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The Team Unbound:
The Theoretical, Methodological, and
Managerial Implications of Fluid and
Multiplex Boundaries in Teams

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Working paper

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ABSTRACT

The dynamism, competitiveness, and scope of work forces organizations to utilize teams with boundaries that are both fluid and multiplex – traits which are frequently not reflected in the way in which we characterize teams in our thinking and theorizing. I explore a critical difference between these two characterizations of teams: their boundedness. I suggest that to address the issues that arise when theories based on well-bounded teams are applied to unbounded- or weakly-bounded teams, we would benefit from considering boundedness not as a definitional element of the team, but as a dimension along which teams can and often do vary. Importantly, this implies three shifts in our thinking: from approaching and differentiating teams on the basis of their membership to doing so on the basis of their task, from viewing teams as stable entities to viewing them as states in an ongoing process, and from viewing them as self-contained to viewing them as inextricably linked to the broader social system in which they are situated. I discuss the benefits and costs of changing how we think about teams, compare this proposed shift with other approaches to rethinking the construct of “team,” and provide guidelines for making this transition.

INTRODUCTION

To accomplish the majority of tasks faced by today's organizations requires the collaborative efforts of multiple individuals and one of the most widely used approaches to such collaborations is the organizational team, defined widely as *a bounded and stable set of individuals, working interdependently to complete a common goal* (Alderfer 1977; Cohen and Bailey 1997; Guzzo and Dickson 1996; Hackman 1987; Sundstrom et al. 1990). This understanding of the team is central to the way practitioners and scholars think about, design, implement, and study collaborations within organizations.

A central element of the definition above is the notion of boundedness – the idea that a team's boundaries clearly delineate members from non-members (Hackman 1987, 2002; Sundstrom et al. 1990)¹. In reality, however, team boundaries are often fluid – with members changing in response to shifts in their environment – as well as multiplex – with multiple salient but nonaligned sets of members spread across different contexts. While addressing the practical needs of organizations in today's post-bureaucratic global economy, boundary fluidity and multiplexity do not match the approach to boundedness found in much scholarly and lay-thinking about teams.

This disconnect can pose significant problems when we apply theories that are based on well-bounded teams to teams which are unbounded or weakly bounded (i.e. exhibiting the boundary fluidity and multiplexity described above). As an illustration, consider “Alpha” – a product development team tasked with re-developing its company's flagship product. Social identity and categorization theories (Tajfel 1974; Tajfel and Turner 1979) posit that the more strongly members identify with Alpha, the more cohesive they will be (Reynolds et al. 2003), the more they will internalize group values and norms (Ashforth and Mael 1989), and ultimately the better they will perform (Bezrukova et al. 2009). But what happens if members identify strongly with Alpha *but boundary fluidity or multiplexity lead them to define “Alpha” differently?* At the very least, reduced boundedness might undermine, if not eliminate, the

¹ Team boundaries delineate the control of all team resources including both team members and other resources (e.g. financial, physical). However, given the unique role of members as both defining and constituting teams in this article I refer only to boundaries as they relate to membership.

benefits our theories predict will arise from having strongly identified members. More seriously, it introduces effects and processes that our theories may be unable to capture: the consequences of strong identification with misaligned targets – what happens when “my Alpha is not the same as your Alpha”.

To address the disconnect between the reality of many of today’s teams and our established theoretical foundations, I propose a change in the way in which we approach boundedness in teams. I propose that we view boundedness not as a definitional characteristic of teams, but as a dimension along which teams can, and frequently do, vary. This change, in turn, implies three related shifts in how we think about teams: first, from approaching and differentiating teams on the basis of their membership to doing so on the basis of their task; second, from viewing teams as stable entities to viewing them as states in an ongoing process; and third, from viewing them as self-contained to viewing them as inextricably linked to the broader social system in which they are situated. Making this change allows us to study and theorize about teams that are less bounded than those typified in existing theory while building on our existing body of research and theory on teams.

CONCEPTUAL BACKGROUND: TEAM BOUNDARIES AND BOUNDEDNESS

In his seminal work, Alderfer (1976) defined group boundaries in terms of what they do, arguing that boundaries “hold the system together as an organized entity and thus help to distinguish what a system is from what it is not” and “regulate the flow of matter, energy, and information between a system and its environment” (p. 1593). In so doing, he established two key roles of boundaries – as differentiators and as barriers. Since Alderfer’s early work, many scholars have built on these roles either explicitly (e.g. Ashforth et al. 2000; Cherns 1976; Edmondson 2012; Hackman 1987, 2002; Sundstrom et al. 1990; Watson-Manheim et al. 2012) or implicitly (e.g. Ancona and Caldwell 1992a; Carlile 2002; Carlile 2004) establishing them as core themes in present day treatments of team boundaries (see Table 1 for representative works leveraging each conceptualization).

Insert Table 1 about here

Beyond establishing the roles boundaries play and their importance for effective team functioning, these roles and the theories built upon them suggest two key characteristics to consider when assessing a team's boundaries: clarity and permeability. Hackman (1987, 2002) identifies boundary clarity – defined as a team knowing and agreeing on where its boundaries lie – as one of three essential features of “real teams”, particularly critical for a boundary to perform its role as a differentiator. At the same time, Alderfer (1980) stresses the importance the appropriate level of permeability – defined as a boundary's ability to be crossed. He argues that both under- and over-bounded systems face issues – in the form of loss of coherence and detachment respectively – but concludes that under-bounding is a greater risk to a group's survival. Scholars have thus established team boundaries' roles as differentiators and barriers and have identified clarity and permeability as the two key dimensions of “boundedness.”

Is boundedness definitional or variable?

While boundedness is clearly a critical issue for teams, the question remains whether boundedness is a defining characteristic of teams (i.e. to be considered a team requires being well-bounded) or a dimension along which teams can and do vary (i.e. a team may be more or less well-bounded) and therefore one which should be explored in our scholarship.

Not surprisingly, the most concrete position on this question is typically found in theoretical and review articles that wrestle with how to define “team”. Starting with the works cited above, Alderfer (1977, 1980) discussed the consequences of over- and under-bounded systems and Hackman (1987, 2002) identified boundary clarity as a key driver of team effectiveness – implying that teams may vary with respect to both dimensions of boundedness. Building on this tradition, a small number of theoretical articles have explicitly considered boundedness as variable and discussed its effects (e.g. Sundstrom et al. 1990). In many other cases, however, the treatment of boundedness has been more ambiguous, with scholars providing definitions that suggest that they consider boundedness to be more definitional than variable. As a case in point, many scholars building on Alderfer and Hackman, have included being seen as an “intact social entity” as part of their definition of a team (Cohen and Bailey 1997; Guzzo and

Dickson 1996; Guzzo and Shea 1990; Hackman and Katz 2010). While this does not explicitly make boundedness definitional, boundedness is implied.

Empirical studies further complicate matters, as many do not provide an explicit definition of “team” or “boundary” (e.g. Gibson and Dibble 2012; Woolley 2009), thereby leaving it up to readers to infer whether boundedness is considered definitional or variable. This is even the case in research directly related to team boundaries such as that on team boundary spanning (e.g. Ancona and Bresman 2007; Ancona and Caldwell 1992a; Joshi et al. 2008; Marrone et al. 2007). In those cases, however, given that such studies explore the activities that teams can use to actively manage their boundary permeability, variability in boundedness is implied. The majority of research on teams, focused on intra-team dynamics and processes, does not address boundedness either explicitly or implicitly. At best, this leaves such research agnostic to boundedness, and at worst risks promoting an assumption of boundedness, much like a statistical omitted or reference category.

Our methodologies frequently add to that ambiguity. For example, with the exception of a small number of studies on membership disagreement (e.g. Mortensen 2004; Mortensen and Hinds 2002) few field studies – be they survey or ethnography based – explicitly ask subjects how they bound the team. Scholars building theory based on such data are therefore unable to understand or explore how boundedness affects those teams. In other cases, our methods constrain boundedness. Take, for example, experimental studies of team dynamics. With the exception of studies focused on membership change (e.g. Choi and Thompson 2005; Kane 2007; Kane et al. 2005; Lewis et al. 2007), most experimental studies rely on stable sets of people working together on a task in a laboratory. In such contexts, boundary clarity and impermeability is implied, as participants have no reason to assume that the boundaries of their teams are not reflected by the unchanging set of people in the room. Likewise, with a similar caveat for a small number of studies of membership change (e.g. Chandler et al. 2005) in many field studies, data collection instruments are explicitly designed to eliminate variance in boundedness (e.g. by providing respondents with a list of members and asking them to respond with respect to that list; Ancona and Caldwell 1992a; Ancona and Caldwell 1992b). When subjects are not asked how they perceive the team

itself, researchers are unable to identify, much less explore variations in boundary clarity or permeability. Given that discussions of the role or effects of such constraints on boundedness are rare, we lack evidence on whether scholars are unaware of these constraints or have consciously considered them but decided they were not relevant to the focal research question.

Taken together this suggests that while a small number of early works treated boundedness as a dimension along which teams can vary, many of our subsequent theoretical and empirical treatments either ignore boundedness or explicitly – and unintentionally – constrain it. The result has been the generation of a substantial body of research and theory that approaches teams as if they are well-bounded entities, without explicitly considering how less boundedness might affect them.

Does it matter? Or just how (un)bounded are today's teams *really*?

Many of the teams in today's organizations are not as well-bounded – either in terms of clarity or permeability – as those we see depicted in the theories used to understand them. Organizations are frequently structured around networks, markets, projects and teams (Ahuja and Carley 1999; Ford and Randolph 1992; Hobday 2000; Kozlowski and Bell 2003; Miles et al. 1997; Nohria and Eccles 1992). Such organizational forms decentralize authority to improve organizational responsiveness and adaptability, while providing job design and employee motivation benefits (Hackman 1987). Not surprisingly, this environmental and organizational context affects both the tasks that must be performed and the structure of the teams put in place to accomplish them.

Of particular interest are two ways in which team boundaries frequently differ from the implicit characterizations of teams found in much of our existing thinking about teams. First, teams often have higher boundary fluidity as teams must themselves change to adapt to the changes in the external environment. Defined as *the extent and speed of change in the position of a team's boundaries in a given period of time*, boundary fluidity includes both how many members change (e.g. one member versus half

the team leaving) and how frequently boundaries shift (e.g. daily, weekly, or monthly)². Boundary fluidity itself therefore, is a dimension along which a team's boundaries may range; within a given time period, the farther and more frequently a team's boundaries shift, the greater its boundary fluidity. Second, teams may have higher boundary multiplexity, arising from shared and/or dispersed membership. Defined as *the extent to which a team concurrently has multiple salient non-aligned boundaries*, boundary multiplexity incorporates two factors: how many different boundaries a team has (e.g. two different boundaries versus seven) and how different the team's boundaries are (e.g. disagreeing on only one team member versus disagreeing on half the team). Importantly, to affect boundary multiplexity, a given boundary must be salient relative to the team's members and task. For example, the distinction between team members who live in houses and those who live in apartments is not likely to be relevant to the team's ability to accomplish its task. As with boundary fluidity, multiplexity is a dimension along which teams vary; the larger the number of salient boundaries a team has and the more different they are, the more multiplex are that team's boundaries (Figure 1 provides an illustration of these concepts). Tying back to the dimensions of boundedness, fluidity and multiplexity reduce boundary clarity and increase boundary permeability. In doing so they diverge from the characterization of boundedness found in much existing theory on teams with major implications for the way we study, work in, and understand teams.

Insert Figure 1 about here

Boundary fluidity and multiplexity have not gone unnoticed by scholars; indeed there is substantial research on elements of each, typically framed as scholarship on “non-traditional” teams. For example, scholarship on virtual teams has focused on the effects of teams spanning geographic, temporal, cultural and organizational boundaries, but has rarely pulled these multiple dimensions together, and has overlooked the effects of increased membership overlap or fluidity (for notable exceptions, see

² This definition of boundary fluidity is agnostic to the direction of the shift (e.g. adding versus removing members) and period of time (as long as any inter-team comparisons are carried out based on the same time period)

Cummings and Haas 2011; Matthews et al. 2011). In other instances, scholars have cited fluid and unbounded teams as a driver of their choice of methodology or level of analysis (e.g. Metiu and Rothbard 2012), but there is no systematic, integrated assessment of the effect of boundary fluidity and multiplexity on teams, nor understanding of how they affect the definitional team attribute of boundedness, or what must be done to adapt our theories and practice to remain applicable. A review of prior scholarship on boundary fluidity and multiplexity and their effects on boundary clarity and permeability follows (see Table 2 for a summary).

Insert Table 2 about here

Boundary fluidity: Evidence, scholarship, and effects

Much existing theory on teams is based on teams that are for the most part stable and unchanging over the life of a team (e.g. research on coal mining teams Goodman and Leyden 1991; Trist and Bamforth 1951). In contrast, however, in two recent studies, respectively 69% and 84% of teams had changed their membership over the course of the life of the team (based on author correspondence regarding data in: Cummings and Haas 2011; and Espinosa et al. 2012 respectively). Particularly in project-based work, teams are frequently created and used in a transient fashion – they are formed, accomplish their task and are disbanded in a short period of time (Cohen and Bailey 1997; Sundstrom et al. 2000). This need for dynamism reflects the established view that teams must change over time to better adapt to their environment (ex. Arrow and McGrath 1995; Ziller 1965). Project teams are frequently designed around short-term, fluid activities (Prencipe and Tell 2001). Indeed, some scholars define project work as self-contained, complex and temporary (Grabher 2002). Domain experts are often brought in to fulfill unique, short-term needs, and released once that expertise is no longer needed. In other cases membership change itself is seen as a means to promote knowledge transfer (Kane 2010; Kane et al. 2005). As not all team members start and end their work on the project at the same time, the composition of the team shifts significantly over the project’s lifetime. Work on “dynamic teaming”

(Matthews et al. 2011) finds such membership change makes it difficult for team members to hold a cohesive picture of their teams.

In another parallel stream, Hackman and Wageman (2005), refer to “sand dune” teams – defined as “dynamic social systems that have fluid rather than fixed composition and boundaries” (Hackman and Wageman 2005p. 56) that “form and re-form within a larger organizational unit as external demands and requirements change” (Hackman 2011). Also contributing to boundary fluidity is the widespread use of contingent and temporary work (Barley and Kunda 2004; Belous 1989; Davis-Blake and Uzzi 1993; Evans et al. 2004) which affects the nature of the work and teams themselves, “characterized as flexible, discontinuous, and ephemeral” (Bechky 2006 p. 3).

Fluidity affects boundaries by reducing their clarity and increasing their permeability – the two critical attributes of boundedness identified by Alderfer (1976) and Hackman (1987, 2002). When a team’s boundaries change over time, it creates uncertainty as changes in a group’s composition make it difficult to concretely determine its membership at any given point in time (Wageman et al. 2008). In the case of fluid team boundaries, a team’s boundary is a moving target depending on when it is assessed, the effects of which have been explored in substantial research on membership change (e.g. Arrow and McGrath 1993; Choi and Thompson 2005; Lewis et al. 2007). Importantly, such change may lead either to uncertainty on the part of an individual team member or disagreement at the team level as to where the boundary lies, both of which are forms of reduced clarity. Exacerbating this effect, the more rapidly a team’s boundaries shift, the less time its members spend operating with a given boundary. Given research that finds that mental models are established and reinforced over time (see, for a review Mohammed et al. 2010), the less time a team has to reinforce a particular boundary location, the less clear it is likely to be.

Boundary multiplexity: Evidence, scholarship, and effects

While much existing research is focused on a single boundary for each team, in reality team members face multiple boundaries representing different dimensions of dissimilarity. These include factors like socio-demographic traits (e.g. culture or language), functional characteristics, (e.g. training or experience), and contextual and organizational factors (e.g. physical location or time zone and

organizational, divisional, or team membership). Studied extensively by scholars of faultline theory (Bezrukova et al. 2009; Lau and Murnighan 1998; Thatcher and Patel 2011), such multiplexity poses little problem when all such boundaries align – as in a team where all members are situated in the same location, come from the same culture, and are 100% dedicated to the team in question. In such cases, we would expect these boundaries to reinforce one another, increasing the team's sense of boundedness. Frequently, however, these boundaries are only partially overlapping and therefore non-aligned, for example, geographically dispersed teams with members working in different physical locations, cross-organizational teams composed of employees from multiple organizations, or teams whose members are concurrently members of multiple – and different – other teams. In such situations, team members must manage and make sense of multiple, and at times competing, boundaries.

While we lack data on the boundary multiplexity prevalence, we do have data on many of these dimensions independently. Recent surveys found that approximately 80% of workers collaborated with colleagues who were geographically dispersed, (Solomon 2010; Witchalls et al. 2010), including related differences such as culture, language, and time zone. In studies of multiple team membership, approximately 80% of those working on teams reported working on more than one at a time (O'Leary et al. 2011b). Similarly, in a sample of over 1200 employees at Intel, more than 60% were members of three or more teams concurrently (Chudoba et al. 2005). A cross-organizational survey put the percentage of knowledge workers concurrently working on more than one team at 94.9% (Martin and Bal 2006).

Scholarship on dispersed teams and on shared membership, while not exploring multiple dimensions of dissimilarity, provide us some insights into the mechanics of boundary multiplexity. As noted, teams are frequently physically dispersed, with a range of related types of boundaries (e.g. spatial, temporal, cultural, linguistic and organizational). Scholars have noted the frequency of dispersed teams, highlighting the effects of involving individuals who are embedded in differing physical and social contexts (see reviews by Hertel et al. 2005; Martins et al. 2004; Powell et al. 2004; Webster and Staples 2006). Research has identified several important dimensions that define such external contexts: *physical*, as collaborators working in different physical spaces affects interpersonal interactions (e.g., Allen 1977;

Van den Bulte and Moenaert 1998); *configurational*, as the relative number of collaborators per site affects individual and collective processes (O'Leary and Mortensen 2010; Polzer et al. 2006); *temporal*, as collaborators working within different time zones affects coordination (e.g. Espinosa and Carmel 2003; Massey et al. 2003; Rutkowski et al. 2007; Saunders et al. 2004); *cultural* (regional, national, ethnic, or organizational) and *linguistic*, as collaborators operating within differing cultural and linguistic frames can impede effective interaction and productivity (see Gelfand et al. 2007; Jones et al. 2008; Krauss and Chiu 1998; Leidner and Kayworth 2006; Marschan-Piekkari et al. 1999; Neeley in press; Pearson 1989). Even within a single organization and location, organizational structure may contribute to boundary multiplexity. Scholars of project-based work have argued that project teams frequently share members in an effort to leverage differentiated skills (Lindkvist 2004), each team having a partial claim on an individual's time (e.g. Hobday 2000; Zika-Viktorsson et al. 2006). Such "Multiple Team Membership" (Mortensen et al. 2007; O'Leary et al. 2010) or multi-teaming (Matthews et al. 2011) has implications for outcomes at the individual, team, and organizational levels (O'Leary et al. 2011a).

As with fluidity, boundary multiplexity also reduces boundary clarity and increases boundary permeability. Faultline theorists (Lau and Murnighan 1998; Lau and Murnighan 2005) have argued that within a social group, the more that multiple faultlines (hypothetical dividing lines analogous to boundaries) align, the clearer and stronger the distinction between the groups will be when such faultlines are activated. Thus, to the extent that all of a team's boundaries align, the clearer they will be.

Conversely, misalignment weakens each boundary by providing alternative dimensions along which that boundary does not hold. Multiple non-aligned boundaries introduce competing boundaries to consider when assessing what is and what is not within the group, particularly when team members can no longer rely on cues from the local context (e.g., collocation, common language, or common organization) as bases for situating boundaries. Whether the result of multiple team membership or dispersion, the more non-aligned boundaries a team has, the less clear it will be to members where the overall team boundary lies. This led Bresnen and colleagues (2004) to note that the existence of overlapping projects creates a "partly indeterminate and shifting organizational terrain" (p. 1537), making it difficult to establish a

shared understanding or common knowledge base of both the task and team (Lindkvist 2004). Mortensen and colleagues further posit that in some cases such overlap leads to team-level disagreement as to membership (2011; Mortensen and Hinds 2002). At the same time, multiplexity will increase permeability as alternative boundaries provide alternative paths to cross the team boundary. In the face of multiple non-aligned boundaries, an information transmission between two team members may in fact transmit information outside the team based on a different team boundary that includes only one of the team members. In other words, a transmission of information that crosses one boundary may be viewed as wholly inside or outside another boundary.

What happens if teams do not match our theories?

The above arguments suggest that, as a result of boundary fluidity and multiplexity, teams may be less bounded – less clear and more permeable – than those depicted in our theories. Indeed, the idea of boundedness is deeply ingrained in many theories and findings regarding both attitudes and cognition, as demonstrated with the two following theories and the incorrect conclusions they may yield.

Boundedness in theories about team attitudes and behaviors: Identification

Returning to our earlier example of identity and categorization theories, these theories are based on the premise that individuals use social categories (such as team membership) to make sense of their environment (for a review, see Hogg and Terry 2000). They have been widely adopted by scholars of teams to explain both intra- and inter-team dynamics and outcomes (Hogg and Hains 2001; Reynolds et al. 2003), the general prediction being that identifying oneself as a member of a given group shapes one's perception of, and feelings toward, that group and its other members (Ashforth and Mael 1989; Hogg and Terry 2000). This infers boundedness as identity theories require that the target of a person's identification is a distinguishable entity with established characteristics and infer boundedness inasmuch as an actor must be able to determine whether others are group members if such a determination is going to shape their perceptions, attitudes and behaviors towards those others.

The application of theories of social identity processes based on well-bounded teams to un- or weakly-bounded teams may lead to incorrect conclusions. Most directly, as identities are established and

reinforced over time through member interactions and through differentiation between members and nonmembers, applying theories based on well-bounded teams to those with high boundary fluidity or multiplexity may mean that we overestimate identity strength. Delving deeper, doing so may lead us to systematically overestimate the cohesiveness of individual and team identities, and to underestimate the potential for identity conflict arising from that fractured identity. As research has established that identities are constructed in part through narrative rationalization of individuals' experiences (Ibarra 1999; Ibarra and Barbulescu 2010), to the degree that collaborators' experiences vary – due to different entry and exit times or different “other” teams they contribute to – they will be more likely to hold multiple, independent, isolated self-images, and those identities may conflict.

Theories of identity have long argued the existence of multiple and frequently nested identification, such as simultaneous identification with an organization, division and team (Ashforth and Johnson 2001), which often leads to conflict and confusion (Fiol et al. 2009). However, this conflict has been attributed to incompatibilities between multiple identities rather than differing definitions of a single identity. Weakly-bounded teams increase the likelihood of a new type of identity conflict – that arising from different definitions of the same identity. This might be reflected in multiple collaborators working on the “Alpha” team who each identify strongly with the team, but define it – and its resultant identity – differently. Importantly, this can happen even if all members identify strongly with a team in name.

Taken together, such views illustrate how theories of identity and identification within teams rely heavily on boundedness, and thus how their application to weakly bounded teams may result in incorrect predictions. Research linking team task performance to both identity (Bezrukova et al. 2009; Ellemers et al. 2004) and transactive memory (Austin 2003; Lewis 2004; Moreland and Myaskovsky 2000), suggests that our ability to predict team performance is likewise at risk when we apply theories based on traditional teams to un- or weakly-bounded teams.

Boundedness in theories about team cognition: Transactive memory systems

Transactive memory systems (TMS) are shared divisions of labor for the encoding, storage, and recall of information (Wegner 1987). In an effective team TMS, members become increasingly

specialized in the information they both hold and attend to, while the team develops a shared understanding of where particular expertise lies (Hollingshead 2001). Successful TMSs reflect three key characteristics: specialization, coordination and credibility (Lewis 2003; Liang et al. 1995) and have been used to explain the improvement in team performance that frequently occurs as teams work together over time (Liang et al. 1995; Moreland and Myaskovsky 2000). A well-bounded team helps members to hold a “complete” picture of the expertise held within the TMS, allowing for specialization as members get to know for what information they (or others) are the best fit. For similar reasons, boundedness also shapes and frames coordination in TMS, as it defines the set of individuals whose knowledge is coordinated.

If we approach less-bounded teams as if they are well-bounded, our theories of TMS may lead us astray. In weakly bounded teams, specialization may occur, but rather than creating an efficient memory system it may produce one with significant redundancy or gaps. Redundancies are likely to occur in cases where, as a result of fluid or multiplex boundaries, members fail to recognize that there are others in the team better suited to store a particular piece of information than they are. Conversely, when boundary fluidity or multiplexity lead multiple members to assume someone else in the team is better suited to storing that information than they themselves are – the team may leave no one attending to a particular domain of knowledge. At the same time, low boundedness may lead team members to establish potentially conflicting coordination routines if they assess the team at different times (boundary fluidity) or on different dimensions (boundary multiplexity) – conflicts which our theories are not designed to recognize. This risk is particularly likely when we use measures of TMS based on individual member assessment of knowledge specialization, credibility, and coordination (e.g. Lewis 2003) which do not actually map out and compare the underlying models of knowledge held by each member. In short, while TMS theories predict benefits arising from knowledge specialization and coordination, those predictions are predicated on the idea that TMS members specialize and coordinate based on a shared understanding of the team, which may not be the case in un- or weakly-bounded teams.

Boundedness in methods: Expectations of temporal invariability and independence

Approaching teams with fluid or multiplex boundaries as if they were traditional teams also creates serious methodological concerns. Analyzing unbounded or weakly bounded teams as if they are static, decontextualized and mutually exclusive risks methodological problems when we utilize methodologies that have these assumptions built in. In teams with boundary fluidity, members change over time, and therefore measures collected at different points in time may not reflect the same entity. This disconnect can arise both from the characteristics of the data collection process and the design of individual items. In teams with rapidly changing membership, collecting survey or interview data over a two-week period may mean that early respondents answer with respect to a different set of collaborators than those who respond at the end. Even if membership does not change during data collection itself, assuming that all members respond with reference to the same set of actors may be incorrect when data collection does not explicitly delineate a reference time period. When respondents are asked to assess or reflect on their team without specifying a time period, they may be referring to the team at different points in time. Even qualifiers such as “current” leave room for interpretation, which in a context of boundary fluidity may yield differing reference points.

In teams with multiplex boundaries, members may contribute to more than one team at the same time or be embedded in more than one context (location, division, culture) – meaning that those teams and contexts are not independent. When an individual concurrently contributes to two or more teams, those teams are interdependent, even if the tasks remain unconnected with respect to inputs and outputs. Similarly, as teams with multiplex boundaries are closely linked to the context in which they are embedded, they may not be independent across levels. Frequently, however, studies of teams rely on data gathering centered only on the focal team. Without data on the amount and type of shared membership across teams, we cannot control for interdependence across multiple overlapping teams. Likewise, without data on the context from which team members are drawn, we cannot “bracket” phenomena (see Hackman 2003) to capture multilevel effects. This may occur even if teams do not share membership, as in the case of multi-team systems (Zaccaro et al. 2011). Given these temporal and interdependence issues,

approaching teams with fluid or multiplex boundaries as if they are stably and singly bounded poses serious methodological problems.

How have we dealt with this disconnect?

Scholars have adopted different tactics to deal with this disconnect between how teams frequently look “in the wild” and how our theories portray and seek to understand them. Below I discuss prior efforts grouped into two basic categories (see Table 3 for a summary): introducing “non-traditional” types of teams and viewing teams from a radically different conceptual or methodological lens.

Insert Table 3 about here

Introducing “non-traditional” teams

One of the simplest and most direct approaches to addressing the disconnect between the characterization of teams found in much of our theory and the teams we frequently find in the wild is to add an exception for each divergence. Many of the initiatives outlined in the discussion of boundary fluidity and multiplexity (e.g. research on x-teams, boundary spanning, virtual teams, multiple team membership, multi-team systems, sand dune teams, project teams, and “teaming”) fall into this category, as a means to explain teams that do not fit the traditional definition.

Consistent across all these domains of study is the introduction of special forms of teams to account for real world examples that differ from the way teams are typically depicted in our theories. While this has provided significant insight into less-bounded teams, it does not provide a solution to the problem. Most of these streams of research focus on only one way in which our theories diverge from teams in practice (e.g. being geographically dispersed or having overlapping or fluid membership) without linking that characteristic to the broader issue of boundedness or to each other. Because they neither provide nor link to a broader framework, it is difficult to situate such forms relative to one another or to traditional teams. Such relative positioning is necessary if we are to integrate theory and findings on these teams with our understanding of traditional teams. Without an integrating framework, we risk a

proliferation of disjointed teams-related theories. Furthermore, most research in this category focuses exclusively on the exploring the characteristics of the exception, with little consideration of how its existence shapes or changes our core characterization of “team”.

Also in this category, Hollenbeck et. al.’s (2012) recent work argues that we should consider teams as points on a dimensional scale of three characteristics: skill differentiation, authority differentiation, and temporal stability. Like the approaches above, they address the disconnect through the use of special types of teams, but differ in providing a means to link across them methodologically. While these dimensions do address some of the discrepancies between the way we typically characterize teams and the way those teams look in the wild (notably boundary fluidity), Hollenbeck et. al. do not address how those shifts affect how we think about teams and our resultant theories. Ultimately, boundedness is still largely viewed as definitional rather than variable.

Viewing teams through a different lens

Other scholars have argued that we should view teams through a different theoretical or methodological lens. Arrow, McGrath, & Berdahl (2000), stress the benefits of reconsidering small groups (and by extension teams) as dynamic systems that are driven by intra-group and group-context interactions. They promote viewing teams as adaptive systems, and advocate the use of computational modeling to assess and understand them. This shares similarities with calls to view teams as networks of actors through the lens of social network analysis (e.g. Murase et al. 2012). Doing so allows scholars to leverage established techniques for subgroup identification (e.g. cliques, cohorts), facilitating the identification of groups “from the bottom up” (for a review see Carton and Cummings 2012).

Beneficially, both of these approaches ensure that boundedness is not inferred, by viewing teams as emergent and dynamic phenomena, thereby allowing us to assess and explore issues of boundary fluidity and multiplexity. This benefit comes at a significant cost, however, as the bottom-up nature of both approaches identifies and defines teams solely on the basis of patterns of interactions rather than a meaningful category. This makes it more difficult to account for and interpret the social psychological effects of an entitative group (Hamilton et al. 1998; Lickel et al. 2000; Sherman et al. 1999). While such

analyses allow scholars to identify and effectively model emergent groups, they cannot capture members' perceptions of those groups and the meaning attributed to them.

SO WHAT DO WE DO: VIEWING BOUNDEDNESS AS VARIABLE

This disconnect between our existing theories based on teams and the form many teams take “in the wild” necessitates a shift in how we think about, approach, and study them – in particular the attribute of boundedness. I suggest that we must transition how we think about boundedness: from viewing it as a definitional characteristic of the team to viewing it as a dimension along which teams can, and very often do, vary. This means explicitly considering boundedness when we collect data, build theory, and think about teams, but goes beyond simply introducing boundedness as another mediator. It requires a fundamental shift in how we think about teams.

What changes and what stays the same?

Given the issues identified earlier, to make this transition, three parallel shifts must occur in how we think about teams, to view them as: focused on task, dynamically-produced states, and embedded in a broader social system. At the same time, in order to be able to leverage the substantial theory and understanding we have built around teams it is important that we retain the two other aspects of teams that are central to their definition: interdependence and goal commonality.

What changes?

First, we must shift how we think about a given team from focusing on *who* they are to *why* they are. While the definition of a team as “a set of people who work interdependently towards a common goal” includes both its members and their shared purpose, in practice scholars and practitioners typically differentiate among teams on the basis of the individuals comprising them. We typically think of a team as “a group of people who...” – in effect defining a given team in terms of a particular set of people. This implicitly proscribes both boundary fluidity and multiplexity, as changing members changes the team itself, and multiplexity blurs the boundaries that differentiate one team from another. Facing this issue, Metiu and Rothbard (2012) were forced to abandon the construct of team altogether to focus at the level of the interaction episode for their recent study of group engagement.

By defining and differentiating among teams on the basis of their task rather than membership, even if that team's membership changes repeatedly, it remains definable, identifiable and comparable to other teams. This allows theories based on such teams to be applied equally well to teams with stable, unchanging membership and those whose entire membership changes every few months. Similarly, defining teams in terms of their objectives does not imply exclusivity of boundaries. Linking team members through their shared contribution to the team's task is a many-to-many relationship, as each member contributes to one or more teams' tasks and each team has one or more team members contributing to it. This allows for theorizing about and comparison between teams with multiplex boundaries. Taken together, this allows boundedness to be explored as a dimension along which teams can vary and facilitates the exploration of differential effects of clarity and permeability.

Second and third, the remaining two shifts – towards thinking of teams as dynamically produced states and as embedded in a broader social system – while conceptually distinct, are most easily discussed in concert. Though there are clearly exceptions (e.g. work on boundary spanning Ancona and Bresman 2007; Ancona and Caldwell 1992a; Joshi et al. 2008), the majority of research on teams is focused on the structures, states and processes that occur within a stable set of actors. This stable, internal focus constrains boundedness in terms of both boundary fluidity and multiplexity. Studying teams as pre-existing stable entities, however, implicitly constrains boundary fluidity by ignoring membership changes, while focusing internally constrains boundary multiplexity as it ignores the social system from which those changing members are drawn and to which they return.

The importance of the broader social context within which teams are embedded is well argued in works on team boundary spanning and the management of external relationships (Ancona and Caldwell 1992a, b; Choi 2002; Joshi 2006; Joshi et al. 2008; Joshi and Roh 2009; Marrone et al. 2007), ultimately leading Ancona and Bresman (2007) to introduce “x-teams” as a new type of team particularly effective in dynamic contexts due to its external focus. Similarly, recent work on multi-team systems (DeChurch and Marks 2006; Hoegl and Weinkauff 2005; Marks et al. 2005; Zaccaro et al. 2011) and multiple team

membership (O'Leary et al. 2011a) stresses the importance of explicitly considering not only intra-team processes and states but the relationship between teams and their context.

At the same time, a key link between teams and their contexts arises through the process through which members are assigned to (and released from) teams. Irrespective of whether such assignments occur as the result of managerial edict or member self-selection, it is a growing body of research arguing for the importance of viewing teams dynamically. To that end, Edmondson (2012) recently advocated a shift from thinking about teams to thinking about the process through which teams are constructed and re-constructed – which she labeled “teaming”. Explicitly approaching teams as reflecting states in a dynamic process linking them to their external contexts provides a valuable starting point for thinking about teams both more contextually and more dynamically – as snapshots in an ongoing process of re-constitution from a broader social system.

These three shifts in how we think about teams, to view them as: focused on task, dynamically-produced states, and embedded in a broader social system are all required if we wish to seriously explore and understand boundedness as a dimension along which teams may vary.

What stays the same?

A substantial body of research on traditional teams reaches back as far as to the turn of the last century (Simmel 1902; Triplett 1898) and it is important that in changing how we think about boundedness in teams we do not reject or lose the ability to leverage that scholarship. Critical to our ability to do so is the retention of the interdependence and goal commonality as defining characteristics of a team. The importance of interdependence towards a common goal is even more critical given the aforementioned need to focus on the task being pursued rather than the set of members as the defining and differentiating element of teams. Taken together, this suggests that we approach teams not as stable and isolated groups of people working towards a common goal, but as reflecting a set of people who at a particular moment have been drawn from a broader social system to work towards a common goal.

What are the costs and benefits of viewing boundedness as variable?

Explicitly considering boundedness as a dimension along which teams vary clearly has both benefits and costs for our theories and theorizing. I highlight such benefits in the following section.

Benefit: Addressing theoretical shortfalls

Considering variation in team boundedness in our theorizing addresses some of the theoretical issues that arise when we apply theory based on a characterization of teams as well-bounded to teams that are less well-bounded, as summarized in Table 4 and discussed below.

Insert Table 4 about here

Example: Identification in less-well-bounded teams

While applying theory based on a well-bounded teams to teams with fluid or multiplex boundaries is likely to lead us to overestimate identity strength and underestimate identity cohesiveness, repositioning our theories around a view of boundedness as variable helps to reduce both eventualities.

First, considering boundedness as variable allows it to be operationalized, measured, and incorporated in our analyses, allowing us to control for its effects in assessing and predicting identity strength. Thus when a team has stable and exclusive boundaries, identification will be driven by the same underlying factors that have been extensively studied in the past. When teams are less well-bounded, however, the effects of those underlying factors will be constrained by the team's boundedness – as reflected in research on entitativity and identification (Castano et al. 2002; Sherman et al. 1999).

Second, the problem of identity fracturing arises when teams are defined primarily through their membership. In the case of a team with fluid or multiplex boundaries, members may view its membership differently. As discussed, by explicitly considering boundedness as a dimension along which teams vary, we are forced to define them in terms of their objectives. While a team's membership may change, its goal will remain consistent, providing an invariant identification target. At the same time, this does not

prevent the study of individuals' identification with other teams and highlights the non-exclusivity and transiency of the resultant identities.

Third, explicitly considering boundedness as a dimension of variance yields additional benefits by definitionally linking the level of the team itself with the social system that gives rise to it. This forces a more multi-level consideration of identity to capture and understand concurrent identification with the team and with the social system in which it is embedded. It also prompts exploration of identification with fundamentally different types of identification targets – e.g. identification with the team's goal and the members currently working towards that goal.

Example: Transactive memory systems in less-well-bounded teams

Well-bounded teams provide a fixed set of members to whom transactive memory processes apply. As noted, however, the application of theories of transactive memory based on well-bounded teams to teams with fluid or multiplex boundaries may result in incorrect predictions. In particular, we may consider each team member's efforts to increase knowledge specialization to be correct when based on his or her model of the team, even though the resultant team-level transactive memory system has incomplete or redundant information. Analogously, assuming that all members share the same underlying model of the team may lead to the assessment of coordination routines as beneficial even though the end product is an inefficient system.

Considering teams that may be unbounded or weakly bounded explicitly links those teams to the broader social system in which they are embedded – necessitating a shift in the way we think about TMS, from a single-level to a fundamentally multi-level phenomenon. TMS in less-well-bounded teams becomes the product of processes and knowledge sources both inside the team and in its broader context. By regarding TMS as a fundamentally multi-level phenomenon, we can assess positive and negative cross-level effects of states and processes at each level. To be able to assess these cross-level effects also requires a shift towards measurement of outcomes. This opens up new research domains, such as the members of a team working to improve not their own TMS but the TMS at the system level, or processes through which members of the team incorporate or account for extra-team resources in the TMS

processes. Taken in concert, explicitly considering boundedness as a dimension along which teams vary when considering TMS not only addresses the noted methodological limitations of applying teams-based TMS to teams with fluid or multiplex boundaries, but also highlights new research opportunities.

Benefit: Highlighting methodological concerns

Turning to methodology, while considering boundedness as variable when we build theory about teams does not provide the temporal invariability or construct independence noted earlier, it does ensure they are not incorrectly assumed. As considering boundedness as variable requires considering teams as the result of a dynamic process, there is no assumption of their constancy over time. While this does not prevent scholars from trying to model them as stable entities, doing so would be counter to the way they are conceptualized. Similarly, as considering boundedness as variable links those teams to the social system in which they are embedded, they are explicitly tied to the broader context and implicitly to other teams, eliminating any assumption of construct independence.

Benefit: Identifying new questions and research domains

Approaching teams as variable with respect to boundedness also highlights a number of domains for future research that have been largely overlooked in existing research. At the most basic level, considering boundedness as variable encourages scholars to explicitly consider the various points along the continuum of boundedness. At one end are well-bounded teams with clear and relatively impermeable boundaries; while in contrast global virtual project teams may have very unclear and highly permeable boundaries. Furthermore, this continuum serves to position these teams relative to other collaborative forms that do not meet the defining criteria of interdependence towards a common goal – such as the targets of crowd-sourcing or wiki contributors (O'Mahony and Ferraro 2007). Whereas scholars of entitativity have begun to explore similar questions (e.g. Hamilton et al. 1998) about the extent to which actors consider a given entity a “thing”, their approach has been focused on a social psychological perception of what a given group “is”. Importantly, the consideration of boundedness as variable, leaves teams as concrete structural phenomena with outwardly observable characteristics.

By explicitly considering boundedness as a dimension along which teams vary, we are able to ask questions like: When, along the continuum, do the processes and states well-noted in studies of well-bounded teams begin to occur? Is there a single, relatively consistent threshold, or does that threshold differ for different processes – for example do social factors (e.g. affinity, identification) arise before cognitive (e.g. TMS, shared cognition) ones or vice versa? Do transitions occur at one or more clear tipping points or is there a gradual transition through which “team-y” behaviors begin to emerge when examining increasingly-bounded teams? Despite being framed by Alderfer (1980) over thirty years ago, there has been relatively little systematic study of the relationship between boundary clarity and permeability. For example, while studies of boundary spanning consider permeability, they often empirically control boundary clarity (Ancona and Caldwell 1992a, b). This leaves open questions like: Do team members themselves differentiate between boundary clarity and permeability, or do they focus instead on generalized “boundedness”? Does boundary clarity or permeability more strongly shape team members’ sense of boundedness and entitativity?

When we explore variability on boundedness, the explicit link between teams and the social systems in which they reside suggests the need for further research on the link between those teams and the broader social system from which their members are drawn. In addition to the research domains noted in the discussion of TMS above, this suggests an important area of research into the processes which give rise to the mobilization of members to form teams. This parallels Edmondson’s recent work on “teaming” which views teams as the product of an ongoing process of constitution and re-constitution. Considering boundedness as variable, however, goes beyond Edmondson’s arguments by explicitly linking the team to the broader context and considering both the team and its context as part of a multi-level system. Considering this multi-level system also encourages exploration of characteristics of the social system itself, including: In what way does boundedness at the system level affect the processes of a given team within it? What are the effects of member mobilization through different processes (e.g. being assigned by an authority figure vs. self-nominating)? Does the strength and commonality of a social system’s goal affect the likely success of teams within it? What social system structures (e.g. centralized/decentralized,

hierarchical/flat) are more effective in supporting teams, and to what extent does that differ depending on how members are assigned? Also, what are the relationships among teams themselves, particularly in support of broader system-level objectives? Initial explorations of many of these questions can be seen in recent work on multi-team systems (e.g. Zaccaro et al. 2011).

More broadly, exploring the role of boundedness at the level of the team facilitates our ability to leverage and connect to the substantial scholarship that has been conducted on boundaries in other domains and at other levels. For example, research on the boundary between work and home (Ashforth et al. 2000; Nippert-Eng 1996; Voydanoff 2005) has explored strategies that individuals use to manage frequently conflicting demands from competing domains, leading to questions like: Are work-home boundaries fundamentally different from intra-team boundaries, or do they operate based on the same basic principles of clarity and permeability? At the same time, scholars have examined boundaries at different levels, such as organizations (e.g. Pisano 1990; Santos and Eisenhardt 2004) and industries (O'Mahony and Bechky 2008; Rao et al. 2005). A deeper understanding of team boundaries and boundedness can be both informed by, as well as build on, this research, exploring questions such as: How do team members balance conflicting boundaries when team boundaries span organizations or industries as in the case of cross-organizational collaborations.

Cost: Increasing complexity and departing from a well-established paradigm

Most simply, adopting boundedness as an explicit dimension along which teams vary also necessitates more complex theoretical and empirical models of the phenomena being considered – and the similarly complex data required to do so. Multi-level models are required in order to incorporate phenomena within the team and the social system from which the team's actors are drawn (Klein et al. 1999; Klein et al. 1994) and the inherent dynamism of fluid boundaries requires models that take temporality into account. At the same time, explicitly considering boundedness as a dimension along which teams may vary departs from a well-established paradigm and increases theoretical and methodological complexity. Despite the prevalence of less bounded teams in the wild, the idea of a team as “a bounded set of people” has remained central to both scholarly and lay-theories of teams and groups

(for a discussion of lay theories of groups see Lickel et al. 2001). As a result, by viewing boundedness as variable, we risk increasing the gap between our theories and the mental models of both scholars and the practitioners who design, implement and manage teams in the real world.

GUIDELINES FOR MOVING FORWARD

Putting into practice the view of boundedness as a fundamentally variable aspect of teams requires a number of key steps as we must both translate existing research and scholarship, as well as shift our approach to teams in future research.

How do we translate existing research?

Considering boundedness as variable in practice requires identifying if, when, and how existing theory based on a well-bounded view of teams can be translated. In some cases prior theories based on teams as well-bounded remain relevant and may be directly applied. In other situations, existing theories have already acknowledged the prevalence of boundary fluidity and multiplexity and can thus be directly translated to teams varying in their boundedness. In other cases, viewing existing theory in light of these changes reveals gaps in our understanding, thereby opening up new topics to be explored.

Where a given team has clear and relatively impermeable boundaries, established theory is likely to remain directly applicable. Slightly more complex are situations in which one or the other constraint is met— such as a team with boundaries that are clear and unchanging, but permeable. In such cases, to understand whether theory based on well-bounded teams can be used to explain the processes and states of such teams we must evaluate the extent to which that theory relies on boundedness. One such example is scholarship on the effects of entitativity – the sense that a group of people is an intact singular unit as opposed to a collection of individuals (Campbell 1958). Entitativity arises through homogeneity and concerted collective behavior (Ip et al. 2006) and underlies many theories of teams that assume teams to exhibit characteristics as coherent unitary entities. Boundary fluidity and multiplexity reduce the likelihood that all contributors will behave similarly at any one point in time, thereby reducing cohesion of behavior. In addition, because boundedness itself is a driver of entitativity – as it is difficult to consider a group as an entity if it cannot be bounded –boundary fluidity and multiplexity reduce entitativity

through affecting the sense of boundedness itself. Thus, theories requiring a sense of entitativity are less likely to hold for teams that are fluid and overlapping.

In other situations, existing research on special types of teams (ex. project-based or distributed) has begun to explore less-well-bounded teams, but has tended to focus on a subset of drivers of boundary fluidity or multiplexity rather than more broadly on reduced boundedness. Such research can clearly be directly appropriated to teams exhibiting those characteristics. Research on distributed or project-based teams, for example, provides insights into the processes, states, and characteristics of teams with high boundary fluidity or multiplexity. Similarly, relevant non-team-focused research may provide insights if found in contexts reflecting similar boundary fluidity and multiplexity. For example, research on “boundaryless careers” (Arthur and Rousseau 1996; Faulkner and Anderson 1987; Jones and DeFillippi 1996) may help us to better understand how to adapt our theories regarding advancement and personal development to teams with fluid boundaries. Similarly, research on contingent workers (Barley and Kunda 2004) shows that such individuals rely on social networks to establish independent career structures. Relatedly, research on typecasting (Zuckerman et al. 2003) illustrates a potential individual cost of individualized careers, while recent research on “stretchwork” (Bechky 2006; O'Mahony and Bechky 2006) suggests strategies that individuals may use to counteract that cost.

How do we shape future scholarship?

Beyond addressing our current research, given the prevalence of less-well-bounded teams in the wild, if we wish to reduce the disconnect between our theories and the teams they address, it is important that we design future research keeping in mind the view of boundedness as variable. This suggests three nested classes of questions (see Table 5 for a summary and example questions).

Insert Table 5 about here

First, in all cases it is important that we assess the likelihood that boundedness is relevant to the focal phenomena under study. To do so, we must ask whether the core dimensions of boundedness –

clarity and permeability – are likely to affect the occurrence of our focal phenomena. In addition, to assess a more holistic effect, it is important to ask whether the phenomena will be affected by the team's overall sense of boundedness. Second, if based on the answers to the questions above we believe boundedness is relevant to our focal phenomena, we must ask how the design of experimental studies or the context of field studies will constrain or shape the underlying drivers of boundary fluidity and multiplexity – and, through them, boundary clarity and permeability. With the answers to these two classes of questions in hand, we can assess and control for the effects of variations in boundedness on our focal phenomena. Subsequent theory based on such data, in turn, will take into account variability in team boundedness. A third class of questions are relevant for those cases where boundedness is itself the phenomena under study. In those cases it is important to delve further into the elements noted in the section “What changes and what stays the same?” – namely the team's relationship with its broader context, the processes linking the two, and the other definitional aspects of the team: interdependence and goal commonality. Building our studies with these questions in mind will ensure that our future teams research explicitly treats boundedness as variable and thereby avoids the disconnects between theory and reality discussed earlier.

CONCLUSION

Evidence points to the widespread use of teams with boundaries that are fluid and multiplex. Boundary fluidity and multiplexity, in turn, contribute to such teams being less well-bounded than the characterization found in many of our theories. Problematically, we continue to apply theories based on that characterization even when the teams under study are not well-bounded. By ignoring this mismatch between the empirical reality and the theories used to understand it, we risk reducing their relevance and validity (Glaser and Strauss 1967). Moreover, inappropriately assuming boundedness impedes our ability to recognize, measure and account for important processes that arise directly from teams being less-well-bounded – for example, issues arising from dynamically-changing or concurrent affiliation. As Barley and Kunda note in their discussion of the changing nature of work in post-bureaucratic organizations: “Contemporary organizational theorists may, therefore, face the same challenge that confronted the field's

founders: the need to develop images of organizations that are congruent with the realities of work in the new economic order” (2001: 77).

I suggest a shift in the way in which we view and think about boundedness, from a sometimes definitional or assumed characteristic to a dimension along which we expect teams to vary. Doing so focuses our attention not on “groups of people” as has traditionally been the case, but on the goals towards which those team members work interdependently within the context of a broader social system. Doing so allows us to explicitly incorporate boundary fluidity and multiplexity in our theories and expand our understanding of teams and their states and processes.

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TABLES

Table 1: Characterizations of boundaries in prior work

Prior work	Boundary as differentiator	Boundary as Barrier
Alderfer (1976)	“hold the system together as an organized entity and thus help to distinguish what a system is from what it is not” (p. 1593)	“regulate the flow of matter, energy, and information between a system and its environment” (p. 1593)
Hackman (2002) (also in: Hackman 1987)	“to work well together, team members need to know who they are” “reliably distinguish between the people who share responsibility and accountability for the collective outcome and others who may help out in various ways but are not team members” (p. 44)	
Sundstrom (1990)	“Features that ... differentiate a work unit from others” (p. 121)	“Features that ... pose real or symbolic barriers to access or transfer of information, goods, or people” (p. 121)
Ashforth et. al. (2000)	“the physical, temporal, emotional, cognitive, and/or relational limits that define entities as separate from one another” (p. 474)	
Edmondson (2012)	“divisions between identity groups” (p. 248)	
Watson-Manheim et. al. (2012)		“boundaries represent both barriers and opportunities for innovation, efficient knowledge sharing and coordination...” (p. 31) “a border can be seen as a jump in the cost of flows at the border.” (p. 35)

Table 2: Boundary characteristics, their drivers, prior scholarship, and effects

Dimension	Description & Contextual Driver	Related Prior Scholarship	Effect on Boundedness (Clarity)	Effect on Boundedness (Permeability)
Boundary Fluidity	<i>Boundaries change over time...</i> <i>...to keep pace with dynamic environment.</i>	<ul style="list-style-type: none"> • Contingent & Contract work • Project-based work • Sand-dune teams 	Members unsure / disagree <i>when</i> to assess boundaries	<p>Less time to reinforce boundary</p> <p>Boundary permeable across time periods</p>
Boundary Multiplexity	<i>Multiple, non-aligned boundaries...</i> <i>...resulting from member dissimilarity (contextual & demographic) due to global competition and interdependence.</i>	<ul style="list-style-type: none"> • Distributed / Virtual teams • Multiple team membership • Project-based work 	Members unsure / disagree to <i>which</i> boundaries to attend	<p>Inverse faultline: non-aligned boundaries are weaker</p> <p>Multiple, non-aligned impermeable boundaries similar to single permeable boundary</p>

Table 3: Alternative approaches to updating our concept of "team"

	Key idea	Strengths	Weaknesses	Cites
Augment "team" with special types				
"Non-traditional" teams (e.g. project-based, sand dune, virtual, and x teams, MTM, MTS)	Introduce special types of teams to account for collaborations that do not match traditional definition	<ul style="list-style-type: none"> • Explicitly address particular deviations • Pre-existing research avoids construct proliferation 	<ul style="list-style-type: none"> • Rarely considers both boundary fluidity and multiplexity • Lack of unifying framework allowing for integration across research 	(see sections on boundary fluidity and multiplexity)
Dimensional Scaling	Teams as points on dimensional scaling of 3 characteristics	<ul style="list-style-type: none"> • Avoids key pitfalls of taxonomic structures • Captures change over time 	<ul style="list-style-type: none"> • Teams still framed as bounded • Descriptive - does not explain differences or effects 	(Hollenbeck et al. 2012)
View "team" from different theoretical and/or methodological lens				
Small Groups as Complex Systems and Teams as Social Networks	Refocus on links (relationships or interactions) over members	<ul style="list-style-type: none"> • Removes assumption of boundedness • Highlights complexity of relationships both intra- and extra-group • Introduces new methods (computational modeling & subgroup identification) 	<ul style="list-style-type: none"> • Lose link to prior groups research & social psychological connotations derived from entitativity 	(Arrow et al. 2000) (Falzon 2000; Murase et al. 2012)

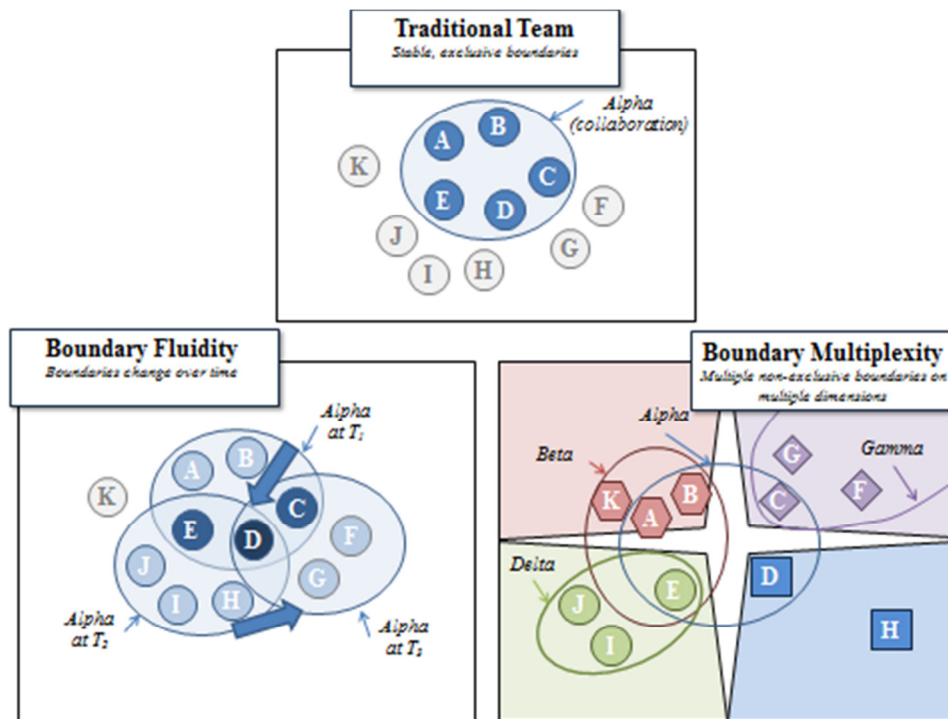
Table 4: Existing theory under different views of boundedness

Theory	What is the role of boundedness in existing theory?	What do we get wrong when we incorrectly assume boundedness?	How does considering boundedness as variable help us?
Social Identity	<ul style="list-style-type: none"> • Required for identification target to be differentiable entity • Required to be able to determine which others are in- vs. out- group 	<ul style="list-style-type: none"> • Overestimate identity strength due to overestimation of interactions over time • Underestimate identity conflict arising from incorrect assumption that strong identification is with same entity. 	<ul style="list-style-type: none"> • Viewing boundedness as variable allows explicit measurement and control • Defining teams in terms of objective provides invariant identification target • Explicit incorporation of social system forces explicit consideration of multiple identity levels (team, social system)
Transactive Memory Systems	<ul style="list-style-type: none"> • Required for members to know how to specialize • Required for members to effectively coordinate 	<ul style="list-style-type: none"> • Failure to recognize that individually “correct” specialization processes may lead yield incorrect (redundant or incomplete) team-level information • Incorrect assumption that coordination routines are complementary 	<ul style="list-style-type: none"> • Promotes reconsideration of TMS as having / based on individual-level processes • Introduces new domain of TMS in dynamic social systems or across multiple levels

Table 5: Questions to consider in designing future research

For all studies:
Questions to ask ourselves about the focal phenomena under study, to assess if boundedness is relevant
<p><i>Do I expect phenomena to occur more/less/differently when...</i></p> <ol style="list-style-type: none"> 1. ...the team's boundaries are unclear? 2. ...the team's boundaries are more permeable? 3. ...the team feels "well-bounded"?
If we believe boundedness is relevant to focal phenomena:
Questions to ask about study context, to assess extent to which it will shape boundedness (and transitively the focal phenomena)
<p><u>Experiments:</u></p> <p><i>(How)Will study design...</i></p> <ol style="list-style-type: none"> 1. ...constrain/promote boundary fluidity, or subjects' perceptions thereof? (and through that boundary clarity and permeability) 2. ...constrain/promote boundary multiplexity, or subjects' perceptions thereof? (and through that boundary clarity and permeability)
<p><u>Field studies:</u></p> <p><i>(How)Will field site under study constrain/promote boundary...</i></p> <ol style="list-style-type: none"> 1. ...fluidity? <ol style="list-style-type: none"> a. How frequently do team members change over a given period? b. What percentage of team members change over a given period 2. ...multiplexity? <ol style="list-style-type: none"> a. How many boundaries are salient to team members? b. What percentage of those boundaries align?
If boundedness IS the focal phenomena:
Questions to ask about study context or to consider in designing experiments when exploring team boundedness
<ol style="list-style-type: none"> 1. What, and how well-defined, is social system from where are members drawn? (e.g. work unit vs. open source contributors) 2. Who assigns members to team? (e.g. manager vs. self-selection)
Questions to ask subjects, to assess perceptions of boundaries and boundedness
<p><i>Regarding boundedness itself</i></p> <ol style="list-style-type: none"> 1. Who is in your team? (can be used to calculate indices of membership agreement/disagreement) 2. How clear are your team's boundaries? 3. How permeable are your team's boundaries? 4. Does your team feel under-, over-, or appropriately-bounded? <p><i>Regarding other definitional elements</i></p> <ol style="list-style-type: none"> 1. How interdependent are you on your team members? 2. What do you think is the team's goal and do all team members agree on it?

Figure 1: Characteristics of collaboration



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