Berdahl, 2000) researchers have largely ignored the possibility that group boundaries may not be well-defined.

One reason for this is that much of our understanding of the effects of group membership comes from social psychological experiments in which random assignment to condition artificially eliminated boundary disagreement, rendering it impossible to recognize (for example: Asch, 1953). Also, in the case of many field studies, team membership was explicitly delineated by providing membership lists which team members were not given the opportunity to validate (for example, Ancona et al., 1992). Lastly, when disagreements on team membership have been identified, it was often assumed that they were the result of errors in measurement, respondent recall, or a combination of both. Thus, the lack of prior investigation of boundary disagreement is attributable to both the design of prior studies, and the interpretation of their findings.

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and useful in the examination of boundary disagreement and the research presented here is informed by and builds on existing theory in both domains. For accuracy, when referring to prior research I will employ the language used in those studies.

Connecting Boundary Disagreement to Existing Theories

Two well-established but conceptually different approaches to the study of groups are of particular relevance to boundary disagreement: social networks and social psychology. In conceptualizing and understanding groups, social network analysis focuses primarily on structural patterns of interconnection among individuals in teams while social psychology examines the effects of teams through the abstract conceptualizations held by their members. I argue that the membership attribution process provides a first link between these two different perspectives.

In social network analysis, groups are identified primarily on the basis of density of ties within the group relative to ties with the rest of the population, a framing which has lead to a large number of differing operationalizations (for examples see: Scott, 2000; Wasserman & Faust, 1994). Consequently, groups are treated as phenomena that naturally emerge from a larger network - a pattern of relationships without any connection to a goal, task, or broader organizational factors. Lacking in this conceptualization is a notion of an abstract team identity – an outwardly identifiable team with which team members identify.

In contrast, social-psychological research conceptualizes groups as abstractions – as a collection of individuals characterized by a set of qualities or attributes which carry with them meanings and often a positive or negative valence. From a social psychological perspective, when an individual thinks of her team, she does not think of a set of individuals, or a set of ties that connect her to those people but of an abstract entity that manifesting a set of shared values, goals, beliefs, and perspectives. It is this meaning that subsequently affects individual attitudes and behavior through mechanisms like social comparison (see: Festinger, 1954), social

categorization (see: Moreland, 1985; Tajfel, 1978) and social identity (see: Abrams & Hogg, 1990; Tajfel, 1982).

In this piece, I argue that by incorporating both the structural patterns of interconnection among team members and their abstract understandings of their team, boundary disagreement and the membership attribution process provide a link between social network and social psychological perspectives. In this way, boundary disagreement and the underlying process of membership attribution bring the abstracted notion of a team to existing social network theories, and a concrete grounding in patterns of interpersonal interactions to existing theories in social psychology.

Differentiating Boundary Disagreement from Existing Theories

In order to justify the introduction of boundary disagreement as a new concept, it is important to differentiate boundary disagreement from existing theories that deal with team boundaries. In particular, it must be differentiated from related theories of dynamic and open boundaries, social identity, and formal vs. informal teams. Research on groups has repeatedly noted that boundaries are often flexible and may change over time to fit their environment (Alderfer, 1987; Arrow & McGrath, 1995; Ziller, 1965). While theories of dynamic and open boundaries allow members to have multiple models of team membership, they assume that at any one point in time team boundaries are clearly defined and agreed upon. This runs counter to the central idea of boundary disagreement, that at a single point in time, team members disagree as to where to draw the team's boundaries.

Taking a different perspective, social identity theory argues that when an individual perceives that he or she shares an identity with another individual, be it through shared gender, job category, or team membership, it will affect the way he or she acts towards that person

(Ashforth & Mael, 1989; Ellemers, Spears, & Doosje, 1997). Focused at the level of the individual, social identity theory captures how evaluators will act towards targets based on whether they do or do not attribute them membership status. What social identity theory fails to capture, however, is team-level disagreement as to membership, and how that disagreement might affect team and interpersonal phenomena.

Beginning with the early work of Roethlisberger and Dickson (1939) and Dalton (1959), a substantial body of research has examined the relationship between formal and informal networks of interaction within organizations (Krackhardt & Stern, 1988; Lincoln & Miller, 1979). This research posits that in all organizations there exists an informal structure of interconnections that may or may not align with the formal organizational structure. 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.

Mechanisms Underlying Boundary Disagreement

Key to understanding the cause of boundary disagreement is understanding the process through which an individual (evaluator) decides whether or not to include another individual (target) in the team. I argue that this "membership attribution" process is an individual-level decision based on the decision-maker's experiences within his or her team and is heavily affected by two distinct factors. The first factor, salience, affects the likelihood that the target is remembered. The second factor, integration, affects the evaluator's decision whether the target should be considered a member of the team.

Salience is defined as the extent to which a target is perceived as differentiated from its broader environment (Taylor & Fiske, 1978) and affects the extent to which a target draws and focuses an evaluator's attention, allowing the use of that information as part of more elaborative reasoning and complex inferences (Bargh, 1984; Burnstein & Schul, 1982). I argue that membership attribution is one such complex inference and that salience impacts the ability of an evaluator to include a target in the team. If a target is not salient, then that target is not likely to be remembered by the evaluator and will not be available for inclusion in the team when a membership decision is being made. I contend that characteristics or processes that increase a target's salience relative to other potential team members (see: Fiske & Taylor, 1991 for a review) will increase the likelihood he or she will be available for future recall in an evaluator's membership attribution. In addition, however, the evaluator must have a reason to attribute membership to that target.

Teams, beyond collections of individuals, reflect recurrent patterns of interpersonal relationships (Arrow et al., 2000). To attribute membership to a target, an evaluator must therefore decide whether that target is integrated into the network of relationships (communications, interdependencies, and affiliations) that comprise the team. I argue that individuals, when thinking of their team, think it in terms of a web of individuals interconnected on multiple dimensions at once: they rely on one another, communicate with one another both formally and informally, seek advice from one another, and may even be friends with one another. In trying to decide whether or not to include a particular target in the team, an evaluator makes a decision based on whether he thinks the evaluator is or is not part of that interconnected network.

Bringing together salience and integration, to attribute membership to a target, an evaluator must both be able to include a target as well as feel justified in including that target (see figure 1). The target must be salient, so the evaluator remembers the target at the time of the decision, and perceived as integrated in the team, such that the evaluator feels justified in including that target in her model of the team.

Insert figure 1 about here

It is important to acknowledge the interaction between salience and integration. Being perceived as integrated in a team is likely to differentiate a target from the broader organization, thereby increasing that target's salience. Also, the greater attention paid to a salient target will increase the likelihood of evaluators noticing and recalling that target's interactions with other team members, thereby causing evaluators to perceive that target as more integrated in the team. Thus, in addition to their individual effects on membership attribution, there is also an interaction between salience and integration that strengthens both of their effects.

ANTECEDENTS OF BOUNDARY DISAGREEMENT

Based on the relationships between both salience and integration and boundary disagreement outlined earlier, I identify characteristics of targets (uniqueness), dyadic relationships (communication, interdependence), and team-level relationships (workflow) that I hypothesize will impact evaluators' attributions of membership. In turn, I connect these individual attributions to team-level boundary disagreement.

Communication

Research has identified a number of antecedents of salience that are likely to be affected by communication. As evaluators communicate more with a particular target, that interaction makes them more figural (more complex and noticeable) which has been linked to increased

salience (McArthur & Post, 1977). Increased communication will differentiate targets, thus making them unusual compared to the reference group of the rest of the organization. Research has also found that target salience is increased by novelty of targets compared to the reference group (Jones & McGillis, 1976) and the amount of time that target is seen or interacted with (Iyengar & Kinder, 1987). Through these effects linked to target salience, I contend that increased communication will be positively related to membership attribution.

Similarly, I argue that amount of communication is directly connected to perceived integration. As defined earlier, evaluators' perceptions of integration entail a holistic assessment of a target's involvement with other team members along all dimensions including communication. A target's perceived level of communication with other members of the team is therefore likely to be positively related to his perceived integration and thus likelihood of membership attribution.

As all targets' likelihood of inclusion by evaluators increases, so does agreement among evaluators, thus reducing levels of boundary disagreement within those teams. Thus, average level of communication within a team will be negatively related to boundary disagreement in that team, yielding my next hypothesis:

> ***Hypothesis 1a:*** *Amount of communication will be negatively related to level of boundary disagreement.*

Substantial research has found that communication is likely to vary across dyads in a team. Researchers have examined the sources and effects of differing communication patterns (Bonacich, 1987; Breiger, 1991) within groups and teams. Also, research on boundary spanning (Aldrich et al., 1977; Ancona et al., 1992; Friedman et al., 1992) is based on an explicit assumption that boundary spanners exhibit radically different communication patterns than more

central team members. Evidence of varying communication patterns has also been found in research on virtual teams (Ahuja & Carley, 1999). Varying communication patterns at the team level imply uneven communication at the dyadic level, with multiple evaluators, varying in their communication with a particular target. This suggests that teams with heterogeneous communication patterns will experience higher variance in membership attribution than more homogenous teams. Thus, I argue that heterogeneity in amount of communication will lead to increased boundary disagreement.

> ***Hypothesis 1b:*** *Heterogeneity in amount of communication will be positively related to level of boundary disagreement.*

Interdependence

Research has shown that evaluators pay close attention to those who influence their outcomes (Erber & Fiske, 1984; Taylor & Fiske, 1975) and tend to ignore those they believe have little impact or relevance to their goals (Rodin, 1987). This has further been elaborated to argue that interdependence will be positively related to salience (Neuberg & Fiske, 1987; Ruscher & Fiske, 1990). Following a similar argument as that made for communication, interdependence forms another dimension of perceived interconnection and integration of team members. When an evaluator perceives a target as highly integrated in the network of interdependencies that exist within the team, that evaluator is likely to attribute membership to that target. Thus, high interdependence within a team will result in a consistent increase in membership attributions, thereby reducing variance across evaluators. Consequently, level of interdependence is likely to be negatively related to boundary disagreement. Furthermore, different evaluators are likely to exhibit and observe different levels of interdependence with any given target. As was the case with communication, heterogeneity in interdependence will be

positively related to heterogeneous membership attributions and thus boundary disagreement, yielding my next two hypotheses.

> ***Hypothesis 2a:*** *Amount of interdependence will be negatively related to level of boundary disagreement.*
>
> ***Hypothesis 2b:*** *Heterogeneity of interdependence will be positively related to level of boundary disagreement.*

Work flow

Beyond the impact of patterns of interdependencies and communications, I argue that the patterns of workflow, defined as channels of communication and resource exchange (Ibarra, 1992), will impact boundary disagreement. Distinct from interdependence which is a dyadic attribute, workflow captures the team-level patterns by which pieces of the task are passed from one individual to another. I argue that the flow of work between a target and evaluators is likely to increase that target's salience as his role as a source or recipient of work flow differentiates him from the rest of the organization. To the extent a target is involved in the transmission of work to or from other team members, that target will also be perceived as more integrated in the team. Differing patterns of workflow, however, substantially are quite dissimilar in the extent to which they allow handoffs between team members and more importantly, will affect the consistency of such workflow across evaluators. I build on the typology identified by Thompson (1967) and further refined by Van de Ven, Delbecq, and Koenig (1976) which identified three basic types of workflow: serial, reciprocal, and pooled.

In the case of serial workflow, each team member hands off work to only one other team member and conversely, each recipient gets work from only one source. As a result, every team member has a different pair of team members from whom he receives and to whom he hands off

his work. Two evaluators assessing a target are likely to differ in their workflow relationship to that target. This leads to variations in their subsequent workflow-based membership decision, increasing boundary disagreement. Conversely, in the case of reciprocal workflow, team members receive work from and hand off work to many members of the team. Multiple evaluators are likely to have similar perceptions of the team's workflow and thus make similar membership attributions on the basis of those perceptions. Thus, reliance on a reciprocal pattern of workflow is likely to be negatively related to occurrence and level of boundary disagreement. In the case of pooled workflow, work does not flow between team members, leaving members to work independently. As this pattern of workflow does not make an evaluator more or less likely to receive work from or hand off work to a particular target, pooled workflow will not be related to boundary disagreement. This yields the following hypotheses:

> ***Hypothesis 3a:*** *Use of serial workflow will be positively related to level of boundary disagreement.*
>
> ***Hypothesis 3b:*** *Use of reciprocal workflow will be negatively related to level of boundary disagreement.*

Uniqueness

In prior research, novelty on the basis of demographic traits like gender or race have been consistently identified antecedents of target salience (for example, Higgins & King, 1987; Moss Kanter, 1977). I argue such novelty-based salience will lead to an increased likelihood of membership attribution by evaluators. Unlike the prior three hypotheses regarding communication, and interdependence, I argue that a target's perceived novelty is not likely to vary across different dyads in a team. Most demographic characteristics (age, gender, ethnicity, etc.) will be perceived consistently by all evaluators, thus I contend that a target's uniqueness

will increase his or her salience consistently across all team members. This, in turn, increases the likelihood of all evaluators recalling that target, implying a reduction in team-level boundary disagreement. Furthermore, the effect of a target's novelty is additive in that simultaneous novelty along multiple dimensions will make a target stand out more than novelty on only one dimension. Consequently, average uniqueness across all demographic traits should be negatively related to boundary disagreement within teams. Some initial support for this hypothesis is provided by Mortensen and Hinds' (2002) preliminary study in which demographic uniqueness was be negatively related to boundary disagreement.

> ***Hypothesis 4:*** *Uniqueness will be negatively related to level of boundary disagreement.*

EFFECTS OF BOUNDARY DISAGREEMENT

In addition to examining the predictors of boundary disagreement, in this study I also examine the effects that such disagreement will have on teams and their processes. I argue that the existence of boundary disagreement in teams impacts the formation of an effective transactive memory system, shared team identity, conflict, and ultimately performance. Furthermore, the relationships between boundary disagreement and these outcomes are interconnected, with transactive memory, shared team identity, and conflict all mediating the relationship between boundary disagreement and performance.

Transactive Memory

Transactive memory systems are cognitive systems by which members of a group learn, categorize, store and retrieve information. Based on awareness of others' domains of expertise, an individual tailors his or her own knowledge to maximize the team's breadth and depth of knowledge while minimizing redundancy and effort (Hollingshead, 2001; Moreland, 1999;

Moreland & Myaskovsky, 2000; Wegner, 1987). Team members must differentiate, identify, and integrate their domains of expertise (Nonaka & Takeuchi, 1995). More specifically, successful transactive memory systems have three basic requirements: specialization, the differentiation of knowledge across members of the system; credibility, trust in the knowledge held by other members of the system; and coordination, the knowledge of who has expertise in which areas and how to access that knowledge (Liang, Moreland, & Argote, 1995; Moreland et al., 2000).

In teams experiencing boundary disagreement, both the coordination of knowledge and source credibility may be hampered by team members' differing understandings of who they can and cannot rely on for information. 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. These errors, when attributed to particular individuals, may subsequently weaken team members' credibility as knowledge sources. In Mortensen and Hinds' preliminary study (2002), boundary disagreement was positively related to difficulties in correctly identifying and allocating expertise within the team. Thus, teams experiencing boundary disagreement will be less successful in the coordination of knowledge and maintaining credibility and will have less effective transactive memory systems.

> ***Hypothesis 5a:*** *Teams experiencing boundary disagreement will be less successful coordinating knowledge and maintaining the credibility of knowledge sources than those without boundary disagreement.*

Hypothesis 5b: *Teams experiencing boundary disagreement will be have less effective transactive memory systems than those without boundary disagreement.*

Shared Team Identity

The construct of shared team identity is a form of social identity (Hogg & Abrams, 1988; Hogg & Terry, 2000; Tajfel, 1974, 1982; Tajfel & Turner, 1986). Social identity theory argues that individuals examine their environment, distilling their surroundings into prototypes. They then group these prototypes, into those like them (ingroup) and those unlike them (outgroup), the former of which is valued more highly (Gecas, Thomas, & Weigert, 1973). A shared team identity occurs when multiple individuals identify each other as an ingroup, resulting in positive attributions among those team members. In many cases ingroup and outgroup distinctions occur within teams (see Williams & O'Reilly, 1998 for a review) resulting in negative attributions and outcomes including conflict and decreased satisfaction.

I argue that in teams experiencing high levels of boundary disagreement, such intra-team ingroup-outgroup distinctions may occur on the basis of differing perceptions of team membership. Furthermore, research has shown that prototypes are highly contextual – based on and maintained by features of the immediate context (Fiske et al., 1991; Hogg et al., 2000). Consequently, differing membership may also result in differing reference groups and thus misaligned or incompatible prototypes. Teams experiencing boundary disagreement will, by definition, include individuals considered team members (thus ingroup) by some but not team members (thus outgroup) by others. This will result in the existence of unshared identities. Thus I hypothesize that boundary disagreement will reduce levels of shared identity within teams.

Hypothesis 6: *Teams experiencing boundary disagreement will have less shared identity than those that agree on their boundaries.*

Conflict

Conflict researchers have traditionally divided conflict into two main types: affective and task conflict (see Jehn, 1997 for a discussion). 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[2]. I argue that boundary disagreement is likely to lead to conflict due to clashing perceptions of team boundaries which lead to uneven patterns of interaction and information exchange. Team members are likely to include or exclude individuals from intra-team communications and decisions based on differing perceptions of the team and its membership.

Boundary disagreement is likely to impact affective conflict, as team members left out of the loop on communications or decisions may feel personally slighted. Although non-inclusion may be the result of differing models of the team, the fundamental attribution error (Ross, 1977) suggests that the excluded individual may feel that they were singled out and excluded intentionally, thus creating a source of strain and conflict. Similarly, boundary disagreement may result in task-related information not being adequately conveyed, leaving certain team members unaware of basic information, new developments, or recent changes. Support for this was reported by Cramton (2001) who found that incomplete or uneven information exchange

[2] A third type of conflict, process conflict (Jehn 1997), was more recently identified but as measures were not well-established at the time of data collection, it was not included in this study.

resulted in increased frustration and conflict. In addition, some team members may be perceived as not pulling their weight due to differing expectations of responsibility. Thus, affective and task conflict will result from boundary disagreement.

> ***Hypothesis 7:*** *Teams experiencing boundary disagreement will have more affective and task conflict than those that agree on their boundaries.*

Performance

Finally, I argue that the occurrence of boundary disagreement in teams is likely to affect team performance, and that that relationship will be mediated by transactive memory, shared identity, and conflict as outlined above. Teams experiencing boundary disagreement are also likely to experience issues in coordinating their work, as team members have differing expectations regarding who is responsible for particular parts of the task. Such confusion may lead to parts of the task slipping through the cracks, delaying work and causing missed deadlines and making it more difficult for teams to accomplish their goals.

In addition, many researchers have found evidence of the positive link between transactive memory and performance (Hollingshead, 1998; Liang et al., 1995; Moreland, Argote, & Krishnan, 1996; Moreland et al., 2000). Knowledge of member skill sets and expertise allows teams to approach problems more flexibly, thus improving performance (Moreland et al., 1996). In addition, effective knowledge coordination has been linked to performance in both laboratory and field settings (Stasser, Stewart, & Wittenbaum, 1995; Weick & Roberts, 1993). To the extent boundary disagreement impedes teams' abilities to effectively maintain and coordinate the expertise of their members this reduction in effective transactive memory will reduce team performance.

Similarly, research has shown shared social identity increases team performance. Brown and Wade (1987), found groups lacking a distinct identity performed more poorly than those with more established identities. Conversely, outgroup feelings towards teammates lead to numerous negative outcomes including both reduced cooperation and performance (Williams et al., 1998). Thus, the low shared identity I predict will occur in teams experiencing boundary disagreement will, in turn, be linked to reduced performance.

Though there is a large body of research linking conflict to performance, different types of conflict have been linked to different impacts on group effectiveness (Jehn, 1994, 1995; Jehn, Northcraft, & Neale, 1999). Research has consistently found affective conflict to be negatively related to team performance (Jehn, 1995) and reduced individual effort (Amason & Schweiger, 1994). In contrast, limited task conflict has been linked to more open and complete discussion of ideas and alternatives (Bourgeois, 1985; Eisenhardt & Schoonhoven, 1990; Jehn & Chatman, 2000; Jehn & Mannix, 2001; Schwenk & Cosier, 1993), especially in the case of complex tasks (Jehn, 1995; Shah & Jehn, 1993). Large amounts of task conflict, however, tend to degenerate into affective conflict, bringing with them reductions in performance and a recent meta-analysis (De Dreu & Weingart, in press) found that task conflict generally has a negative effect. Thus, the increased affective and task conflict hypothesized to result from boundary disagreement will mediate the relationship between boundary disagreement and team performance.

In summation, I hypothesize that the existence of boundary disagreement will be negatively related to performance. Initial support for this was provided by Mortensen and Hinds (2002) who reported that teams disagreeing on their membership scored lower on performance measures. I also hypothesize that transactive memory, shared identity, and conflict will mediate the relationship between boundary disagreement and performance.

Hypothesis 8a: *Teams experiencing boundary disagreement will perform more poorly than those that agree on their boundaries.*

Hypothesis 8b: *The relationship between boundary disagreement and performance will be mediated by effectiveness of transactive memory, existence of shared team identity, and level of conflict.*

METHODS

To test my hypotheses, I conducted a two-phase web-based survey of software development teams in a single large, multi-national corporation. Surveys were followed up by semi-structured interviews intended to provide a richer understanding of the teams and their work practices as well as to clarify issues raised in the survey.

Procedure

The two phases of the survey were administered approximately two weeks apart, so membership lists used in the second phase could be tailored to reflect the responses given in the first phase of the survey. The phase 1 survey was used to collect data on team demographics and membership attributions. In the phase 2 survey, questions regarding teammates were populated using a superset of all individuals referenced by members of that team in the phase 1 survey[3]. The two-phase survey also helped to eliminate common methods bias between the independent and dependent variables. Data on team performance was collected from team managers through a similar web-based survey. In teams with multiple team managers, all team managers were

[3] To increase survey response rate, in teams identified by managers as having 10 or more members, only those individuals referenced by two or more members were included in the phase 2 survey. This affected the most disagreed upon members of large teams (11 of the 43 included in the sample), resulting in a more conservative test of most hypotheses.

asked to participate and all valid responses were averaged to create a single rating per team. As noted, member and manager surveys were followed by semi-structured interviews with a randomly selected subset of individuals. In all cases, interviewees had completed the survey prior to being interviewed.

Sample

The sample used in this study consisted of software development teams in a single large, multinational software company. Initially, 443 individuals in 49 teams were contacted. Responses from at least 50% of team members (with a minimum of at least 3 team members) were required, reducing the usable sample to 43 teams. A total of 366 individuals within those 43 teams were initially contacted, yielding a total of 335 phase 1 responses (92% response rate) and 305 phase 2 responses (83% response rate) in the final sample. The membership of each team, for the purposes of data collection, was based on official team rosters provided by team managers.

Measures

To create the measure of boundary disagreement, I performed a dyadic comparison of the membership lists provided by all respondents in a team. For each dyad (*i*,*j*), their membership attributions regarding each other potential teammate were coded as 1 if they were different and 0 if they are the same. The sum of all codes is then divided by the total number of targets referenced by that dyad, yielding a dyadic percentage of disagreement. The mean of the dyadic disagreement scores across all possible dyads in the team was then used as the measure of team boundary disagreement (see figure 2). A dichotomized measure of boundary disagreement was created for those hypotheses dealing with the existence rather than level of boundary

disagreement. Teams with continuous boundary disagreement scores of 0 were coded as 0 and all other values as 1.

Insert figure 2 about here

Per-team communication matrices were created based on respondents' self-report data on how frequently they interact with each other member of their team both face-to-face and via media (email, phone, voicemail, videoconference, teleconference, instant messenger, fax, and paper documents). The mean communication scores across all dyads and via all media was used as a measure of average level of communication within that team and euclidean distances between team members were used as a measure of communication pattern dissimilarity. The mean of all communication dissimilarity scores was used as a team-level measure of heterogeneity of communication.

Kolmogorov-Smirnov tests were carried out comparing the distribution of the average communication and heterogeneity of communication measures to a normal distribution. Both were non-normal ($z=1.89$, $p<.01$, and $z=1.76$, $p<.01$ respectively), reflecting skewness of 4.74 (.36) and 4.03 (.36) respectively and kurtosis of 26.51 (.71) and 19.25 (.71) respectively. The natural log of both variables yielded a more normal distribution with skewness of .49 (.36) and .11 (.36) respectively and kurtosis of 1.00 (.71) and 1.14 (.71) with which passed the Kolmogorov-Smirnov test of normality ($z=.58$, $p>.20$, and $z=.60$, $p>.20$ respectively). The transformation did not affect the pattern of results and thus the transformed variables were 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.

Interdependence was measured through individual team-members' self-reported reliance on each other team member rated on a five-point scale (1= "not at all", 5= "heavily"). The mean

of all interdependence scores within a team was used as a measure of average level of interdependence within that team. The average euclidean distance between team members was used as a measure of heterogeneity of interdependence.

Based on the workflow models of Van de Ven, Delbecq, and Koenig (1976), respondents were asked to identify the percentage of total work in their team that is pooled, serial, reciprocal, or team-based as represented by a combination of textual description and graphical representations. The mean of each of these percentages across all members in the team was used as a team-level measure of use of the four workflow models. To verify that aggregation to the team-level was justified, I estimated within-group interrater reliability scores based on James, Demaree, and Wolf (1984). The interrater reliabilities of the four indices ranged substantially with the most reliable being serial workflow followed by reciprocal, team, and pooled (.78, .65, .58, and .35 respectively). The measures of team and pooled interdependence were therefore discarded and only measures of serial and reciprocal workflow were included in the analyses.

Measures of uniqueness were based on individual team members' self-reported characteristics including three outwardly observable characteristics (gender, age, and ethnicity) as well as job category and educational background. While neither job category nor educational background is likely to be outwardly observable, I argue they are both extremely relevant to the team's ability to accomplish its task and thus are likely to be well-known within the team.

I calculated relational demography scores for each variable, as per O'Reilly and colleagues (O'Reilly, Caldwell, & Barnett, 1989; Tsui, Egan, & O'Reilly, 1992; Tsui & O'Reilly, 1989). The relational demography score is calculated as the square root of the summed squared differences between an evaluator *Ei's* value on a specific variable and the value of that variable for every other evaluator in *Ei's* team, divided by the total number of team members. For

categorical measures the above formula is modified such that variations between team members are replaced by a 0-1 coding (0 if the respondents had the same value on that dimension and 1 if they had different values). These individual-level scores were averaged to produce team-level heterogeneity scores. Counter to the spirit of demographic uniqueness as used in this analysis, the resultant team-level score is weighted in favor of widely distributed heterogeneity rather than uniqueness – a team of the form (3X, 3Y) will be rated more unique than a team of the form (1X, 5Y). To rectify this, I subtracted all non-zero team-level relational demography scores (ranging from 0-1) from one, yielding a team-score that captures the spirit of uniqueness as used in this study.

To measure transactive memory, respondents were asked to rate the accuracy of 15 statements (Lewis, 2003), with respect to their workgroup using a five point Likert scale (1 = Not at all accurate, 5 = Very accurate). The mean of these ratings was then calculated to create an individual-level measure of transactive memory with high reliability ($\alpha = .87$). The mean of all individual-level measures yielded a team-level measure of transactive memory deemed justified with an interrater reliability score of .96. The 15 item scale was also broken into three sub-scales measuring specialization, credibility, and coordination which had reliability scores of $\alpha = .59$, $\alpha = .84$, and $\alpha = .82$ respectively. Due to its low reliability score, the measure of specialization of knowledge was not included in the analyses.

Shared team identity was measured using a thirteen item scale based on Tyler (1999). Team members rated each item on a five-point Likert scale (1 = Not at all characteristic, 5 = Very characteristic). The mean of the thirteen items was calculated and used as an individual-level identity score with high reliability ($\alpha = .80$). The mean of the thirteen items was calculated to form an individual-level identity score with high reliability ($\alpha = .80$) and the mean across all

team members was used as a team-level measure of identity, deemed justified with an interrater reliability score of .92.

Affective and task conflict were measured using relationship conflict scales developed by Jehn (1994; 1995) and further refined by Jehn and Mannix (2001). Respondents rated 9 statements regarding the extent to which they occurred within their team using a five-point Likert scale (1 = Not at all, 5 = Very much). These scores composing each of the measures were averaged according to Jehn's model to form indices of the three types of conflict. Checks of the indices' validity showed the measures of affective and task conflict to be quite reliable (α = .86 and α = .79 respectively) and interrater reliability scores of .81, .86, and .86 respectively, further affirmed that these constructs were perceived consistently by the members of each team.

Performance was measured by team member and manager ratings on seven dimensions of performance (Ancona et al., 1992) using a five-point Likert scale (1 = poor, 5 = excellent). The average of team managers' ratings was used as a measure of manager-rated team performance with high reliability (α = .85). In those cases where teams had multiple managers, the mean of all managers' ratings was calculated, with an interrater reliability score of .94. Team members were also given the same questions assessing team performance which yielded high reliability (α = .84) and interrater reliability (.93). Unfortunately, no manager ratings were available for 4 out of the 43 teams, resulting in a loss of statistical significance. As team member and team manager ratings were significantly positively correlated and demonstrated similar patterns of correlation with other measures, the team member ratings of performance were used in place of team manager ratings of performance.

The analyses of boundary disagreement antecedents also included controls for recall error, impact of team-manager lists, demographic traits, geographic distribution, and team size.

To control for the effects of recall error, I calculated the ratio two respondent-generated membership lists: a "freeform" list consisting of the names provided by the subjects in response to the question: "Please list all members of your team" and the second consisting of the respondents' validation of his team manager's list. The percentage of that primed list that does not appear on the freeform list was used as a measure of recall error. To control for the effect of the management-sanctioned list, I calculated percentage of overlap between the official management-provided membership list and the list provided by the respondent. Demographic traits at the team level (gender ratio, average age, distribution of functional training, distribution of ethnicity) were included in the analyses, as were controls for team characteristics (average team age, team size, and percentage complete). Finally, controls for team size were introduced as well, calculated as the average of the number of team members identified by the team manager and the number of team members included in the superset of all referenced team members. In addition, all analyses were conducted using the manager and team member measures of team size individually but all yielded similar patterns of results. Team size was the only control that had a significant effect on any analyses. In the interest of retaining degrees of freedom, all controls except team size were removed from the final reported analysis.

Analyses

As noted, the data collected through the surveys were used in two separate analyses. In the first analysis linear regressions with ordinary least squares (OLS) estimates were used to test hypotheses 1 through 5. In this analysis, the continuous measure of boundary disagreement was regressed on controls and measures of heterogeneity and average amount of communication, heterogeneity and average amount of interdependence, pooled, serial, and team-based workflow, and uniqueness. In the second analysis, Analyses of Variance (ANOVA) were used to examine

the relationships between the existence of boundary disagreement and the team level outcomes of transactive memory, shared team identity, and performance. Furthermore, to evaluate the mediation effects outlined in hypothesis 8b, a series of three OLS regressions were carried out for each mediator as per Baron and Kenney (1986). The mediator was regressed on the independent variable (existence of boundary disagreement), the dependent variable (performance) was regressed on the independent variable, and finally the dependent variable was regressed on the independent variable controlling for the mediator. In addition to the quantitative statistical analysis, the tape-recorded interviews were transcribed and coded for relevant themes. These themes were used to provide greater insights into the factors and motivations underlying team members' survey responses.

RESULTS

Table 1 provides the descriptive statistics for and correlations between the primary variables of interest. Boundary disagreement existed in 30 out of the 43 (69.80%) teams in the sample. Levels of boundary disagreement ranged from a low of 0 to a high of .50 (M=.14, s.d.=15). Within those teams that did experience boundary disagreement, mean boundary disagreement was .20 (s.d. = .14). This provides validation of the existence of a substantial amount of naturally occurring boundary disagreement.

Insert table 1 about here

Antecedents of Boundary Disagreement

In my first hypothesis, I predicted that level of boundary disagreement would be negatively related to communication and positively related to heterogeneity of communication. Contrary to hypothesis 1a, regressing level of boundary disagreement on level of communication (see table 2, model 3) yielded no significant relationship (β=-.35, n.s.). Similarly, contrary to

hypothesis 1b, regressing level of boundary disagreement on heterogeneity of communication (see table 2, model 3) also yielded no significant relationship (β=.33, n.s.). Thus no support is found for hypotheses 1a or 1b.

In my second hypothesis, I predicted that level of boundary disagreement would be negatively related to interdependence and positively related to heterogeneity of interdependence. Regressing level of boundary disagreement on heterogeneity and level of interdependence (see table 2, model 3) found a significant negative relationship between level of boundary disagreement and average interdependence (β=-.43, $p<.05$) and a significant positive relationship between level of boundary disagreement and heterogeneity of interdependence (β=.59, $p<.05$), thus supporting both hypotheses 2a and 2b.

Insert table 2 about here

In my third hypothesis, I predicted that level of boundary disagreement would be positively related to use of a serial workflow and negatively related to use of a reciprocal workflow. I regressed level of boundary disagreement on use of both serial and reciprocal workflow (see table 2, model 4). There was a significant positive relationship between level of boundary disagreement and use of serial workflow (β=.34, $p<.05$). There was, however, no significant relationship between level of boundary disagreement and use of reciprocal workflow (β=-.06, n.s.). This provides support for hypothesis hypothesis 3a but not 3b.

In my fourth and final hypothesis regarding antecedents of boundary disagreement, I predicted that level of boundary disagreement would be negatively related to uniqueness on multiple dimensions. Regressing level of boundary disagreement (see table 2, model 5) on uniqueness yielded no significant relationships between boundary disagreement and measures of uniqueness of gender or educational background (β=.17, β=.05 respectively). However, there

were significant negative relationships between level of boundary disagreement and heterogeneity of ethnicity (β=-.47, p<.01), age (β=-.34, p<.05) and job category (β=-.29, p<.05). In addition, substituting a single measure of uniqueness across multiple dimensions for the individual measures of uniqueness yielded a significant negative relationship (β=-.33, p<.05). Thus, the results provide support for hypothesis 4.

Effects of Boundary Disagreement

To test the hypotheses regarding the effects of boundary disagreement, I ran a series of one-way ANOVAs using existence of boundary disagreement as the independent variable and team-level outcomes as dependent variables (see table 3). Team performance was significantly correlated with boundary disagreement existence (r=–.36, p<.05).

Insert table 3 about here

In my fifth hypothesis, I predicted that teams experiencing boundary disagreement would be less successful coordinating knowledge and maintaining the credibility of their knowledge sources and would consequently have less effective transactive memory systems than those without boundary disagreement. As hypothesized, teams experiencing boundary disagreement reported lower levels of effective transactive memory than those without (M=3.74 vs. M=3.94 respectively) and that difference was significant (F=5.05, df=41, p<.05) (see table 3). Teams experiencing boundary disagreement also reported lower scores for coordination of knowledge and credibility of knowledge sources than teams without boundary disagreement (M=3.31 vs. M=3.63 and M=3.91 vs. M=4.11 respectively) and both effects were significant (F=4.53, df=41, p<.05 and F=4.50, df=41, p<.05 respectively). This supports both hypotheses 5a and 5b.

In my sixth hypothesis, I predicted that teams experiencing boundary disagreement would report less shared team identity than those without boundary disagreement. As hypothesized,

teams experiencing boundary disagreement reported significantly lower shared identity than those not experiencing boundary disagreement (M=3.51 vs. M=3.74, F=5.70, df=41, p<.05 respectively) (see table 3). This provides support for hypothesis 6.

In my seventh hypothesis, I predicted that teams experiencing boundary disagreement would have more affective and task conflict than those without boundary disagreement. Similarly, teams experiencing boundary disagreement reported significantly higher levels of affective conflict (M=2.15 vs. M=1.79 respectively) and this difference was significant (F=4.54, df=41, p<.05). In contrast, although task conflict was higher in teams experiencing boundary disagreement (M=2.46 vs. M=2.29), the difference was not significant (F=1.42, df=41, n.s.). Thus partial support was found for hypothesis 7.

Finally, in my eighth hypothesis, I predicted that teams experiencing boundary disagreement would be perform more poorly than those without boundary disagreement and that the relationship between boundary disagreement and performance would be mediated by transactive memory, shared identity, and conflict. As predicted, teams experiencing boundary disagreement reported significantly lower performance than those experiencing no boundary disagreement (M=3.65 vs. M=3.94 respectively) and that this effect was significant (F=6.06, df=41, p<.05) (see table 3). This provides support for hypothesis 8a.

To show mediation, significant relationships must be found in regressions of the mediator on the independent variable and the dependent variable on the independent variable. Also, mediator must remain significant in the regression of the dependent variable on both the independent variable and mediator (Baron et al., 1986). As the dependent and independent variables were the same in all the mediations tested, the second model regressing performance on

boundary disagreement was the same in for all the analyses. This regression yielded a significant negative relationship (β=-.36, $p<.05$) as required if mediation is present.

Insert table 4 about here

To test the mediating effect of transactive memory, transactive memory was regressed on existence of boundary disagreement, yielding a significant negative relationship (β=-.33, $p<.05$) (see table 4). Regressing performance on boundary disagreement, controlling for transactive memory found a significant relationship between transactive memory and performance (β=.73, $p<.01$) and no significant relationship between boundary disagreement and performance (β=-.12, n.s.). This supports the hypothesis that transactive memory mediates the relationship between boundary disagreement and performance. Affective conflict was regressed on boundary disagreement yielding a significant positive relationship (β=.32, $p<.05$) (see table 4). Regressing performance on affective conflict, controlling for boundary disagreement, yielded a significant negative relationship between affective conflict and performance (β=-.45, $p<.01$) and no significant relationship between performance and boundary disagreement (β=-.22, n.s.). This supports the hypothesis that affective conflict mediates the relationship between boundary disagreement and performance. Lastly, shared identity was regressed on boundary disagreement, yielding a significant negative relationship (β=-.35, $p<.05$) (see table 4). Performance was regressed on shared identity and boundary disagreement yielding a significant positive relationship for the former (β=.56, $p<.01$) and no significant relationship for the latter (β=.16, n.s.). This supports the hypothesis that shared identity mediates the relationship between boundary disagreement and performance. Thus, the relationship between performance and

boundary disagreement was mediated by transactive memory, affective conflict, and shared identity, thereby providing support for hypothesis 8b.

DISCUSSION

Salience-Integration Model

The findings of this study provide preliminary support for the salience-integration model. Boundary disagreement was negatively related to uniqueness of job category and ethnicity, factors I argued would be its closely linked to target salience. Boundary disagreement was also significantly related to both heterogeneity of interdependence and reliance on serial workflow. Though distinct, these two factors reflect unevenness in work-related interconnections, which form the basis for perceived integration. This study was not designed to explicitly measure either salience or integration and thus I cannot provide direct evidence of the connection between boundary disagreement and either salience or integration. I believe, however, that the findings presented here do provide initial support for this relationship and evidence to propel further research in this domain.

Role of Awareness

Fundamentally affecting the relationship between boundary disagreement and existing theories relating to team boundaries is the extent to which team members are aware of the existence of boundary disagreement. When asked whether they knew who the members of their teams were, most interviewees were quite sure of themselves; with one respondent, 'Tim,' stating: "Yeah, I think I know that exactly." Furthermore, as illustrated in the opening quote by 'Claire', most individuals felt confident not only in their own understanding of the team but in their teammates' having the same understanding. Tim's team, however, had a boundary disagreement score of .47 while Claire's was .28. This suggests that not only is boundary

disagreement occurring, but the members of the teams in which it occurs are often unaware of its existence.

By thinking about and referring to the team as an abstraction (ex. "the alpha team" or "the beta project") 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 team members worked in and successfully discussed their team in the abstract, unaware of differing underlying models on which that abstraction was mapped.

This lack of awareness is 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, would allow individuals to compensate. This compensation could occur through storing redundant information or correctly attributing errors, thereby maintaining a source's credibility. Similarly, recognition of boundary disagreement may cause individuals to perceive exclusion from meetings or communications as situational rather than personal, thus reducing the likelihood of affective conflict arising.

The impact of an awareness of boundary disagreement on shared team identity is more difficult to predict. Boundary disagreement implies differing frames of reference on which evaluators base their definitions of the prototypical team member. Comparisons with that definition then shape perceptions of a shared team identity. Awareness of boundary

disagreement may allow for a more nuanced understanding of the team in which an evaluator recognizes differences between his or her reference frame and those of teammates.

One should note that in none of the three examples does an awareness of boundary disagreement imply its elimination. The question this raises for practitioners is whether efforts should be taken to eliminate boundary disagreement where possible. I suggest there may be some benefits to boundary disagreement that should not be discounted. Boundary disagreement can occur side by side with an awareness of the different understandings that it reflects. That awareness, in turn, may reduce some of the negative effects identified in this study as related to boundary disagreement.

Boundary disagreement may help make teams more resilient to environmental shocks through a process akin to loose coupling (Weick, 1976). I suggest that boundary disagreement may allow members of teams to be less closely tied to their colleagues (by not identifying some as teammates at all), thereby allowing some team members to ignore the negative morale and motivational effects of reorganizations or layoffs by considering them external to the team. Boundary disagreement may also benefit groups by fostering creativity and innovation. Creativity researchers argue that individual creativity is affected by contextual factors (Amabile & Gryskiewicz, 1989) and social networks (Perry-Smith & Shalley, 2003; Simonton, 1984). Exposure to a diverse set of people increases the likelihood of exposure to a diverse set of ideas which can be recombined in novel and creative ways (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Payne, 1990; Woodman, Sawyer, & Griffin, 1993). Boundary disagreement implies that team members bound the team differently, and thus the set of individuals from whom they seek information and with whom they interact on task-related issues is likely to vary. Some team members will tap into resources that other team members might not consider to be

part of the team. Thus boundary disagreement may promote creativity within teams. It therefore appears that increasing awareness of boundary disagreement without seeking to eliminate it may provide the most effective means of managing boundary disagreement in practice.

The benefits of awareness may, however, come at a price. To the extent that team members may feel uncomfortable with the idea of disagreement over team boundaries, awareness of boundary disagreement may result in feelings of dissonance and confusion as team members seek to understand or even "correct" their teammates different understandings of team composition. Whether the impact of such dissonance proves substantial enough to outweigh the negative effects of a lack of awareness of boundary disagreement remains a topic for future research.

Implications for Theory

There are two critical ways in which boundary disagreement impacts existing theory. First, the phenomena of membership attribution and boundary disagreement provide a link between two distinct approaches to the study of groups and teams: social networks and social psychology. Second, the existence of boundary disagreement demands the reevaluation of existing theories and research built on the assumption of agreed-upon team membership.

Linking Existing Perspectives on Groups

The other key theoretical implication for boundary disagreement is the link it provides between two distinct approaches to groups and teams. While much existing research has examined phenomena from social network or social psychological perspectives, this study suggests that phenomena like boundary disagreement may exist only in the intersection between these multiple perspectives. Within the social network approach, the discord between higher-level abstractions brought about by variations in structure is lost. Taking a similarly isolated

social psychological approach, differing structures and conceptualizations underlying similarly named abstract team identities are not likely to be detected. This suggests the importance of concurrently examining multiple perspectives on groups and teams as a means of understanding their impact on team dynamics and processes. By looking at the different perspectives in isolation it is likely that phenomena like boundary disagreement, occurring at the juncture between multiple perspectives, will be missed. I believe that it is only through an examination and comparison of multiple concurrent perspectives that one is able to fully understand team dynamics and processes. As such, I believe it is critical that researchers consider and compare multiple conceptualizations of groups and teams.

Integration to existing theories

Starting with the example of boundary spanning, if, as suggested earlier, many boundary-spanners are actually interacting with people they consider to be their teammates, then the behaviors predicted by the boundary-spanning literature may not be appropriate. Moving beyond this one specific case, recognition of boundary disagreement demands a broader re-evaluation of existing theory on teams and groups. While I do not claim that any or all existing theory is invalid, I suggest we revisit those studies that focused on the theoretical abstractions of teams as they are particularly likely to be affected. One such example is research on shared identity as such that did not account for the effects of boundary disagreement may have found evidence of strong identity in cases where individuals identified strongly with different abstractions.

The remaining question is which studies warrant controls for boundary disagreement and as opposed to those in which agreement on boundaries can be used as a simplifying assumption. I argue that measurement of and control for boundary disagreement is warranted in those studies

in which the identification with, or perception of, an abstraction representing a team might impact the results of the study. For example, considering boundary disagreement in future research on group norms would provide a better understanding of the way in which people learn existing norms and how that affects their subsequent understanding of those norms. 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 to impact communication patterns. Without that justification, it would be reasonable to use boundary agreement as a simplifying assumption.

Limitations

The key limitation of this study is its level of analysis. In this study, the mechanisms hypothesized to underlie boundary disagreement were framed at the levels of the individual and team. To maintain a reasonable scope, this study neglects to examine organization or industry level phenomena that may impact the existence and effects of boundary disagreement. Organizational culture, for example, may attribute differing levels of importance to extra-group collaboration for different types of teams. An organization that actively recognizes and supports collaborations across team boundaries may find much higher levels of boundary disagreement than those that frown on such activities. Similarly, some organizations may explicitly identify and publicize high-performing teams as a means of highlighting their achievements. This emphasis and publicity may, in turn, impact boundary disagreement within those teams. Beyond these factors affecting integration, organizational culture may also impact what factors are most salient to team members by stressing certain characteristics. Consequently, organizational culture is likely to impact both the antecedents and effects of boundary disagreement.

It is also possible that this study suffers from omitted variable bias. Although I examined variables deemed most likely to impact the existence and effects of boundary disagreement, there may exist some biases in the selection of those variables as I did not measure all of the possible factors that may have affected or been affected by boundary disagreement. Finally, as this was correlational field study, I was limited in the number of questions that I could investigate and ask my informants. Consequently, the identified correlations cannot be assumed to be causal. Longitudinal research is needed to assess the causal nature of these relationships. Furthermore, additional ethnographic field work is needed to better understand the causes of boundary disagreement in teams and how it, in turn, affects team-level outcomes like performance.

Future directions

Though the analysis of the antecedents and effects of boundary disagreement presented here provide a first look into the phenomenon of boundary disagreement, there remain a number of related, potentially fruitful areas of research. As noted earlier, further examination of the relationship between boundary disagreement, its effects, and awareness seems warranted. A better understanding of the impact of awareness on the effects of boundary disagreement would begin to provide the tools needed to manage the effects of boundary disagreement, reducing its negative effects while potentially allowing for positive outcomes.

Structures of Boundary Disagreement

Beyond simply identifying and measuring the strength of boundary disagreement, a more detailed analysis of different structures boundary disagreement may take seems warranted. Such analysis may allow the categorization of boundary disagreement into different forms with different characteristics, antecedents, and effects. This may highlight the differential antecedents

and effects of a single core with a uniform periphery, a single core with peripheral subgroups, or multiple subgroups without a consistent core.

To begin to examine the effects of different boundary disagreement structures, the five highest and lowest performing teams were identified based on the average of manager and team member-rated measures of performance. The Bron and Kerbosch (1973) algorithm was applied to those teams' matrices of membership attribution to find all Luce and Perry (1949) cliques of size 2 or more in those teams. This initial analysis found that three of the five top performing teams displayed no subgrouping at all. Of the two that did, both displayed a bimodal grouping in which the team divided into two approximately equal-sized subgroups. In contrast, four of the five lowest performing teams, showed evidence of a single dominant subgroup and one or more small subgroups or isolates. Though preliminary, this analysis suggests that membership-based subgrouping may be particularly relevant to team performance.

Relationship to Information Technology

Another area of potentially fruitful future research is the relationship between boundary disagreement and information technology. Boundary disagreement is likely to be affected by the design of information systems currently in place while in turn affecting the design of future systems. To the extent that existing technologies (from email lists to knowledge management systems) explicitly identify the membership of teams through delimited member lists, they provide consistent evidence of an individual's integration in the team. Thus I suggest that such technologies may reduce team boundary disagreement.

At the same time, I argue that boundary disagreement is likely to impact the design and implementation of new systems. When creating a new system to support a team, the system designer must base that design or implementation on a particular understanding of the team. The

design of that technology is therefore likely to reflect the team as perceived either by the system's designer or commissioner. The existence of boundary disagreement suggests that this understanding of the team may not reflect the perceptions of all or even the majority of team members. Consequently, the resultant system may appear flawed or poorly designed by individuals with different perceptions of the team. Also, because it was designed to fit a different underlying model of the team, such a system may not effectively perform the functions for which it was designed and thereby ineffectively manage the team's knowledge.

This study provides a first crucial step towards understanding the way in which team members perceive their teams and conceive of team membership. This study demands a reexamination of existing theories of team and interpersonal behavior through the critical lens of boundary disagreement and provides researchers with a valuable tool which can be used to better understand the effects of membership on team member behavior. Furthermore the findings linking boundary disagreement to lower team performance, increased conflict, and ineffective transactive memory systems illustrate very strong potential downsides of boundary disagreement occurring within teams.

FIGURES & TABLES

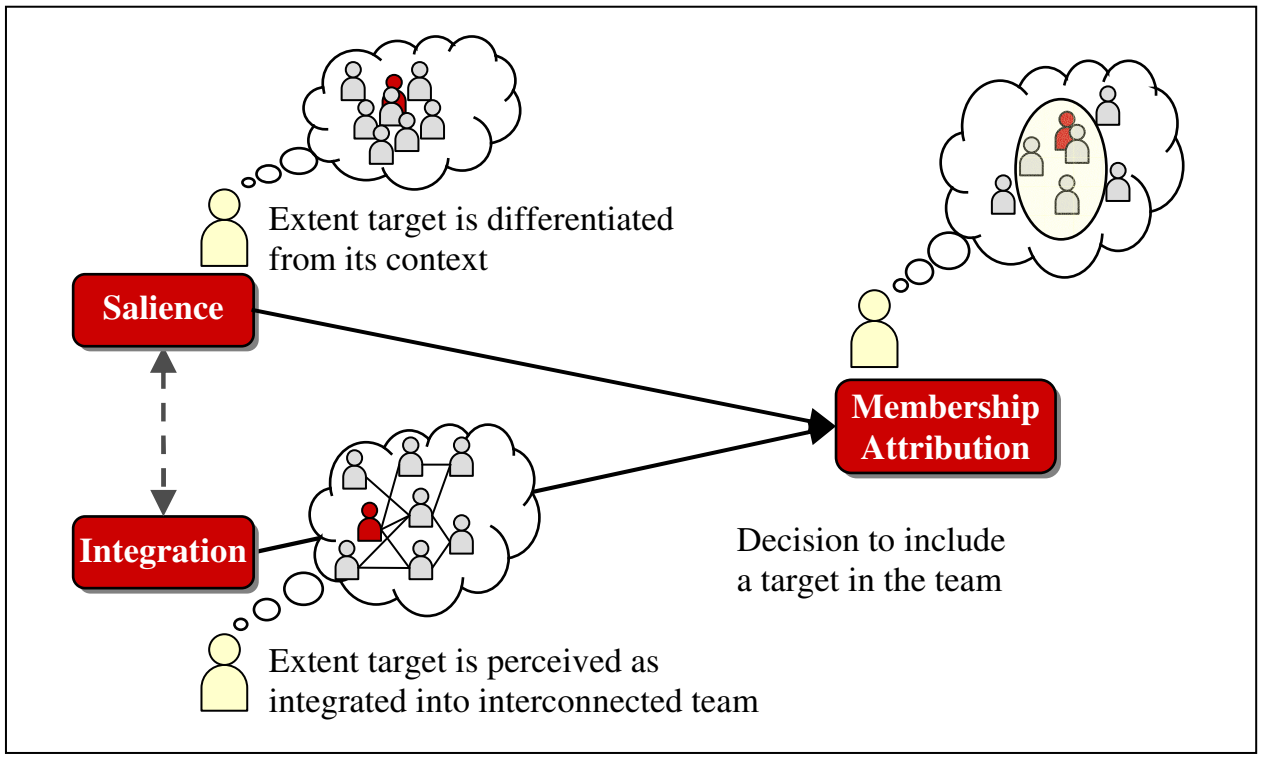

Figure 1: Membership attribution process

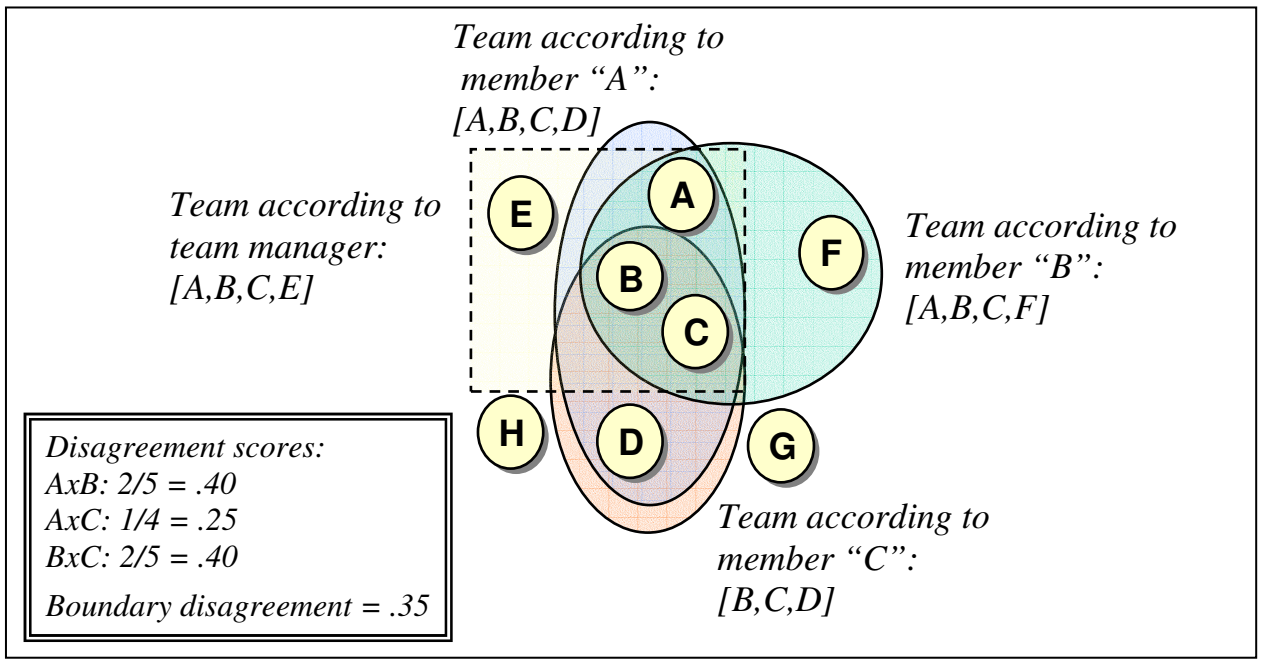

Figure 2: Boundary disagreement calculation example

Table 1: Descriptive statistics and correlations between key variables

	Variable	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9
1	Boundary disagreement (level)	.14	.15									
2	Boundary disagreement (existence)	.70	.46	.63 **								
3	Number of team members	12.76	6.42	.34 *	.49 **							
4	Average communication	.60	.37	-.21	-.34 *	-.47 **						
5	Hetero.of communication	1.33	.37	.11	-.02	.04	.65 **					
6	Average interdependence	2.54	.44	-.40 **	-.47 **	-.58 **	.52 **	-.02				
7	Hetero. of interdependence	4.40	2.64	.36 *	.42 **	.74 **	-.18	.06	-.15			
8	Serial workflow	16.54	7.56	.47 **	.28	.21	-.24	.02	-.13	.29		
9	Reciprocal workflow	25.62	7.18	-.06	.13	-.17	.19	.08	-.06	-.15	-.08	
10	Uniqueness of gender	.29	.19	.13	.23	.45 **	-.06	.08	-.15	.40 **	-.04	.09
11	Uniqueness of ethnicity	.24	.18	-.11	.12	.24	.00	-.04	.28	.57 **	.06	-.06
12	Uniqueness of age	.16	.09	-.08	-.01	-.01	.05	.40 **	-.17	-.08	.22	-.10
13	Uniqueness of job cat.	.24	.17	-.27	-.05	.25	.11	.07	.05	.30	-.12	.20
14	Uniqueness of education	.18	.08	.17	.19	.20	-.25	.05	-.21	.13	.18	-.22
15	Performance	3.74	.38	-.21	-.36 *	-.12	-.04	-.15	.11	-.20	-.11	.08
16	Shared identity	3.58	.31	-.36 *	-.35 *	-.07	-.04	-.04	.07	-.30	-.21	.05
17	Transactive memory	3.80	.28	-.13	-.33 *	-.14	.00	-.10	.15	-.17	-.19	.01
18	Affective conflict	2.04	.52	.16	.32 *	.07	.11	.09	-.05	.27	.21	.01
19	Task conflict	2.41	.43	.08	.18	.04	.18	.08	.09	.18	.18	-.07

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

Table 1: Descriptive statistics and correlations between key variables (cont.)

	Variable	9	10	11	12	13	14	15	16	17	18
1	Boundary disagreement (level)										
2	Boundary disagreement (existence)										
3	Number of team members										
4	Average communication										
5	Hetero.of communication										
6	Average interdependence										
7	Hetero. of interdependence										
8	Serial workflow										
9	Reciprocal workflow										
10	Uniqueness of gender	.09									
11	Uniqueness of ethnicity	-.06	.36 *								
12	Uniqueness of age	-.10	-.21	-.24							
13	Uniqueness of job cat.	.20	.39 *	.18	.04						
14	Uniqueness of education	-.22	.23	.20	.17	-.10					
15	Performance	.08	.12	-.08	.14	.12	.10				
16	Shared identity	.05	.00	-.14	.23	.00	.12	.62 **			
17	Transactive memory	.01	.17	-.11	.06	.09	.07	.77 **	.56 **		
18	Affective conflict	.01	.07	.30	-.04	-.09	-.02	-.52 **	-.62 **	-.69 **	
19	Task conflict	-.07	-.04	.19	-.08	-.10	.05	-.48 **	-.45 **	-.63 **	.72 **

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

Table 2: OLS estimates for regressions predicting level of boundary disagreement

Variable	1	2	3	4	5
Number of team members	.34 *	.16	-.50	-.34	-.48
Average communication		-.35	-.31	-.03	-.25
Heterogeneity of communication		.33	.29	.11	.36
Average interdependence			-.43 *	-.47 *	-.26
Heterogeneity of interdependence			.59 *	.42	.76 **
Sequential workflow				.34 *	.31 *
Reciprocal workflow				-.06	-.01
Uniqueness of gender					.17
Uniqueness of ethnicity					-.47 **
Uniqueness of age					-.34 *
Uniqueness of job category					-.29 *
Uniqueness of education					.05
Adjusted R^2	.09	.10	.22	.28	.50
F	5.39 *	2.59	3.33 *	3.38 **	4.47 **
Df	1 42	3 40	5 38	7 36	12 31

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

Note: Values are standardized β's

Table 3: Summary of ANOVAs

Variable	Mean		df	F
	No Boundary disagreement	Boundary disagreement		
Performance	3.94	3.65	41	6.05 *
Shared identity	3.74	3.51	41	5.69 *
Transactive memory	3.94	3.74	41	5.04 *
Credibility of knowledge sources	4.11	3.91	41	4.50 *
Coordination of knowledge	3.63	3.31	41	4.53 *
Affective conflict	1.79	2.15	41	4.54 *
Task conflict	2.29	2.46	41	1.42

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

Table 4: OLS estimates for regressions testing mediation effect on performance

	Model 1: Mediator regressed on IV	Model 2: DV regressed on IV	Model 3: DV regressed on IV and Mediator	
Mediating Variable	β of mediator	β of DV (performance)	β of mediator	β of IV (boundary disagreement)
Transactive memory	-.33 *	-.36 **	.73 **	-.12
Affective conflict	.32 *	-.36 **	-.45 **	-.22
Shared identity	-.35 *	-.36 **	.56 **	-.16

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

Note: Values are standardized β's

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