Constructing the Team: The Antecedents and Effects of Membership Model Divergence

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Abstract

Scholars have established that team membership has wide-ranging effects on cognition, dynamics, processes and performance. Underlying that scholarship is the assumption that team membership – who is and who is not a team member – is straightforward, unambiguous and agreed upon by all members. Contrary to this assumption, I posit that as a result of changing environmental conditions, mental models of membership increasingly diverge within teams. Building on the literature on shared mental models, I explore the antecedents and consequences of such divergence. In a study of 38 formally defined software and product development teams, I identify the structural and emergent drivers of this “membership model divergence” and examine its effect on performance operating through team-level cognition. I use the findings of this study to suggest an overall model of membership model divergence and explore its potential implications for both management theory and managerial practice.

Keywords: Teams; Membership; Composition; Boundaries; Perception; Mental Models; Project-based Work.
Constructing the team

Abe sat frustrated as he read the onslaught of criticisms he received on his recent presentation to the board on behalf of the “Alpha” product development team. The board had turned down Alpha’s new project, and his presentation on behalf of the team was being criticized by many of his teammates as incomplete, as off-target, and for ignoring some of their most important arguments. This bewildered Abe as he had met with each member of the team individually in the previous week, asking for comments on his draft. Betty explained that Abe hadn’t included any of the arguments Chris and Denise had made. Why should he? thought Abe, Chris and Denise are not even in the team.

This scenario illustrates one of the effects of a frequently overlooked phenomenon which I refer to as membership model divergence – defined as misalignment among team members’ models of who are, and who are not, team members. Given the increasing use of teams that are fluidly shifting, globally dispersed and overlapping (Hackman and Katz 2010), scenarios such as these are increasingly common. I argue that they challenge an implicit assumption widely held in both theory and practice: that teams agree upon their membership.

With this study I seek to accomplish three things. First, I draw upon existing theory and research on shared mental models to define membership model divergence. Second, I conduct an empirical study to illustrate that membership model divergence does occur in organizational teams, and to test a series of hypotheses built around two research questions: What are the causes of membership model divergence, and what are its effects on emergent team processes and states? Third, I propose a model of membership model divergence that links its antecedents, mechanisms, and effects, and I address its implications for existing and future theory and managerial practice. In so doing I address a gap in our understanding outlined by Guzzo and Dickson in their 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).

CONCEPTUALIZING MEMBERSHIP MODEL DIVERGENCE

As membership model divergence is a new construct that has not yet been theorized about or empirically assessed, I outline this conceptualization through four questions: 1) What does “membership”
Constructing the team

What is membership model divergence and why does it matter? 3) What are the mechanisms leading to membership model divergence? and 4) In what contexts is membership model divergence likely to occur?

What does “membership” mean?

Lickel and colleagues observed 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; p. 223). Before discussing divergence in membership models, it is important to clarify what is meant by “membership”. Three approaches to membership can be discerned in theories and research on teams and groups, which I characterize as formal, emergent, and identified as summarized in Table 1 and represented relative to membership model divergence in Figure 2.

Complicating our consideration of membership the different members of a team can base their membership model on any of the above conceptualizations, according to stable differences (e.g. considering formal membership to be the most important) or more transient ones (e.g. how long in the team). Compounding the problem an individual’s definition of membership may vary both over time and across situations (e.g. Smith et al. 2012). For example, one might define one’s team on the basis of the official roster at the time of launch, but rely more on an emergent pattern of relationships as the team works together over time. Similarly, one might rely on formal membership when considering employee appraisals, but informal membership when seeking advice. With the exception of studies limited to one approach (e.g. studies of informal networks), existing research typically takes membership as a given, rarely questioning its basis. Indeed, team members themselves typically take membership models at face value even if they have different bases. For the purposes of this study I consider all three approaches as valid bases for attributing membership and the effects of misalignment of membership models are construed irrespective of the conceptual bases of those models.
What is membership model divergence and why does it matter?

I equate membership model divergence with *intra-team variance in membership models*, irrespective of the basis of membership. To put it another way, it refers to the extent to which the members of a team hold different mental models of who is (and who is not) a team member. A mental model has been defined as a “psychological representation of the environment and its expected behavior” (Holyoak 1984 p. 193). Mental models may may be composed of diverse elements, including, but not limited to, people, places, physical artifacts, relationships, interpersonal dynamics, social norms and events. Irrespective of the content, individuals use such representations to interpret events, as well as to predict future behavior and states, and to guide their actions (Rouse and Morris 1986; Walsh 1995).

When mental models are shared across the members of a team, it is easier for members to implicitly coordinate their behavior and actions, ultimately enhancing performance (Cannon-Bowers and Salas 1990; Cannon-Bowers et al. 1993)(DeChurch and Mesmer-Magnus 2010a, b). Variance in a team’s mental models can be a source of confusion, misunderstandings, and conflict as a result of differing interpretations of information and events (Rouse et al. 1992). Moreover, such variance yields coordination costs as well, as members must devote considerable time and effort to explicitly communicate and align variant models. This led Mohammed et al to argue that “both team successes and failures speak to the necessity of members being ‘on the same page’ with respect to what tasks to perform and with whom to coordinate actions.” (2010 p. 877), and concluded that “empirical studies have consistently shown [team mental models] to be of substantial benefit to both team processes and performance” (2010: p. 878).

Variance in membership models have practical and theoretical consequences that go beyond those of variance in other mental models. These effects, discussed in detail below, arise for the following...
Constructing the team

reasons: 1) Team membership is typically taken for granted and membership model divergence is difficult to observe; 2) Membership models have second-order effects on other team mental models; and 3) Membership models are uniquely tied to the members’ definition and understanding of the team itself.

First, while many aspects of a team may be hard to discern, open to interpretation, or dynamic (e.g. interpersonal dynamics), scholars and practitioners typically consider membership to be easily accessible, unambiguous and commonly-held (Diehl 1990), making it less likely that scholars and team members question or seek clarification about team membership than for other factors that may be a focus for the team’s other mental models. This ‘assumption of agreement’ is embedded in social psychology theories built around a sense of entitativity (Brewer and Harasty 1996). And in many cases, divergence is empirically obscured or eliminated through study design, as, for example, in Ancona and Caldwell’s often-cited work on boundary spanning (Ancona and Caldwell 1992a, b), in which the researchers provided teams with membership lists and told subjects to answer with respect to those lists. In evidence of this, in both theory and research on sharedness of mental models, one of the few factors not examined is the team members’ model of the team itself.

Rendering the recognition and effects of membership model divergence more complex and difficult to observe it sits at the intersection of the three perspectives on membership outlined earlier. As indicated, individuals can rely on all three when creating their models – they may do so based on, who is officially named as a member of the team, whom he or she thinks of as characterizing the team, and with whom he or she interacts with most for team-related tasks. Membership model divergence occurs when two or more of these approaches to membership fail to yield a shared. Therefore, to the extent that scholars approach membership exclusively from one of the three perspectives, they are less likely to recognize membership model divergence and its effects.

Second, whereas membership model divergence may directly impact coordination and understanding (as would any unshared mental model), it has a second level of effects through the same underlying mechanism, since membership models serve to define the team for the formation of other mental models. Individuals look to those around them to learn about their team (Bettenhausen and
Constructing the team

Murnighan 1985) and as noted by Hackman, team boundaries frequently delineate the “social universe” (1992 p. 201) that members use as a reference. Hence alignment in a team’s membership models will impact whether its other mental models are shared. Membership model divergence should therefore be conceptually and empirically accounted for not only in research on shared mental models, but in practice – given the negative effects of unshared mental models. A team may experience conflict when members try to divide the workload fairly, for example, due to differing models of who and how many people are members (first-order effects), as well as second-order effects from conflicting behavioral norms resulting from members looking to different sets of colleagues (reflecting their different mental models) as a reference.

Third, since membership models capture who is and who is not in a team, they shape the definition of the team itself, and therefore whether team members view the team as a coherent, entitative unit (Brewer and Harasty 1996; Hamilton et al. 1998; Lickel et al. 2000). This calls into question the applicability of social psychology theories based on the notion that recognized membership in such groups has a psychological impact (beyond its role in delineating social context) (Hogg and Terry 2000). Research has shown that membership affects individuals’ self-conceptions (Abrams and Hogg 2003), attitudes (Terry et al. 1999), beliefs (Chen and Kenrick 2002) and behaviors (Moreland 1985), as well as team-level factors including structure (Arrow and McGrath 1995) and both intra- (Chatman et al. 1998) and inter-team dynamics (Tajfel and Turner 1986). The applicability of these theories and the strength of their effects may vary significantly as a result of membership model divergence, implying that it is an important mediator to control for both theoretically and empirically. In practice, it may affect team dynamics not simply through its effect on mental models, but by shaping how a team thinks about itself. For example, a team with divergent membership models may feel fragmented and therefore less of a single coherent entity, prompting members to identify less with their teammates. Both theory and practice, therefore, should take account of membership model divergence given membership’s unique characteristics: its taken-for-grantedness, its second-order effects, and its link with team definition.
What are the mechanisms leading to membership model divergence?

Team members create mental models to represent their understanding of the environment as experienced through interaction with teammates (Marks et al. 2001). Variation in a team’s membership models can arise at either of two points in the classic input-process-output chain: first, members may create models using differing information as input; second, they may process that information differently (see Figure 2 for a representation of the input-process-output model of membership model divergence).

Starting with input, I posit that a team’s membership models are more likely to diverge to the extent that they are based on different initial information. This information is determined by factors such as team design (e.g. team size, geographic distribution, concurrently working on multiple teams); task design (e.g. workflow, interdependencies); work process (e.g. time spent on the team’s task, level and type of interaction); and environmental factors (e.g. information overload). For example, within a geographically dispersed team one may expect member experiences to vary across sites, yielding different models of who is (and is not) in the team. In turn, team members vary in their interpretation of that information. The interpretation process is affected by factors such as differences in cognitive constraints (e.g. information processing limits, recall error, or cognitive biases); cognitive framing (e.g. decision criteria, temporal bounding); personality traits and mental states (optimism, arousal, motivation); and interpersonal dynamics (e.g. norms, cohesion, affect). For example, their differing information-processing capacities will determine how much of the available information they incorporate in their decisions. Under interpretation I also include ‘intentionality’ – a team’s members may set different boundaries to facilitate or inhibit access to its resources, for example, whether a particular individual deserves to be considered a team member. Some may exclude that individual as a way of withholding the prestige of being associated with the team. While intentionality could arguably be considered a separate mechanism...
Constructing the team

in parallel with differences in information and interpretation, it is modeled here as part of the process of interpretation of the information available to team members.

**Why is membership model divergence increasing, and in what contexts?**

While these two mechanisms suggest that there is a potential for membership model disagreement in any team, scholars have found relatively little evidence of it to date. Recent changes in the nature of collaboration, however, may be increasing the likelihood of membership model disagreement occurring, and ultimately prevailing.

In traditional teams – characterized by co-present, stable and exclusive membership – individuals spent their time collaborating with the same teammates, thereby establishing considerable common ground, which in turn served as the basis of the mental models they forged. Models of the team were built around a set of shared experiences. Over time, numerous shifts – towards more globally distributed work (Martins et al. 2004), the fluid creation, redesign and disbanding of teams (Thiry and Deguire 2007), and concurrent multiple team membership (O'Leary et al. 2011) – have created a more complex and dynamic context (Mortensen 2011). These phenomena increase the likelihood of membership model divergence arising from the first mechanisms since they increase variation in the information used as input to create membership models.

As a result of globalization, teams are increasingly dispersed across substantial distances. Such distributed teams require team members to collaborate with colleagues in different physical locations, time zones, cultures, languages and configurations (for discussions of these dimensions see: Gibson and Gibbs 2006; O'Leary and Cummings 2007). Dispersed team members’ experiences are themselves widely divergent as collaborators are embedded in very different contexts. Given the rapid pace of change, growing product complexity, and a greater need for customer-focused innovation, organizations increasingly rely on project-based teams that are assembled to work on specific short-term projects and

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2 Within the extant literature, the terms “global”, “virtual”, “dispersed”, “distributed”, and “far-flung” have all been used to describe the same basic phenomenon.
Constructing the team

disbanded upon completion (Brown and Duguid 2001; Hobday 2000; Prencipe and Tell 2001). The inconstant nature of such work has been characterized as “short-term and fluid” (Prencipe and Tell 2001) and as “self-contained, complex and temporary” (Grabher 2002), involving specialized employees organized around “short-term project objectives” (Lindkvist 2004). It requires that individuals frequently switch context upon completion of each project, although not all team members start and end their work at the same time, entering and leaving as their particular expertise is needed. Moreover, as project teams are designed to leverage employees’ differentiated skills (Lindkvist 2004), those with unique skills increasingly find their time divided across multiple teams (e.g., Hobday 2000). The overlap between any two teams can range from ‘none’ to ‘complete’, and shift over time as different projects manifest different temporal rhythms, such that an individual may be an active member of a given project at certain times and have little interaction with it at others (for a discussion see O’Leary et al. 2011).

In this increasingly common context, individuals spend less time in each team, enter/exit the team at different times, and may only dedicate a portion of their available hours to that team. Hence the amount of time collaborators have to work together – creating shared experiences likely to yield convergent definitions of the team itself – is shrinking. Scholars of distributed work have observed these within the domain of dispersed teams, identifying a “mutual knowledge problem” (the lack of shared information) as a major impediment to distributed team functioning (Cramton 2001). Similarly, scholars of project-based work have found that fast-moving project-based teams have difficulty establishing a shared understanding and common knowledge base (Lindkvist 2004). As such forms of collaboration become more widespread, membership model divergence is more likely to occur, particularly in contexts that rely heavily on dispersed, dynamic and overlapping teams.

In summation, I argue that 1) shared team mental models are powerful drivers of behavior in team environments; 2) divergence in membership models is likely to have effects above and beyond that of unshared models of other aspects of the team; 3) membership models diverge either as a result of differing input or of differing processing of that input; and 4) changes in the nature of work are widening
Constructing the team

the variety of member experiences, increasing the likelihood that their models of the team will diverge though the first mechanism (input variation).

In the following sections I present hypotheses and analyses to test this model of membership model divergence, its antecedents and effects. As it is beyond the scope of this study to test all mechanisms and drivers, I focus on a set of factors directly related to the trend towards dispersed, overlapping and fluid collaborations. As a first step I explore how such factors increase membership model divergence by amplifying input variation, and its subsequent effects on team outcomes. Rather than being an exhaustive testing of antecedents, I seek to determine if these factors are indeed drivers of membership model disagreement. The effects of other drivers of membership model input variation and factors affecting members’ input processing are worthy of future investigation, and should be pursued (irrespective of which is the strongest driver) since it is seemingly obvious to both scholars and practitioners “who is in the team” – that is, they assume agreement on this point.

HYPOTHESES

To understand the factors leading to variation in the information team members use to establish their mental models of membership, it is important to consider both their initial design (Hackman 1987) as well as the processes that emerge dynamically (Ilgen et al. 2005; Marks et al. 2001) as a team interacts to complete its task. I therefore categorize the antecedents in my model into two groups: proximate drivers, that is, emergent states and processes which directly increase or decrease information variation, and underlying conditions, that is, the initial characteristics of the team that give rise to the proximate drivers, thereby indirectly affecting membership model divergence. I similarly categorize the effects of membership model divergence into proximate effects, that is, emergent states and processes which are affected by membership model divergence – and, ultimately, outcomes. The relationships between the specific drivers and effects of membership model disagreement hypothesized in this study are presented in Figure 3 and discussed as Hypotheses 1 through 3.
Proximate drivers of membership model divergence

The proximate drivers relating to membership model divergence operate through the two mechanisms outlined above – the information used by members to create their membership models, and their interpretation of that information. I focus on two factors that may lead a team’s membership models to diverge: the amount of time spent by members with the team, and differences in members’ experiences of working together.

Time dedicated to the team will be negatively related to membership model divergence

It is widely acknowledged that employees are forced to divide their focus and time across an ever-increasing number of tasks and work structures (Perlow 1999); indeed some scholars have moved to a view of the organization as existing to channel members’ attention towards some activities and away from others (Ocasio 1997). Time allocation is a critical structural determinant of the attention a team’s members can and do pay to it (Cummings and Haas 2011), thereby shaping the information they can access when constructing their membership models. As noted by O’Leary and colleagues (2011), the less time team members dedicate to a given team, the less time they have to interact with its members and share experiences which form the basis of membership models. Compounding this, the less time members dedicate to the team itself, the less likely they are to share in any one experience, as the time one member dedicates to the team may not align with that dedicated by another (O'Leary et al. 2011). Both situations have the same net effect: fewer opportunities to interact and share experiences that have been shown to predict the ‘sharedness’ of team mental models (Smith-Jentsch et al. 2005). Hence,

Hypothesis 1a: The smaller the portion of their time that a team’s members dedicate to the team, the more its membership models will diverge.
Constructing the team

The amount of interaction within a team will be negatively related to membership model divergence.

Interaction with others is a key source of information used by members to socially construct their understanding of the environment (Berger and Luckmann 1966), including their understanding of the team. This underlies Lickel and colleagues’ finding that the amount of interaction time is central to the way individuals characterize their team (2000), and to its sense of group entitativity (2001). The amount of interaction is likely to affect membership model divergence through both the mechanisms outlined: information and interpretation. The more a team interacts, the more opportunities its members have to share information and establish a common body of knowledge about the team itself, not least because individuals are biased towards sharing information that is already commonly held (Stasser and Titus 1985). The more a team interacts, the more opportunities it has to share models of the team, providing consistent data for membership models to converge.

Beyond a source of information, interaction is itself a shared experience. The more a team interacts, the more its membership models will be based on shared experience, which is used for membership decisions as well as to shape team members’ interpretation of that information. These arguments underlie Rentsch and Klimoski’s claim that the more a team’s members interact, the more likely it is that they will develop shared understandings (2001).

Hypothesis 1b: The more a team interacts, the less membership model divergence it will exhibit.

Variance in the patterns of interaction within a team will be positively related to membership model divergence

As a corollary to the above argument, it is important to recognize that interaction is not likely to be uniform as not all interactions include all team members. Indeed, to the extent that members vary in their interaction patterns, the information they hold is likely to vary, as is the set of experiences that affects their interpretation of that information.

Early work on intra-group communication (Bavelas 1950) found patterns of interaction differed dramatically within teams, ultimately affecting team outcomes. These findings have been reinforced by
Constructing the team

research on social networks (e.g., Sparrowe et al. 2001), and more recently on virtual and distributed teams (e.g., Wiesenfeld et al. 1999). Given that mental schema are built incrementally through repeated interactions (Fiske and Linville 1980), to the extent that they differ we would expect the resulting mental models to differ as well. Take, for example, the case of Abe, Betty, Chris, Denise, and Emilio. If Abe interacts with Betty and Chris daily, but not Denise and Emilio, and conversely Emilio interacts primarily with Denise and Chris, but not with Abe and Betty, we would expect Abe and Emilio’s experiences within the team – and consequently their models of it – to differ. Expanding this, the more variation there is in the patterns of interaction within a team, the more variance in their experiences, echoing recent work on collective intelligence which found that teams in which some members dominated discussions were less collectively intelligent (Woolley et al. 2010). Thus variance in a team’s interaction patterns should be positively related to membership model divergence.

Hypothesis 1c: The more variance there is in the patterns of interaction within a team, the more membership models will diverge.

Underlying conditions leading to membership model disagreement

The proximate drivers of membership model divergence outlined above are dynamic properties that emerge as a result of the team’s ongoing interaction. Underlying such properties are a series of more persistent, structurally-based characteristics which stem primarily from the design of the team, such as overlap with other teams in the form of multiple team membership, geographic distribution of members, and team size.

Multiple Team Membership will be negatively related to the time dedicated to the focal team

Research by Zika-Viktorsson et al. (2006) found that organizations increasingly assigned employees to work concurrently on multiple teams. At the same time, scholars have begun to explore the relationships between multiple team membership and factors like attention (Leroy and Sproull 2004), distribution (Cummings and Haas 2011), effectiveness (Mortensen et al. 2007), technology (Bertolotti et al. 2012), and ultimately learning and productivity (O’Leary et al. 2011). These studies consistently noted that in multiple team membership, members had to divide their time between the teams of which they
Constructing the team

were members. As noted by Cummings and Haas (2011), time allocation across multiple teams is a structural feature of team design that fundamentally shapes the focus of members’ attention to the team. In short, to the extent members are shared with other teams, they will dedicate less of their time to the focal team. As outlined earlier, this limits opportunities for interaction within the team, thereby reducing the shared experience essential to align members’ membership models.

Hypothesis 2a: When a team’s membership overlaps with other teams, the less time its members will spend on the focal team (thereby increasing membership model divergence within the team).

Geographic distribution will be negatively related to time dedicated to the focal team

As a result of globalization and technological advances, geographically distributed teams are becoming more prevalent, allowing organizations to leverage dispersed resources, reduce costs and be more responsive to market changes (Gibson and Cohen 2003; Malhotra et al. 2001; Townsend et al. 1998, Cummings, 2004 #1415, Gray, 2004 #12869). This affects not only a team’s composition, interpersonal dynamics and work structure, but also influences the amount of time that its members devote to it. Research by Cummings and Haas (2011), for example, found that geographically distributed teams were more likely to have “high-demand” members, who in turn dedicated less time to the team task. Research on visibility in distributed teams found that it was difficult to keep dispersed team members and tasks in mind (Hinds and Bailey 2003), increasing the likelihood of members being “over-assigned” in terms of numbers of tasks. Similarly, other research found a lower volume of spontaneous interaction in distributed teams (Hinds and Mortensen 2005), reducing the opportunity for unplanned task-related work. Furthermore, distribution increases the competing demands on a team’s members through the proximity of local colleagues seeking to pull their attention away from the focal team (Armstrong and Cole 2002). Similar arguments underlie Barkema et al.’s claim that knowledge-intensive teams are less likely to work together full time on a single team in the same location (Barkema et al. 2002). Thus we posit that geographic distribution will reduce the time a team’s members dedicate to it.

Hypothesis 2b: The more geographically dispersed a team is, the less time its members
Constructing the team

will spend on it (thereby increasing the amount of mental model divergence the team will exhibit).

Geographic distribution will be positively related to variance in a team’s interaction patterns

Research on geographically distributed teams has found that the structure of the team itself affects the emergent dynamics within it. Structural subgroups, imbalance, and the presence of geographic isolates shape both affective and cognitive characteristics of teams (O’Leary and Mortensen 2010). A team’s structure, however, does not impact all members in the same way since geographically distributed teams are rarely fully distributed (i.e. every member is a geographic isolate). More commonly, distributed teams consist of some combination of collocated subgroups and isolates. Given that spontaneous interaction is rarer in distributed than collocated teams (Hinds and Mortensen 2005), members have more opportunity to interact with collocated teammates than those at other sites. These frequent face-to-face interactions with local colleagues are also richer than mediated interactions with distant teammates (Daft and Lengel 1986). This was borne out in Panteli and Davison’s (2005) study of geographically distributed teams, which found that geographic subgroups were one of the most powerful direct shapers of interaction patterns, with team members communicating significantly more with their collocated teammates. Thus distributed teams are likely to exhibit greater variance in members’ interaction patterns than teams that are collocated.

Hypothesis 2c: The more geographically dispersed a team is, the more variance there will be in the interaction patterns of its members (thereby increasing membership model divergence within the team).

Team size will be positively related to variance in a team’s interaction patterns

Team size also affects the variance in a team’s interaction patterns, through two mechanisms. First, combinatorially, larger teams have more other members with whom a given team member may interact. For example, in a four-person team, six potential dyadic interactions can occur, while in a six-person team there are fourteen potential interactions. Knowing nothing about the drivers shaping team members’ interaction choices, this means that more variation in interaction patterns is possible within
Constructing the team

larger teams. This is related to the argument that larger teams have greater potential for dissimilarity because they include more members who themselves may be distinct (e.g. Smith et al. 1994; Wiersema and Bantel 1992). Second, beyond increasing the possible complexity of interaction patterns within a team, team size also increases the number of team members whose interaction patterns may differ. These mechanisms underpin the argument that team size is negatively related to the development of a shared team mental model (Cannon-Bowers et al. 1993; Klimoski and Mohammed 1994; Rentsch and Hall 1994). As noted by Rentsch and Klimoski (2001), the argument uses size as a proxy for opportunities for team member interaction.

Hypothesis 2d: The larger the team, the more variance there will be in the interaction patterns of its members (thereby increasing the membership model divergence within the team).

Team size will be negatively related to the amount of interaction within a team

In larger teams, interaction is diffused across more potential targets, thereby reducing the amount of interaction each team member engages in. Research on intra-team communication has repeatedly found that as team size increases, the evenness of communication within that team declines as a smaller and smaller proportion of members dominate the discussion (Shaw et al. 1981). Thus, as teams grow in size, the amount of communication between any given members will be reduced. Furthermore, research on social loafing suggests that the larger a team gets, the less its members contribute due to a reduced sense of engagement and motivation (Latane et al. 1979).

Hypothesis 2e: The larger a team is, the less interaction there will be among its members (thereby increasing the mental model divergence the team will exhibit).

Proximate Effects and Outcomes

Like that proximate drivers and underlying conditions of membership model divergence, I posit that it has both proximate effects and more distant outcomes.
Constructing the team

Membership model divergence will be negatively related to performance through effectiveness of transactive memory

Research on mental models has found that the convergence of team mental models is positively related to effectiveness of coordination (Marks et al. 2002). Mathieu and colleagues found shared team mental models were indirectly linked to performance, operating through team processes (Mathieu et al. 2000). In line with these findings, I suggest that membership model divergence will have a negative effect on a team’s performance by reducing the effectiveness of its transactive memory system.

Effective transactive memory systems coordinate content knowledge as well as meta-knowledge about the location of expertise within a group (Wegner et al. 1991). They allow team members to categorize, store and retrieve information in a way that maximizes a team’s breadth and depth of knowledge while minimizing redundancy and recall effort (Hollingshead 2001). Effective transactive memory systems are characterized by: knowledge specialization (i.e., the differentiation of knowledge across members), knowledge coordination (i.e., awareness of who has what knowledge and how to access it), and knowledge credibility (i.e., trust in the knowledge held by other members) (Liang et al. 1995).

Prior research has established transactive memory as a predictor of team performance (Lewis 2004). Effective transactive memory systems boost performance by reducing the time and effort wasted on coordination miscues, searches for external knowledge and assistance, and misuse of available knowledge (Austin 2003). Knowledge of member skill-sets and expertise also enables teams to approach problems more flexibly (Moreland et al. 1996), thereby allowing for more novel solutions. An effective transactive memory system allows a team to efficiently manage the knowledge held by its members.

Conversely, in cases where members base their actions on different models of team membership, there is an increased likelihood of unintentional redundancies or gaps in information transfer. Moreover, when new information must be assimilated into the team’s body of knowledge, differing membership models may result in confusion over who is responsible for attending to and integrating knowledge within a particular domain, allowing some information to fall through the cracks. When the team needs to retrieve knowledge, membership model divergence may lead to confusion over whose expertise is most
Constructing the team

relevant. Breakdowns in either information storage or retrieval that arise from divergent membership
models may be interpreted as failures by certain members to fulfill their responsibilities and undermine
their credibility as perceived by their teammates – another key driver of transactive memory
effectiveness. The link between transactive memory effectiveness and performance implies an indirect
effect of membership model divergence on performance operating through transactive memory in line
with prior research that found that disagreement over team boundaries had a negative effect on expertise
identification and allocation (Mortensen and Hinds 2002).

Hypothesis 3a: The more membership model divergence a team exhibits, the poorer it
will perform.

Hypothesis 3b: The relationship between a team’s membership model divergence and
performance will be mediated by the effectiveness of its transactive
memory system.

METHODS

I conducted a survey-based study of software development teams in a single division of a large,
multinational software company. The teams studied were formal, well established (not ad-hoc) and
project-based. The organization explicitly identified and named all teams in the sample (e.g., the
“Financial Module team”) and in all cases an official management-sanctioned team roster existed. That
official roster was used to bound the sample in both study phases, thereby ensuring a consistent starting
point and aligning with prior research which uses official team rosters as a baseline (e.g. Ancona and
Caldwell 1992b).

I initially contacted 443 individuals in 49 teams. Excluding teams with less than 60 percent of
members responding or with fewer than 3 respondents reduced the sample to 38 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 percent) worked as developers or in related fields (user interface design,
quality, etc.) creating, maintaining and supporting highly interdependent code; 27 percent worked as
Constructing the team

project or development managers; and the remaining 8 percent worked in marketing, as technical writers or in related fields. The mean number of teams of which each respondent was a member was 1.81. Of the 38 teams in the sample, 27 were geographically dispersed, with team members in as many as five locations. All respondents considered themselves members of the teams identified by their managers.

The survey was divided into two phases administered approximately two weeks apart, and sent to the same individuals – those identified on the official management-sanctioned team roster. Phase 1 was used to collect data on team member demographics and membership models, and phase 2 to gather data on respondents’ perceptions of the team and their teammates (all antecedents, effects, and controls in the tested model). Both surveys were tailored to each recipient such that all questions explicitly identified the team as defined by the team manager. For example, all members of the Alpha team received surveys with cues of the type “How long have you been a member of the Alpha team?” The sample surveyed in phase 2 was identical to that of phase 1.

Measures

Membership Model Divergence

To capture participants’ assessments of team membership, phase 1 survey respondents were provided with a list of team members according to their team manager and asked: “Please indicate which of the following individuals you consider to be a current member of the XXX Team”. Phase 2 survey respondents were provided with a similar list and told: “We realize that your perception of the team may differ somewhat from this list. Please take a moment to identify which individuals from the following list you would consider to be members of the XXX Team and which you would not”. In both cases, respondents were able to both add and remove names from the provided lists. Based on these questions, I created three measures of team membership reflecting the question in survey 1, the question in survey 2, and the intersection of the two (those identified as members in both). Results for all three were comparable, thus I used the survey 1 data as the basis for the analyses in this study.

In the absence of an existing empirical measure of membership model divergence, I drew on related prior theory to create one. As noted by Mohammed et al. (2010), research on shared mental
Constructing the team

models has frequently focused on two dimensions: model similarity and model accuracy. In line with this, I created two distinct measures. The first, *inter-member membership model divergence*, captured divergence among team members’ models and is analogous to model similarity in the shared mental models literature. The second, *member-manager membership model divergence*, captured divergence between member models and the model held by the team manager, and is analogous to model accuracy. I used both inter-member and member-manager membership model divergence as indicators of a latent variable of overall membership model divergence.

To calculate the measure of *inter-member membership model divergence* (IM-MMD), I made a pairwise comparison between each pair of respondents within a team as to whether they agreed or disagreed on the membership of each other person identified on their manager’s list of team members. I coded the agreement of each pair of respondents within a team regarding each potential member identified by either respondent: 0 if the respondents agreed on the target’s membership (either both included or both excluded) and 1 if they disagreed (one respondent included the target while the other did not). The total number of disagreements between each pair of respondents was then divided by the total number of unique individuals referenced by that pair, yielding a percentage of disagreement.

\[
\text{IM-MMD}_{ij} = \frac{\sum_{i \neq j} \left[ 1 \text{ if } A_{it} \neq A_{jt}, 0 \text{ if } A_{it} = A_{jt} \right]}{\text{number of members in } T}.
\]

I used the mean of all pairs of respondents as the team-level measure of inter-member membership model divergence. To calculate the measure of *member-manager membership model divergence* (MM-MMD) I used the same procedure, comparing each respondent’s membership attributions against those of his or her manager. Figure 4 provides a graphical representation of a hypothetical team and the membership model divergence calculations based on it.

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Constructing the team

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Insert Figure 4 about here

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Taking Figure 4 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] targets referenced, yielding a percentage of disagreement of 2/5 = .40. Similarly, A and C disagree upon 1 of 4, and B and C on 3 of 5, yielding scores of .25 and .60 respectively. The mean disagreement scores of [A:B, A:C, B:C] yield an inter-member membership disagreement (IM-MMD) score of .42. Following a similar approach, A and the team manager disagree upon one [D] out of a total of four [A,B,C,D] targets referenced (1/4); similarly, B disagrees with the manager on 1 of 4 targets, and C disagrees with the manager on 2 of 4, yielding scores of .25, .25, and .0 respectively, and a member-manager membership disagreement (MM-MMD) score of .33.

Proximate drivers

Average time dedicated to focal team. To assess the portion of time a team’s members dedicated to the team’s task, I asked respondents to report the percentage of time dedicated to the team in question. The team level mean was used as a measure of team time commitment to the focal team.

Interaction mean and variance. I created measures of interpersonal interaction using respondents’ self-report data on how frequently they interacted with each member of their team, either face-to-face or mediated by email, phone, voicemail, videoconference, teleconference, instant messenger, fax, or paper documents. I calculated mean levels of interaction within each team and used these as measures of average intra-team interaction. I calculated the Euclidean distance between each pair of team members based on their pattern of interaction with all other team members. I then used the mean of those Euclidean distance scores as a measure of intra-team interaction heterogeneity.\(^4\)

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\(^4\) I conducted Kolmogorov-Smirnov tests to assess normality and found that average interaction was non-normal (\(z = 2.03, p<.01\)). The natural log yielded a more normal distribution which passed the test of normality (\(z = .70, p>.20\)) but did not affect
Constructing the team

**Underlying conditions**

**Multiple Team Membership.** To capture the extent to which a team’s members were simultaneously members of other teams in the organization, I asked respondents to report the number of other teams of which they were currently members. I used the team-level mean of their responses as a measure of the extent of multiple team membership in the focal team.

**Geographic distribution.** To capture teams’ geographic distribution, I asked respondents to report their primary work location. I used this self-report data to generate measures of the five dimensions of distribution (spatial, temporal, site, isolation, and imbalance) outlined in O’Leary and Cummings (2007) as well as a dichotomous measure of distribution. I tested alternative structural equation models based on each of these measures of distance and found that the dichotomous measure of geographic distribution resulted in a model that was the best fit for the data. I therefore used the dichotomous measure of distribution in the reported analyses.

**Team size.** To capture team size, I compared two measures: the number of unique individual identified by the team manager, and the number of unique individuals identified by survey respondents. The two measures of team size were highly correlated ($r = .65 \ p < .01$), and including either in the structural equation model yielded a similar pattern of results. Thus I used the count of individuals identified by team members as it most closely matched the number of potential members being considered when respondents were completing the survey.

**Proximate effects and Outcomes**

**Transactive memory effectiveness.** I measured transactive memory effectiveness using Lewis’s (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

the pattern of relationships. The transformed variable was used in all subsequent analyses.
Constructing the team

reliable (α = .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 (ICC₁ = .21, ICC₂ = .80, rwg = .96).

**Performance.** To measure performance, I used member ratings of performance on seven dimensions (efficiency, quality, adherence to schedule/budget, work excellence, meeting customer/client needs, contributing something of value to the company, and technical innovation) relative to all other teams with which they had experience (Ancona and Caldwell 1992a). The mean of respondents’ ratings yielded a reliable estimate (α = .79) of performance. However, a factor analysis suggested that the measure of technical innovation did not load with the other factors; removing it produced a measure of performance that was more reliable (α = .83). The measure without technical innovation was therefore used in the reported analyses. However, running the reported models using the performance measure with all seven items yielded a similar pattern of results and significance. To validate the accuracy of team member ratings, a sub-sample of team managers was asked the same question regarding the teams they managed. Manager ratings had similar reliability (α = .85), were significantly positively correlated to member ratings (r = .63, p < .01), and yielded similar patterns of correlation with other measures. However, given the small number of manager ratings, I used member ratings to assess performance.

**Controls**

**Identification.** Given the extensive literature on identification within teams and its sources and effects, we have reason to expect identification will co-vary with membership model divergence. To the extent that individuals hold differing models of who is in the team, they are likely to identify with different sets of people, thereby reducing shared identification – and vice versa. Therefore, in addition to the hypothesized constructs outlined above, I also included level of identification as a control in my model. I measured identification with the team using 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.
Constructing the team

(1 = “not at all characteristic,” 5 = “very characteristic”). The mean of the 13 items formed a reliable ($\alpha = .80$) score of how strongly the individual identified with the team, and inter-rater reliability scores indicated that combining them into a team-level measure of identification was justified given inter-class correlation coefficients (sample-wide, mean by team) of ($\text{ICC}_1 = .30$, $\text{ICC}_2 = .70$, $r_{wg} = .92$).

RESULTS

To test the relationships proposed in my model, I used structural equation modeling (SEM) with maximum likelihood estimation to analyze the saturated measurement model, the structural model corresponding to the full set of hypotheses, and the individual hypotheses.

Membership model divergence existed in 28 (72 percent) of the 38 teams in the sample, with a mean of .69 (s.d. = .52, values ranging from 0 to 1.68, see

<table>
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<tr>
<th></th>
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<th>Who attributes membership and through what mechanism?</th>
<th>Where is this conceptualization found?</th>
</tr>
</thead>
<tbody>
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<td>People included in “official” organizationally-provided team roster</td>
<td>How the organization defines the team</td>
<td>Organization (or representative thereof) through formal assignment</td>
<td>Organizational behavior research on groups and teams in the field (e.g. Barker 1993) and laboratory experiments (e.g. Wittenbaum et al. 1996)</td>
</tr>
<tr>
<td><strong>Identified</strong></td>
<td>People who self-identify as team members</td>
<td>How individuals think of and categorize themselves</td>
<td>Self (sometimes also validated by peers) through individual attribution</td>
<td>Social psychological research based in identification (e.g. Hogg 2001; Tajfel and Turner 1986)</td>
</tr>
<tr>
<td><strong>Emergent</strong></td>
<td>People whose patterns of relation- ships identify them as a team</td>
<td>Naturally occurring groups that may or may not be recognized</td>
<td>Network (as shaped by actors) through pattern emergence</td>
<td>Social network research on cliques (e.g. Falzon 2000) and informal organizational structures (e.g. Krackhardt 1994)</td>
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Constructing the team

Table 2 for descriptive statistics and correlations). Within teams experiencing membership model divergence the mean was .93 (s.d. = .36), thereby providing evidence of the existence of naturally occurring membership model divergence.

<table>
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5 All values reported in tables refer to the arcsin transformed measure. Values for the untransformed measure were: mean = .16, s.d. = .16, range from 0 to .55. Within teams experiencing membership model divergence, mean (untransformed) membership model divergence was .22 (s.d. = .14). The correlation between the transformed and untransformed measures was .96.
I assessed model fit using several statistics. I used the Chi-square test that assesses the goodness of fit between the reproduced and observed correlation matrices. The non-significant Chi-square $\chi^2(41) = 46.14, p = .27$ here indicated that the difference between the model in this study and the data is not significant (see Figure 5). Because the Chi-square test is highly sensitive to sample size, I also used three other widely used goodness-of-fit criteria that are not sensitive to sample size (Bentler and Bonett 1980): Incremental Fit Index (IFI) and Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI). These indices have expected values of 1.00 when the hypothesized model is true, and a value of .90 or higher suggests an adequate fit (Bentler and Bonett 1980). The values for all three within the saturated model indicated an excellent fit (IFI = .96, TLI = .94, and CFI = .96). Finally, I used the Root Mean Squared Error of Approximation (RMSEA), which is an estimate of the discrepancy between the original and reproduced covariance matrices in the population. A RMSEA of .08 or lower represents a reasonable fit and .05 or lower represents a good fit (Browne and Cudeck 1993); My saturated model yielded a RMSEA value of .06.

I tested three hypotheses predicting the proximate drivers of membership model divergence. Hypothesis 1a posits that the mean percentage of team members dedicated to their team will be negatively related to membership model divergence, and the model path was significant and in the expected direction ($\beta = -.30 p < .05$). Hypotheses 1b and 1c posit that membership model divergence will be negatively related to teams’ average level of interaction, but positively related to heterogeneity in that interaction. Both hypotheses were supported, with level of interaction significantly negatively related to membership model divergence ($\beta = -.51, p < .01$), and heterogeneity in interaction significantly positively related to membership model divergence ($\beta = .59, <.01$). Thus Hypotheses 1a-c are supported.

I tested five hypotheses predicting the conditions underlying the three proximate drivers of membership model divergence. Hypothesis 2a and 2b posit that multiple team membership and
Constructing the team

geographic distribution will both be negatively related to the percentage of time a team’s members spent on the team task. Both hypotheses were supported, as multiple team membership and geographic distribution were both significantly negatively related to percentage of time dedicated to the team task ($\beta = -.30, p < .05$ and $\beta = -.46, p < .01$ respectively). Hypotheses 2c and 2d posit that geographic distribution and team size will both be positively related to variance in a team’s interaction patterns. I found no significant relationship between geographic distribution and variance in a team’s interaction patterns ($\beta = .09, \text{n.s.}$), thereby failing to find support for Hypothesis 2c, but found team size was significantly positively related to team interaction pattern variance ($\beta = .39, p < .05$), supporting Hypothesis 2d. Finally, Hypothesis 2e posits that team size will also be negatively related to the mean level of interaction within a team. I found support for Hypothesis 2e, as team size was significantly negatively related to mean level of interaction ($\beta = -.37, p < .05$). Therefore Hypotheses 2a, b, d and e are supported.

Lastly, I tested two hypotheses regarding the effects of membership model divergence. Hypothesis 3a posits that membership model divergence will be negatively related to performance, and Hypothesis 3b that the relationship between membership model divergence and performance will be mediated by transactive memory effectiveness. To test Hypothesis 3a I tested an alternative model identical to that presented in Figure 5, except a direct path linking membership model divergence and performance, and no measure of transactive memory. I found this model to be a good fit for the data, and found the path linking membership model divergence and performance was significant and negative ($\beta = -.51, p < .01$), providing support for Hypothesis 3a. Introducing transactive memory into the model as a mediator resulted in significant paths between membership model divergence and transactive memory and from transactive memory to performance, while the direct path between membership model divergence was no longer significant ($\beta = -.52, p < .01; \beta = .67, p < .01$; and $\beta = -.18, \text{n.s.}$ respectively), indicating full mediation. In the interest of clarity, Figure 5 presents the model without the non-significant direct path leading from membership model divergence to performance, but with the significant paths between
Constructing the team

membership model divergence and transactive memory ($\beta = -.51$, $p < .01$) and between transactive memory and performance ($\beta = .77$, $p < .01$). Thus I find support for Hypotheses 3a and b.

DISCUSSION

In this study I provide the first systematic examination of membership model divergence, its antecedents and its effects. Occurring widely within the teams in my sample, membership model divergence was negatively related to the mean percentage of time that members spent in the team and the mean level of interaction in the team, and positively related to heterogeneity in team interaction patterns. Underlying these proximate drivers were structural characteristics of the team: multiple team membership and geographic distribution both reduced the amount of time team members dedicated to the focal team. Team size reduced overall interaction while increasing the variance within patterns of such interaction. Contrary to my hypothesis, I found no significant relationship between geographic distribution and variance in interaction patterns. This may be due to the teams in my sample having well-established norms for communication – particularly cross-site interaction. Membership model divergence was in turn negatively related to team performance as a result of reducing the effectiveness of the teams’ transactive memory systems. In all models, membership model divergence – as a latent variable – was more strongly associated with divergence between member models than between team member and team manager models, and negatively covaried with the extent to which members strongly identified with the team. These results confirm that membership model divergence, beyond simply reflecting a characteristic of the team, has a measurable effect on critical team dynamics and, ultimately, performance. Furthermore, it appears that these effects occur primarily as a result of processes well established in the literature on teams – that is, by making it more difficult for teams to coordinate their cognitive processes.

Contributions to key literatures

Beyond establishing membership model divergence as an important phenomenon in its own right, the findings here contribute to the scholarly discussion surrounding theories on teams, the changing
Constructing the team

nature of work, and on entitativity, as well as providing an important and under-explored link between social network and social psychological approaches to studying groups.

The changing nature of work and how we think about teams

Teams scholars have noted that the context of work is changing, and, with it, teams themselves (Hackman and Katz 2010). This study highlights the importance of explicitly considering the changing nature of work as not only a generalized context but as a specific driver and shaper of intra-team dynamics. Further, it has important implications for how we think about team membership and our approach to defining teams within this new context. Traditionally, membership – and teams – were viewed as clearly and objectively defined. Membership model divergence implies that members’ behaviors are strongly shaped by how they perceive the team – and that such perceptions are increasingly at variance. Beyond the difference between formal and informal groups, respondents defined their teams differently – driven by differing experiences. Yet at the same time they all considered themselves to be team members and, based on post-survey interviews, generally assumed membership to be agreed upon. These seemingly contradictory stances highlight the complex relationship between the objective definition of a team and the subjective understanding of it.

In this way, membership model divergence provides a link between the social networks approach and the social psychology approach to groups – perspectives which have typically remained distinct. Social networks research sees groups primarily as emergent features of social networks, identified on the basis of relative tie strength and density, and often treated as a emergent patterns of relationships without any connection to a goal, task or broader organizational factors. This explains the many operationalizations of groups found in the social networks literature (see, Scott 2000; Wasserman and Faust 1994). In its analysis of externally identified teams (see, for example, Cummings and Cross 2003; Reagans and Zuckerman 2001; Sparrowe et al. 2001), teams are frequently seen as a context rather than a phenomenon that affects the attitudes and behavior of members.

In contrast, social psychologists have traditionally defined groups on the basis of a psychological abstraction. In their view, a group is a collection of individuals who identify with a set of qualities or
Constructing the team

attributes which, in turn, carry meanings and a often a positive or negative valence (Abrams and Hogg 1990). Such research focuses on team members' perceptions of (and reactions to) an abstraction tied to a set of shared values, goals, beliefs and perspectives.

Membership model divergence provides a link between these two perspectives, illustrating how individuals with a shared definition of a team with respect to its purpose and abstract identity may hold very different models of its membership. This study suggests that important phenomena such as membership model divergence may exist and thrive at the intersection between these perspectives. More broadly, by recognizing that members’ models of membership are subjectively based on their experiences, and that such models shape their behavior, we may need to reassess our definition of the team, shifting to a model that incorporates both objective patterns of relationships and subjective perceptions of an entitative abstraction.

An unexplored antecedent of entitativity

The literature on entitativity asserts team members’s perceptions will be affected by the extent to which a team feels like it is an intact “entitative” unit. A significant variation in levels of entitativity across teams has been found, although it is assumed that this variation occurs even though members hold the same basic model of the team. The recognition that teams frequently do not agree on their membership is an important insight for scholars of entitativity. Though not explicitly measured in this study, it is reasonable to assume that membership model divergence is a key and unexplored antecedent of entitativity. To the extent that the members of a team differ in their models of the team itself, they are likely to perceive the team as less entitative. This points to a potential line for future research: exploring the link between individuals’ perceptions of supposedly objective structural team characteristics and their subjective relationships with those teams.

Implications for methodology

The existence of membership model divergence and the contextual changes that nurture it suggest an important methodological consideration missing from previous work. Lacking a conceptual and empirical approach to account for membership model divergence, prior research has failed to capture and
Constructing the team

interpret divergence in membership models when it has occurred. Where it has gone unmeasured or has been identified as measurement or recall error implies a significant loss of significant explanatory power, or it may have confounded effects, making it more difficult to identify and understand the phenomena with which membership model divergence is interacting. Alternatively, it may have been unintentionally eliminated (as in the case of experimental settings or field studies in which membership is explicitly delineated by researchers), yielding results that are accurate but have less generalizability and external validity.

This underlines some important methodological considerations. In cases where researchers wish to eliminate membership model divergence to avoid interactions with other phenomena, our findings show that explicit delineation of membership is a valuable step. Indeed, they suggest that to better understand membership model divergence and its interactions with other phenomena, scholars would benefit from measuring team member membership models and calculating membership model divergence as either a focal construct or control.

**Implications for practice**

Given the negative effects of membership model divergence on team processes and outcomes, it is tempting to conclude that managers and members should strive to reduce it. Before jumping to that conclusion, however, we should recognize that these negative effects may arise not from divergence itself – members holding different models of the team – but from their being unaware that their models differ. By focusing on agreement, managers are likely to seek to reduce membership model divergence, for example, by increasing member interaction and information (e.g., increasing time spent on the team or promoting communication among team members). In this way they managers might work to “clarify” membership and increase alignment around a single model (e.g., that published in team rosters or instantiated in technologies like information systems). In contrast, by focusing on awareness they are likely to encourage team members to share their differing models. This would mitigate some of the negative consequences of membership model divergence. Conversely, it might also allow teams to leverage its potential benefits, e.g. as a potential source of cognitive diversity and creativity. In addition, it
Constructing the team

might reduce the significant effort and coordination required to ensure team members continue to hold the same mental model, especially amidst fluidly shifting project-based work.

While the relative merits of an agreement vs. awareness approach deserves empirical investigation, at the very least managers and members should be aware of the existence and effects of membership model divergence. Armed with that knowledge, team members may be able to assess and discount any confusion or disagreement that could arise from members working with differing underlying perceptions of the team.

**Reflexivity and causality**

It is important to note that team members’ mental models both shape, and are shaped by, interactions in an ongoing cycle (Marks et al. 2001). In line with this, I argue that membership model divergence occurs as part of an ongoing, iterative, and reflexive cycle in which existing membership model divergence is likely to affect some of factors labeled as antecedents in the model. A team’s pattern of relationships shapes its members’ perceptions of the team, which then influences future relationships. For example, one might expect that membership model divergence might lead people to dissociate from a team and therefore choose to spend less time on it. Lacking the longitudinal data required to fully map these ongoing relationships, I identify certain factors as antecedents and others as effects to reflect the clarity and expected strength of the mechanisms linking those constructs in one direction versus another.

**Towards an overall model of membership model divergence**

In this study I introduced the concept of membership model divergence and explored its relationship to other well-studied team-level phenomena. It is intended to be a first foray into the domain. An overall model of membership model divergence will require significant additional research designed to address the scope limitations of the current research, such as testing additional factors, exploration mechanisms, examining structure and considering the effects of time.

**Additional factors**

In this study I presented proximate and underlying contributors to and results of membership model divergence. I argue that the antecedents of membership model divergence operate through two
Constructing the team

basic mechanisms affecting either: a) the information available to teams members in making membership models, or b) the process they use to interpret that information. An exhaustive model of all drivers and effects being beyond the scope of a single study, data collection and analyses are focused on team-level factors which are structural and cognitive in nature. I consider these to be most closely related to the changing nature of collaboration, and hence to the prevalence of membership model divergence as a phenomenon. Figure 6 presents a broader conceptual model of membership model divergence, including additional antecedents and effects outside the scope of this study (see Figure 6).

Other antecedents: Individual and Organizational factors

Hackman and others argue for the importance of “bracketing” phenomena by examining factors above and below the team level of analysis used here (Hackman 2003, 2009). In the case of membership model disagreement, existing theory suggests that team-level disagreement may be affected both by individual-level factors such as stable personality traits and more transitive mental states, as well as by organizational-level pressures like organizational culture.

Stable personality traits are likely to affect the information team members hold (and their interpretation of it) in forming membership models. For example, considering three of the often cited “five factor model” of personality traits (Norman 1963; Tupes and Christal 1961), we would expect individuals high on conscientiousness to pay close attention to their experiences and interactions – providing them with more information on team membership; individuals high on extraversion would interact substantially with teammates – similarly increasing the information they have available in forming their membership models; while individuals high on agreeableness would be positively inclined towards others – making their models more inclusive. To the extent that a team’s membership varies on such personality dimensions, its membership models are also likely to vary, yielding membership model divergence. Beyond stable traits, emergent individual states such as motivation and arousal are also likely
Constructing the team

to shape individuals’ membership models by affecting the effort and focus individuals apply to the
collection and interpretation of the data used to create their membership models. The more motivated or
aroused an individual team member is, the more likely it is that he/she will attend to experiences shared
with teammates, and the more effort he/she will put into the interpretation of that information. Similarly,
to the extent that motivation varies on a team, we would expect membership model divergence to occur.

Moving to the organizational level of analysis, the culture of organizations has been repeatedly
shown to affect the cognition and behavior of groups and the individuals within them (O'Reilly et al.
1991). For example, we might expect that a more open and inclusive organizational culture would prompt
team members to be more inclusive in their model of the team, thereby reducing the likelihood that
individuals will be considered team members by some but not others. Culture may also affect how
precisely people seek to model their teams. For example, organizations with a more egalitarian, less
structured culture may focus less on working within the bounds of formal teams and more on ad-hoc
helping behavior, which may lead to greater ambiguity and variance in members’ models of the team.

Other antecedents: Team-level work design

Similarly, at the level of the team, the design of the team’s work and task is likely to affect either
the team members’ information or their interpretation of it. Research on workflow and interdependence
(Van der Vegt et al. 2001; Wageman 1995; Wageman and Gordon 2005) has found that different types
(e.g. sequential vs. reciprocal vs. pooled) and patterns of interdependence shape emergent team dynamics.
As teams are created to accomplish a particular common purpose, the extent to which individuals depend
on one another to accomplish that goal is a likely indicator of their membership in that team. A similar
logic underpins social networks research that identifies cliques and groups on the basis of relative levels
of interdependence (Burt 2000; Falzon 2000).

Other correlates: Social factors

While I have hypothesized and tested a model in which identification is modeled as a negative
correlate of membership model divergence, several additional emergent social dynamics have been
Constructing the team

Posited by existing theory to both affect and be affected by membership model divergence – roles, norms, conflict and trust. These may both contribute to and result from membership model divergence.

Clear and unambiguous roles help teams to effectively communicate and coordinate their work (Hartman and Johnson 1990). Well defined and differentiated roles help to align a team’s membership models by making individuals more unique and more memorable, thereby affecting the information on which team members construct their membership models. Conversely, in teams with high membership model disagreement (Brown and Wade 1987) there may be greater confusion over role assignments. Research has consistently found that team norms shape both how team members behave (Barker 1993) and think (Boyd and Richerson 2001). In teams with strongly held norms we would anticipate greater agreement among membership models as a result of a concerted pressure to conform, affecting individuals’ interpretation of the information they have. At the same time, membership model divergence may lead to confusion about team norms, since team members typically learn these by watching the behavior of their teammates (Bettenhausen and Murnighan 1985).

Conflict, which has been studied extensively (Jehn 1995, 1997) and found to have both positive and negative effects on group performance (De Dreu and Weingart 2003), is another likely correlate of membership model divergence. When teams experience substantial conflict – particularly interpersonal – it may affect their willingness to include particular individuals in their model of the team. At the same time, as suggested in the opening vignettes, we might expect conflict to arise as a product of the confusion and miscommunication resulting from membership model disagreement.

Finally, the role of trust is well established as arising within and affecting the cognition and behavior of teams (Williams 2001). Teams high in trust may be more positively inclined towards one another, taking a more open and inclusive approach in creating their model of the team. Conversely, the potential for conflict noted above, as well as the potential failures of transactive memory hypothesized and found in this study, are likely to undermine team members’ trust in one another.
Constructing the team

*Other outcomes: Individual learning and team growth*

In this study I have found evidence of the effects of membership model divergence on a team’s output. Hackman and others, however, argue that overall team effectiveness should be assessed not only in terms of team output, but also in terms of individual team members’ learning and development, and the team’s ability to work together again in the future (Hackman 1987, 2002). Though not modeled in this study, existing research and theory gives us reason to believe that both are likely to be affected by membership model divergence. Research on learning, for example, consistently finds that variation in context and membership is a key source of new ideas (Argote 1993; Edmondson 2002). Membership model divergence means, in effect, that team members focus on differing groups of individuals as sources of information, which may in fact stimulate learning, in line with the findings of Gibson and Vermuelen who concluded that subgroups promoted learning within teams, (2003).

While this would imply that membership model divergence is beneficial for team learning, the negative social dynamics discussed earlier (e.g. increased role ambiguity and conflict, and reduced clarity of norms and trust), may make it more difficult team members experiencing substantial membership model disagreement to work together again in the future – either in the same team or recombined into different teams. Thus, though the net effect of membership model disagreement on team effectiveness remains unclear, it is likely that it differentially affects the distinct elements of team effectiveness.

These factors are provided as an illustration. Other important constructs in existing research are likely to be linked to membership model divergence. Modeling how each of these factors relates to membership model divergence remains a question for further empirical study.

*Mechanisms*

While this study is designed to focus on the antecedents and consequences of membership model disagreement, it cannot explore all the potential mechanisms that may give rise to the phenomenon. As outlined in the introduction, I posit two basic mechanisms through which membership model disagreement arises – team members base their membership models on different information, or they interpret the same information differently. Other potential causes remain important domains for further
Constructing the team

research. For example, it would be valuable to determine which such drivers are the strongest and most consistent predictors of membership model disagreement, and to investigate if and how multiple drivers interact to either reinforce or attenuate its effects. In addition to affecting the level of boundary disagreement created, the type and combination of mechanisms underlying membership model disagreement should, logically, cause different effects. For example, membership model disagreement resulting from different information should be more readily accepted and dealt with than disagreement resulting from different interpretations, as the latter reflect fundamentally different mindsets on the part of members. Further research with a focus on exploring these mechanisms therefore seems warranted.

Structure

As an initial exploration of membership model divergence, this study focuses on its most basic core aspects – if and how much it occurs. It does not examine the structure of the resultant membership models and disagreement among them. Other scholars, however, have made a strong case that different structures have substantial effects on groups (Guimerà et al. 2005; Rulke and Galaskiewicz 2000). For example, research on core/periphery structures (Borgatti and Everett 1999) found that groups frequently had certain “core” members who were well connected to the rest of the team and “peripheral” members who were less connected. In the case of membership model disagreement, particularly as we find it to be driven in part by patterns of interaction, we would expect certain individuals to be included in the membership models of most, or all, of their teammates, while others are included only in the membership models of a small subset of individuals with whom they interact significantly. Similarly, cliques of relatively highly-interconnected actors exist in most networks (Alba 1973), often leading to the formation of subgroups within teams which have significant team-level effects (Gibson and Vermuelen 2003; O’Leary and Mortensen 2010). It seems reasonable to assume that membership models form clusters within a team, with individuals including one another more within than across clusters. While not captured in the measure of membership model disagreement used here, this suggests membership model structure may also have a significant effect on team-level outcomes, meriting further study.
Constructing the team

**Time**

While almost all cross-sectional studies could benefit from a more longitudinal approach, time plays a particularly important role in the formation and effects of membership model divergence. As membership model disagreement reflects differing understanding of the team based on members’ experience, we would expect it to change over time as they spend more time working together. This does not necessarily mean that over time membership disagreement disappears. Indeed, at the time of team formation, members may all start with the same information, but over time diverge in their models due to specific repeated interactions (e.g. a subset of individuals who interact repeatedly because they share the same office or functional background). More broadly, team members’ mental models both shape, and are shaped by, interactions in an ongoing cycle (Marks et al. 2001), suggesting that membership model disagreement is dynamic, shaped by a team’s experience as well as prior membership model disagreement. Longitudinal empirical studies are needed to explore the ways in which membership model disagreement evolves over time and is either reinforced or attenuated.

**Conclusion**

Team membership has long been considered one of the most basic and powerful drivers of a team’s behavior, dynamics, and outcomes. With this study I suggest that membership may not be as clear as previously assumed. Seen against a backdrop of a shift towards more broadly scoped, fluidly shifting and structurally interdependent work, the possibility of a team’s members disagreeing on its composition cannot be ignored. By showing that membership model divergence occurs and drives important dynamics and outcomes, I seek to fill a gap in our understanding outlined by Guzzo and Dickson in their 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 p. 332). Membership model divergence thus represents an important aspect of the complex relationship between people and the teams to which they belong.
Constructing the team

REFERENCES


Constructing the team


Constructing the team


Constructing the team


Constructing the team


Constructing the team


Constructing the team


Constructing the team


Constructing the team

### Tables

**Table 1: Conceptualizations of Membership**

<table>
<thead>
<tr>
<th>How is membership defined?</th>
<th>What is the conceptual focus?</th>
<th>Who attributes membership and through what mechanism?</th>
<th>Where is this conceptualization found?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Formal</strong></td>
<td>People included in “official” organizationally-provided team roster</td>
<td>How the organization defines the team</td>
<td>Organization (or representative thereof) through formal assignment</td>
</tr>
<tr>
<td><strong>Identified</strong></td>
<td>People who self-identify as team members</td>
<td>How individuals think of and categorize themselves</td>
<td>Self (sometimes also validated by peers) through individual attribution</td>
</tr>
<tr>
<td><strong>Emergent</strong></td>
<td>People whose patterns of relation-ships identify them as a team</td>
<td>Naturally occurring groups that may or may not be recognized</td>
<td>Network (as shaped by actors) through pattern emergence</td>
</tr>
</tbody>
</table>
Constructing the team

Table 2: Descriptive statistics and correlations between key variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</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>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Inter-Member MMD</td>
<td>0.69</td>
<td>0.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Member-Manager MMD</td>
<td>0.81</td>
<td>0.53</td>
<td>0.54**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Multiple Team Membership</td>
<td>1.98</td>
<td>0.69</td>
<td>0.00</td>
<td>0.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Geographic Distribution</td>
<td>0.71</td>
<td>0.46</td>
<td>0.17</td>
<td>0.32*</td>
<td>0.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Team Size</td>
<td>16.45</td>
<td>8.83</td>
<td>0.53**</td>
<td>0.24</td>
<td>-0.11</td>
<td>0.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Time Dedicated to Team</td>
<td>78.89</td>
<td>17.18</td>
<td>-0.37*</td>
<td>-0.44**</td>
<td>-0.36*</td>
<td>-0.50**</td>
<td>-0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Interaction (Variance)</td>
<td>29.99</td>
<td>37.68</td>
<td>0.29</td>
<td>0.09</td>
<td>-0.11</td>
<td>-0.01</td>
<td>0.39*</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Interaction (Mean)</td>
<td>0.58</td>
<td>0.32</td>
<td>-0.30</td>
<td>-0.20</td>
<td>-0.10</td>
<td>-0.19</td>
<td>-0.38*</td>
<td>0.29</td>
<td>0.43**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Identification</td>
<td>3.86</td>
<td>0.42</td>
<td>-0.38*</td>
<td>-0.34*</td>
<td>-0.14</td>
<td>-0.31</td>
<td>-0.04</td>
<td>0.26</td>
<td>-0.08</td>
<td>-0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Transactive Memory</td>
<td>3.81</td>
<td>0.29</td>
<td>-0.31</td>
<td>-0.22</td>
<td>-0.10</td>
<td>-0.11</td>
<td>-0.23</td>
<td>0.16</td>
<td>-0.26</td>
<td>-0.02</td>
<td>0.59**</td>
<td></td>
</tr>
<tr>
<td>11 Performance</td>
<td>4.07</td>
<td>0.50</td>
<td>0.10</td>
<td>0.09</td>
<td>0.15</td>
<td>0.12</td>
<td>-0.16</td>
<td>0.01</td>
<td>-0.18</td>
<td>-0.04</td>
<td>0.16</td>
<td>0.35*</td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01
Constructing the team

FIGURES

Figure 1: Approaches to membership

Figure 2: Mechanisms leading to membership model divergence
Constructing the team

Figure 3: Model of Relationships

Figure 4: Membership model divergence calculation example
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Figure 5: SEM of membership model divergence

Figure 6: Conceptual Model of Membership Model Divergence