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BEYOND TEAM TYPES AND TAXONOMIES: A DIMENSIONAL SCALING CONCEPTUALIZATION FOR TEAM DESCRIPTION

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Research on teams has prompted the development of many alternative taxonomies but little consensus on how to differentiate team types. We show that there is greater consensus on the underlying dimensions differentiating teams than there is on how to use those dimensions to generate categorical team types. We leverage this literature to create a conceptual framework for differentiating teams that relies on a dimensional scaling approach with three underlying constructs: skill differentiation, authority differentiation, and temporal stability.

Teams have been defined as small groups of interdependent individuals who share responsibility for outcomes, and team-based structures play an increasingly important role in organizations (Ilgen, 1999). Longitudinal surveys of Fortune 1000 firms have shown a steady increase in the use of team-based structures, from less than 20 percent in 1980 to roughly 50 percent in 1990 to over 80 percent in 2000 (Garvey, 2002). The consensus is that these structures promote organizational adaptability and create individual roles that are broader, more socially connected, and more meaningful for individuals (Hackman & Oldham, 1976).

Correspondingly, research on teams has increased in recent years (Ilgen, Hollenbeck, Johnson, & Jundt, 2005), and one of the primary virtues of this research has been the diversity of tasks, samples, and contexts (Mathieu, Maynard, Rapp, & Gilson, 2008). The research has included laboratory experiments, cross-sectional field studies with diverse jobs, and detailed longitudinal case studies of teams in a wide variety of industries, all of which have examined a diverse set of team processes, emergent states, and team outcomes (LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). The benefit of this kind of diversity in the empirical research base is that it provides a potential foundation for building broad-based theory and tests of the generalizability of inferences across tasks, samples, and contexts.

Unfortunately, the diversity of this expanding research also creates certain challenges. Perhaps the greatest is the problem it causes in generating a cumulative knowledge base for meaningfully integrating and aggregating results across studies. A close inspection of this literature reveals a confusing plethora of alternative team taxonomies and no consensus regarding how to describe or classify teams. Thus, any researcher doing a study of teams may struggle to describe exactly what *kind of team* is the focus of his or her study. That is, the lack of agreement on what taxonomic system to employ and the coarse nature of the existing taxonomies make it impossible for a researcher to identify exactly where his or her particular configuration of task-sample-context fits in terms of existing team types.

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Similarly, any researcher doing a meta-analysis might find it difficult to explore the moderating influence of tasks, samples, and contexts because of the lack of consensus on classification systems. As we document below, there have been numerous meta-analyses over the last twelve years describing effect sizes related to relationships among variables at the team level, and even though each of the meta-analyses tested type of team as a moderating variable, not a single one used the same framework for capturing team type. The history of science is often discussed in terms of revolutions that shift fields from one consensus to another (Kuhn, 1963), and lack of consensus within a field has historically been cited as a sign of disciplinary weakness and immaturity (Platt, 1964). With this as a background, we argue that the literature on teams needs to shift from a tradition of generating idiosyncratic taxonomic structures to developing a new consensus on the critical underlying dimensions most useful for comparing and contrasting different teams.

Thus, the purpose of this article is to develop a new conceptual system for describing and differentiating different teams when building and testing theories. We summarize the literature on team types and leverage this literature to create a new integrated framework that relies on the unidimensional and continuous constructs that underlie existing categorization systems. Ironically, although there is some consensus on what constitutes many of the important dimensions that underlie existing team taxonomies, there is no consensus whatsoever on how to translate information on these underlying dimensions into larger, more holistic team types. By articulating a more granulated, continuous, and multidimensional space for describing teams, we hope to arm future researchers with a more parsimonious and meaningful framework for generating a cumulative knowledge base.

THE ROLE OF TAXONOMIES IN THE BEHAVIORAL SCIENCES

The purpose of taxonomic structures is to classify units of study by creating superordinate categories that are similar on a number of different underlying dimensions. This classification is usually only descriptive; however, even with respect to the goal of description, taxonomies have limited potential, for several reasons (Bacharach, 1989). First, many taxonomic descriptions generate only a few types of coarsely described categories. This might include only two categories that parse the conceptual space into sweeping alternatives that are too broad to allow precise theoretical understanding and powerful prediction.

Second, in order to create an exhaustive classification system, dichotomous taxonomic descriptions often imply a perfect negative relationship between the two types, in the sense that if a person is not one type, then it should logically follow that he or she is the other type. This "either/or" nature of dichotomies often fails to stand up to empirical scrutiny in the behavioral sciences. In many cases, what started out as clean either/or categories in the behavioral sciences has broken down into 2×2 frameworks when continuous measures of the underlying characteristics have shown that the dimensions are orthogonal (or positively related).

Third, when one starts to create additional categories, going from an either/or system to a 2×2 system, the number of types quickly increases. This is not prohibitive with two dimensions, but when one creates a $2 \times 2 \times 2$ system, it may not be easy to meaningfully label and find conceptual exemplars for each cell. This becomes unworkable if one adds a fourth dimension, implying a need for sixteen unique labels and exemplars.

Fourth, even if one develops a system that is not too gross (either/or) and not too refined ($2 \times 2 \times 2 \times 2$), this still leaves one with a nominal measurement system. Measurement scales are ordered in terms of refinement, from lowest to highest, as (1) categorical, to (2) rank orders, to (3) equal intervals, to (4) ratio scales. Taxonomic systems are expressed in nominal terms, necessarily implying that all people within the category are equal in the characteristics that define the type. However, since the underlying variables from which types are constructed usually reflect continuous and normally distributed dimensions, the arbitrary nature of the cutoff point used to create the dichotomy or category ignores real variation on the underlying dimensions. Mature sciences tend to develop ratio scales, and even in the field of psychology, the general consensus among psychometric scholars is that most measures reflect equal intervals (Nunnally, 1978). This is a level of magnitude beyond categorical

systems and holds the possibility of identifying nonlinear relationships that cannot be detected with dichotomous or categorical systems.

Fifth, if the underlying dimensions are normally distributed, this means that whereas unique exemplars can often be selectively chosen by those who originally develop the system, those who have to apply the system in actual research confront a bigger problem. Most units one encounters in practice, if the dimensions are normally distributed, are likely to pile up near the average of each dimension, making categorization very difficult. A unit that lies near the cutoff point (usually the median) can be placed within a specific cell, but the system then treats that unit as though it is the exemplar, despite the fact that it is quite different from the exemplar and, in fact, is probably more like other units that cluster at the center.

All these problems come into play even when one has a well-accepted categorical system, but the problems multiply when a field lacks consensus and contains multiple categorical systems. When there are competing systems, a researcher has to choose a system, and this choice may be difficult to defend, for many of the reasons laid out above. Then, if the categorical system chosen by the researcher does not match the system held by an important reader (reviewer or editor), the original system has to be reconfigured into the language of some other system, where there may not be a clear translation for moving seamlessly between systems. What gets lost in the translation thus further exacerbates what was already lost by the original classification system. As we show in the next section, the research on teams in the organizational literature contains multiple, competing categorical systems.

ALTERNATIVE TEAM TYPES IN THE ORGANIZATIONAL SCIENCES

The literature on teams proposes a dizzying array of different team types, even though the number of actual underlying dimensions used as building blocks to construct team types is limited. This state of affairs impedes the meaningful accumulation of results across studies and, in general, makes it very difficult for researchers or consumers of research to answer the question, "What kind of team is this?" We review this literature in detail in order to document the lack of consensus but also to leverage this literature to isolate where there seems to be consensus on the dimensions that are used as the building blocks of team types.

We show that three underlying constructs emerge as crucial dimensions across many different team type taxonomies, including (1) *skill differentiation*—the degree to which members have specialized knowledge or functional capacities that make it more or less difficult to substitute members; (2) *authority differentiation*—the degree to which decision-making responsibility is vested in individual members, subgroups of the team, or the collective as a whole; and (3) *temporal stability*—the degree to which team members have a history of working together in the past and an expectation of working together in the future.

We chose these three dimensions for both conceptual and practical reasons. Conceptually, even though there is little consensus on team types, there is consensus on the dimensions that underlie the different team types. That is, even though different systems generate very different superordinate categories, they seem to use similar building blocks to do so. Practically, these dimensions are critical because they reflect the primary dimensions that go into the construction of organization charts that point to (and name) specific teams and individuals within the larger organizational framework. The horizontal dimension of an organization chart describes the specific functional responsibility of the individual (skill differentiation). The vertical dimension of the chart establishes who has responsibility for making decisions in the face of disagreement or conflict (authority differentiation). Finally, the names assigned to the charts signal who is on the team at any one moment and, collapsed over time, can describe the team's history of working together (temporal stability). Table 1 lists the different types of teams and describes which, if any, of these three dimensions were invoked as a dimension for defining some team type by previous scholars.

Multiple Team Type Systems

Sundstrom, De Meuse, and Futrell (1990) provided one of the early categorization systems, dividing teams into four team types: advice/

TABLE 1
Definitions of Different Team Types Identified in the Organizational Sciences

No.	Team type	Definition
1.	Advice/involvement groups[S]	"First-line manufacturing or service employees who identify opportunities for improvement. . . . most have restricted scope of activities and little working time" (Sundstrom, De Meuse, & Futrell, 1990: 120).
2.	Production/service teams[S,A,T]	"Teams use technology to generate products or services. . . . These usually consist of first-line employees working together full-time, sometimes over protracted periods, with freedom to decide their division of labor. . . . they elect their own leaders and divide their tasks but have output quotas" (Sundstrom et al., 1990: 121).
3.	Action/negotiation teams[S,T]	"Highly skilled specialist teams cooperating in brief performance events that require improvisation in unpredictable outcomes. They often have elaborate, specialized roles for members. Their missions usually call for outcomes such as negotiating a contract or winning a competition" (Sundstrom et al., 1990: 121).
4.	Project/development teams[S,T]	"Groups of white-collar professionals . . . [who] collaborate on assigned or original projects. Their cycles of work may be longer than in production and service, and outputs may be complex and unique. They may have a mandate of innovation more than implementation, broad autonomy, and an extended team life span. Their performance may be difficult to assess" (Sundstrom et al., 1990: 121).
5.	Project teams[S,T]	"[These] are time-limited. They produce one-time outputs. . . . Project team tasks are non-repetitive in nature and involve considerable application of knowledge, judgment, and expertise. The work that a project team performs may represent either an incremental improvement over an existing concept or a radically different new idea. . . . [they draw] members from different disciplines and functional units" (Cohen & Bailey, 1997: 242).
6.	Traditional work teams[S,A,T]	"Work teams are continuing work units responsible for producing goods or providing services. Their membership is typically stable, usually full-time, well-defined. Work teams are found both in manufacturing and service settings. . . . Traditionally, work teams are directed by supervisors who make most of the decisions" (Cohen & Bailey, 1997: 242).
7.	Parallel teams[S,T]	"Parallel teams pull together people from different work units or jobs to perform functions that the regular organization is not equipped to perform well. They literally exist in parallel with the formal organizational structure. They generally have limited authority and can only make recommendations to individuals higher up in the organizational hierarchy. Parallel teams are used for problem solving and improvement-oriented activities" (Cohen & Bailey, 1997: 242).
8.	Management teams[A]	"Management teams coordinate and provide direction to the sub-units under their jurisdiction, laterally integrating interdependent sub-units across key business processes. . . . The management team is responsible for the overall performance of a business unit. Its authority stems from the hierarchical rank of its members. It is composed of the managers responsible for each subunit" (Cohen & Bailey, 1997: 243).
9.	Project teams	"[Teams that have] a variety of group tasks, including (but not limited to) planning and decision-making. . . . the most uncertain, most complex, or least routine [as compared to production and decision-making teams]" (De Dreu & Weingart, 2003: 744).
10.	Production teams	"[Teams involved in] overt task execution while striving to meet standards. . . . tasks are less uncertain, less complex, or more routine [than decision-making and project teams]" (De Dreu & Weingart, 2003: 744).
11.	Decision-making teams[A]	"[Teams that] require reaching consensus on issues with no right answer . . . and are more uncertain, more complex, or less routine than production teams, while less uncertain, less complex, or more routine than project teams" (De Dreu & Weingart, 2003: 744).
12.	Mixed teams	"[Teams that] perform different tasks combined into one sample [production, decision-making, and project tasks]" (De Dreu & Weingart, 2003: 744).
13.	Ad hoc project teams[T]	"Ad hoc project teams exist for a finite period of time to solve problems, make plans or decisions, or interact with clients or customers" (Devine, Clayton, Philips, Dunford, & Melner, 1999: 683).
14.	Ongoing project teams[T]	"Standing teams with relatively stable membership that solve problems, make plans or decisions, or interact with clients or customers" (Devine et al., 1999: 683–684).
15.	Ad hoc production teams[T]	"[These] are temporary in nature and formed on a case-by-case basis to build, construct, or assemble products; perform artistically or competitively; or provide a public service" (Devine et al., 1999: 684).
16.	Ongoing production teams[T]	"Standing teams that perform the same tasks as ad hoc production teams on a regular or recurrent basis" (Devine et al., 1999: 684).

(Continued)

TABLE 1
(Continued)

No.	Team type	Definition
17.	Ad hoc teams[T]	"A group of ad hoc strangers purposively assembled to conduct either basic or applied research in a contrived setting" (Salas, DiazGranados, Klein, Burke, & Stagl, 2008: 910).
18.	Intact teams[T]	"[Teams] whose members have a shared history as a result of a commonly held assignment to a given collective operating inside an organization" (Salas et al., 2008: 910).
19.	Short-term teams[S,T]	"[A team] assembled to accomplish a short-term goal. . . . In short-term teams greater urgency may surround goals and missions. . . . The members of short-term teams likely have shorter tenure than the members of long-term teams" (Joshi & Roh, 2009: 610).
20.	Long-term teams[S,T]	"[A team that is] a stable and permanent unit in an organization. . . . in long-term teams, task requirements may be more stable, and distribution of tasks and roles may also be more clearly defined [as compared to short-term teams]" (Joshi & Roh, 2009: 610).
21.	Professional teams[S,T]	"Professionals can generally be expected to have more experience than students. . . . Professionals work together in teams for longer periods of time than students. . . . Professional teams perform different types of tasks than student teams do. . . . [Professional teams will] be less interdependent than members of [student] teams" (Peeters, Van Tuijl, Rutte, & Reymen, 2006: 383–384).
22.	Student teams[S,T]	"[Students] can generally be expected to have [less] experience than [professionals]. . . . [Students] work together in teams for [shorter] periods of time than [professionals]. . . . [Students] perform different types of tasks than [professionals] do. . . . [Student teams will] be less interdependent than members of professional teams" (Peeters et al., 2006: 383–384).
23.	Cross-functional teams[S,T]	"Cross-functional teams take many forms, but they are most often structured as working groups, created to make decisions lower in an organization's hierarchy, that have links to multiple subunits—or 'chimneys'—and are designed as an overlay to an existing functional organization" (Denison. Hart, & Kahn, 1996: 1005).
24.	Cross-functional project teams[S,T]	"The responsibility . . . often overlaps between two or more departments. . . . These teams or task forces allow for lateral contact between multiple departments. . . . tend to be temporary groups that exist for the duration of the designated activity. . . . [these temporary groups] are often used for nonroutine tasks. . . . [they] promote, rather than inhibit, cooperation across functional boundaries" (Pinto, Pinto, & Prescott, 1993: 1283–1284).
25.	Cross-functional product teams[S,T]	"They bring together persons from different disciplines and functions who have pertinent expertise about the proposed innovation problem. Such teams have high absorptive capacity, as their members' differing expertise allows them to tap a broad array of external information and new knowledge" (Lovelace, Shapiro, & Weingart, 2001: 779).
26.	New product development teams[S,T]	"All teams had to be working on new product development (a major extension to an existing product line or the start of a new product line)" (Ancona & Caldwell, 1992: 327).
27.	X-teams[S,A,T]	"These new, externally oriented, adaptive teams, which we call X-teams . . . are set apart from traditional teams by five hallmarks: external activity, extensive ties, expandable structures, flexible membership, and internal mechanisms for execution" (Ancona, Bresman, & Kaeufer, 2002: 33–34).
28.	Extreme action teams[S,A,T]	"Teams whose highly skilled members cooperate to perform urgent, unpredictable, interdependent, and highly consequential tasks while simultaneously coping with frequent changes in team composition and training their teams' novice members" (Klein, Ziegert, Knight, & Xiao, 2006: 590).
29.	Crews[S,T]	"The formal teamwork structure of this [medical crew] stipulates that a team be made up of between 3–10 members composed of physicians, nurses, and technicians who are organized for a shift. . . . From these larger teams, ad hoc teams are formed to respond to emergent events such as resuscitations. In this model, teamwork is sustained by a shared set of teamwork skills rather than permanent assignments that carry over from day to day" (Morey et al., 2002: 1555).
30.	Multiteam systems[S,T]	"Two or more teams that interface directly and interdependently in response to environmental contingencies toward the accomplishment of collective goals. MTS boundaries are defined by virtue of the fact that all teams within the system, while pursuing different proximal goals, share at least one common distal goal; and in so doing exhibit input, processes, and outcome interdependence with at least one other team in the system" (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2001: 290).
31.	Small teams	"$n = 2$" (Salas et al., 2008: 911).
32.	Large teams	"$n \geq 5$" (Salas et al., 2008: 911).

(Continued)

TABLE 1
(Continued)

No.	Team type	Definition
33.	Hierarchical decision-making teams[S,A]	"A hierarchical decision-making team has three primary characteristics: hierarchy (unequal status among members), distributed expertise, and a task—the outcome of which is a decision. . . . Incorporation of distributed expertise into a team hierarchy provides the structure linking information to team members" (Hollenbeck et al., 1995: 294–295).
34.	Judge-adviser systems[A]	"JAS consists of one or more persons in the role of advisor who formulate judgments or recommend alternatives and communicate these to the person in the role of judge" (Sniezek & Buckley, 1995: 159).
35.	Self-managing teams[S,A]	"Self-managing work groups usually include a relatively whole task; members who each possess a variety of skills relevant to the group task; workers' discretion over such decisions as methods of work, task schedules, and assignments of members to different tasks; and compensation and feedback about performance for the group as a whole" (Hackman & Oldham, 1976; quoted in Manz & Sims, 1987: 106).
36.	Autonomous work teams[A]	"Autonomous work teams . . . are characterized by the team taking responsibility for completion of a variety of tasks, including team maintenance functions, work allocation, and identifying and solving ill-defined or poorly structured problems" (Taggar, Hackett, & Saha, 1999: 900).
37.	Lower-level managerial teams[A]	"In lower-level teams . . . the outcome measured is team performance based on subjective ratings by supervisors or team leaders" (Webber & Donahue, 2001: 152).
38.	Upper-level managerial teams[A]	"Upper-level managers have an important impact on organizational outcomes" (Webber & Donahue, 2001: 148).
39.	Top management teams[A]	"A company's top team was defined as including all officers above the level of vice president (e.g. senior vice president, vice chairman, CEO) and any other officers who were on the board of directors" (Michel & Hambrick, 1992: 21).
40.	Top management teams[A]	"The top management team is a group of senior managers that generally makes decisions that are important to the firm's future. . . . TMT members in this study are identified as the CEO and executives who report directly to the CEO" (Lin & Shih, 2008: 860).
41.	Conceptual teams[S,A]	"[Conceptual teams are] production teams with ends and means that are not clearly defined [who] spend a great deal of time on planning and deciding. Lack of agreement concerning production means and ends requires the teams to engage in idea generation, decision-making, and negotiating. Interaction strongly influences and determines a team's product. Intrateam processes are therefore strongly related to performance when teams engage primarily in conceptual tasks" (Stewart & Barrick, 2000: 137).
42.	Behavioral teams[S,A]	"The work of production teams engaged predominantly in behavioral tasks is easily programmed, and information is centralized rather than diffused among team members. Work requires little interaction, or interaction that is so mundane and nonproblematic that it does not create interpersonal difficulties. The ends and means of production are clear, so team members need not interact in novel ways to determine how to proceed" (Stewart & Barrick, 2000: 137).

Note: The superscripts indicate which dimensions are reflected in the definition. S = skill differentiation; A = authority differentiation; T = temporal stability.

involvement groups, production/service teams, action/negotiation teams, and project/development teams (see Table 1, types 1 through 4). This system uses nine different underlying dimensions as building blocks, including (1) the team's industry, (2) the level of organizational hierarchy where the team resides, (3) the education level of the workers, (4) the scope of activities, (5) the degree of member autonomy, (6) the routinization of activities, (7) the amount of time members work together, (8) the degree of skill differentiation, and (9) the degree to which team performance is difficult to evaluate. This early scheme was influential in the sense that it has frequently been cited in the ensuing years; however, the widespread awareness of the framework did not prevent the development of many other schemes. This may be due to the fact that the Sundstrom et al. framework uses nine underlying dimensions to generate just four types, and there is no precise formula for assigning teams to types when information on one dimen-

sion is missing. In addition, there is no precise formula for classification when information on one of the dimensions collapsed into a single type runs counter to a different dimension used to define a different team type (e.g., first line teams that have to improvise).

Cohen and Bailey (1997) provided another such narrative review, developing a different team type system that included project teams, traditional work teams, parallel teams, and management teams (Table 1, types 5 through 8). This system contains one type of team (project team) that is similar to one of the types in Sundstrom et al. (1990). However, the remaining types differ substantively from those proposed by Sundstrom et al. Some of the dimensions that serve as building blocks in this system overlap with those of Sundstrom et al. (e.g., routinization, stability, hierarchical level), but they combine in different ways (e.g., the role of self-management separates traditional work teams from production/service teams). In other cases, different dimensions (e.g., the degree to which the team provides lateral coordination of other teams or exists outside the formal organizational structure) are not employed altogether. These differences in how common dimensions combine into types, as well as differences in dimensions, make a direct translation of teams from one system to the other impossible.

Like the earlier Sundstom et al. (1990) system, the Cohen and Bailey (1997) system was not embraced by subsequent researchers, who instead developed their own unique categorization schemes as part of their own literature reviews. For example, De Dreu and Weingart (2003) quantitatively reviewed the literature on team conflict from 1993 to 2002 and used neither of these previous systems. Their study categorizes teams into four types: project teams, production teams, decision-making teams, and mixed teams. Table 1 reports the definitions from this study (see types 9 through 12). The distinctions made in this system involve underlying dimensions such as uncertainty, complexity, routinization, presence of standards, planning versus execution, and decision making as building blocks for team types. The project teams and production teams in this system are similar but not the same as the corresponding types in the Sundstrom et al. and Cohen and Bailey systems.

However, rather than the qualitative difference described by Sundstrom et al. and Cohen and Bailey, in the De Dreu and Weingart system project teams and production teams are opposite ends of one continuum. A project team deals with tasks that are "most uncertain, most complex, or least routine," whereas a production team deals with tasks that are "less uncertain, less complex, or more routine" (De Dreu & Weingart, 2003: 744). This system does not consider technology, skill specialization, or authority structure when separating teams into project versus product categories.

De Dreu and Weingart's (2003) system is unique in two other respects. First, this system recognizes decision-making teams as a distinct team type, different from project or production teams. This type of team is described as lying somewhere between production teams and project teams in the sense that these teams deal with work that is more uncertain, more complex, or less routine than production teams, while less uncertain, less complex, or more routine than project teams (De Dreu & Weingart, 2003). This again suggests one continuum rather than a classification system. This system was also the first to recognize that many teams could not be described definitively via a single type and, hence, included the new category of "mixed." Since a categorization scheme should uniquely classify each team into mutually exclusive types, the need for a mixed type suggests that the existing schemes were insufficient for coding the teams examined in this meta-analysis.

Devine, Clayton, Philips, Dunford, and Melner's (1999) study, while not a meta-analysis, still needed a system to differentiate teams because of the large number of diverse teams involved. Devine et al. developed a new system identifying four types of teams: ad hoc project, ongoing project, ad hoc production, and ongoing production teams (see types 13 through 16). The use of the terms *project* and *production* call to mind the earlier Sundstrom et al. (1990) framework, but this is deceiving. The temporary status of Devine et al.'s ad hoc production teams runs counter to the definition of Sundstrom et al.'s production teams, which states that this type of team works "over protracted periods" (1990: 121). The same type of temporary versus ongoing distinction was made with respect to project teams, but this redefines the concept of project team because Sundstrom et al. defined these as having long work cycles and expanded life spans.

Others noticed the need to distinguish temporary from ongoing status, and although these authors used similar terminology for their classifications, they used very different classification rules. For example, Salas, DiazGranados, Klein, Burke, and Stagl (2008) captured temporary status by distinguishing between ad hoc teams and intact teams. The use of the common term *ad hoc* in Salas et al. makes it look the same as the Devine et al. (1999) classification of ad hoc. However, as is apparent in Table 1 (see types 17 and 18), the Salas et al. definition of ad hoc specifically includes elements of context (i.e., laboratory settings) and people (strangers) that are not part of the Devine et al. definition. In fact, because none of the teams classified by Devine et al. were in "contrived" contexts, none of the Devine et al. ad hoc teams would meet the Salas et al. definition of ad hoc. Joshi and Roh (2009) also differentiated teams by their temporal status and distinguished between short-term teams versus long-term teams (see types 19 and 20 in Table 1). Unlike Salas et al., Joshi and Roh did not distinguish by context (contrived) or the nature of the people (strangers) but focused precisely on time.

Whereas Joshi and Roh (2009) distinguished teams on time, but not the nature of the people (strangers) or context (contrived), Peeters, Van Tuijl, Rutte, and Reymen (2006) distinguished teams on time and the nature of the people, but not context. Peeters et al. simply classified teams into professional teams and student teams (see types 21 and 22 in Table 1). Although it might seem that the distinction of students and professionals lines up precisely with the Salas et al. (2008) distinction between ad hoc teams and intact teams (because of the latter's emphasis on laboratory contexts that are usually staffed with students), this is not the case. Many of the student teams identified by Peeters et al. were not strangers and worked over extended time periods on real tasks with real outcomes. Peeters et al. placed all nonstudents into the professional category, despite the fact that the original Sundstrom et al. (1990) system distinguishes professionals from first line service and manufacturing workers.

Single Team Type Systems

The classification systems described in the previous section were part of research projects that focused on multiple types of teams. A great deal of research on teams, however, has focused on unique types of teams that are distinguishable from all others owing to specific idiosyncratic properties. For example, one popular differentiation of teams focuses on the skill differentiation of the personnel and identifies cross-functional teams as a unique type of team. Three different definitions of cross-functional teams are shown in Table 1 (see types 23, 24, and 25). The first definition, provided by Denison, Hart, and Kahn (1996), is the broadest and emphasizes that these teams make decisions, solve problems, and reside at the lower level of the organizational hierarchy, outside the formal structure. The fact that these are decision-making and problem-solving teams makes them similar to Sundstrom et al.'s (1990) advice/involvement teams, except that the latter teams are not always cross-discipline nor working outside the formal structure.

The other two definitions of cross-functional teams emphasize innovation and new product development. In fact, the Pinto, Pinto, and Prescott (1993) definition and the Lovelace, Shapiro, and Weingart (2001) definition actually seem to be describing exactly the same type of team; however, the former refers to them as cross-functional *project* teams and the latter refers to them as cross-functional *product* teams. The distinction between production teams and project teams was made early, by Sundstrom et al. (1990), and this is probably the most replicated distinction that subsequent taxonomies have carried forward, with this exception. In addition, although these two approaches both emphasize the role of cross-functional teams in new product development, others have identified and defined new product development teams as a separate category of teams (Ancona & Caldwell, 1992) but have not differentiated these teams based on skill differentiation (see Table 1, type 26).

One dimension that all definitions of cross-functional teams share is the notion of temporary membership and flexible composition. This is also the hallmark of X-teams (Ancona, Bresman, & Kaeufer, 2002) and extreme action teams (Klein, Ziegert, Knight, & Xiao, 2006; see types 27 and 28 in Table 1). These two types of teams share many features beyond flexible composition, including adaptability, high levels of interdependence, specialized skills and networks,

and the need to rapidly integrate new members. The main difference seems to be that X-teams exhibit more refined skill differentiation relative to extreme action teams, whose members share some common sets of core skills. In contrast, the term *crew* has been used to refer to teams that have unstable membership but are characterized by high levels of skill differentiation and role standardization (Morey et al., 2002). The high degree of standardization embodied in crews is designed to make these teams highly stable, despite frequent changes in membership.

In some cases, what seem to be multiple crews may come together as part of a multiteam system (Mathieu, Marks, & Zaccaro, 2001), where there is a high degree of skill differentiation between component teams that are assigned different specialized tasks but low degrees of differentiation within component teams that perform the same specialized task. Table 1 shows the definitions of crews and multiteam systems (see types 29 and 30). Much of the empirical research on multiteam systems uses a small number of component teams (e.g., two), each made up of a small number of team members (two or three). Thus, in practice, some multiteam systems look similar to crews, but in addition to skill differentiation, the members of multiteam systems may also come from different organizations with different cultures and values (Mathieu, Maynard, Taylor, Gilson, & Ruddy, 2007).

Indeed, other researchers have noted the importance of the dimension of size as a variable that distinguishes teams. For example, LePine et al. (2008) differentiated small teams from large teams, where they used the raw number of core team members as the measure of team size. Because team size is a continuous variable, the use of the raw number of team members would seem a natural practice for operationalizing this variable. Still, the lure of categorical systems within the literature on teams is strong, and other researchers have categorized teams into small and large categories based on cutoff scores, where two or less reflected small and five or more was large (Salas et al., 2008; see Table 1, types 31 and 32).

Large team size is especially problematic when there are knowledge or value differences between members who have to reach consensus. Some teams avoid the need for total agreement among members by relying on a formal leader to make decisions after obtaining input from members. Hierarchical decision-making teams (HDTs; see type 33 in Table 1) combine this kind of centralized decision-making approach, in conjunction with differentiated expertise, to form another type of team (Hollenbeck et al., 1995). A judge-adviser system (JAS; Sniezek & Buckley, 1995; see type 34, Table 1) is another term used for teams structured similarly to HDTs. HDTs and JASs are alike in the sense that one person makes the decision for the whole group after seeking input; however, the two types of teams differ in terms of whether the members share a common outcome with the decision maker and whether the advisers possess differentiated knowledge (true in an HDT but not a JAS).

The opposite of a team where the leader makes decisions is a self-managing team (Manz & Sims, 1987) or an autonomous work team (Taggar, Hackett, & Saha, 1999; see types 35 and 36 in Table 1). In addition to having decision-making authority reside at a lower level, members of these teams often have a broad, common set of skills, attributable to cross-training. The presence of common skills promotes flexibility through member substitutability and also facilitates consensus decision making. However, unlike De Dreu and Weingart's (2003) decision-making teams, where the classification requires consensus-based processes, no definitions of self-managed teams that we uncovered explicitly state that these teams always reach decisions via consensus. Some articles point to the use of voting or informal emergent leadership (e.g., Beersma & De Dreu, 2002; Ten Velden, Beersma, & De Dreu, 2007), and, thus, these teams are not equivalent to decision-making teams.

The distinction between self-managing and hierarchical teams recognizes whether different levels of authority exist *within the team*. Other researchers developing their own systems of team types have also used hierarchy as a classification rule but have distinguished hierarchical levels *between teams* instead of within teams. That is, Webber and Donahue (2001) differentiated between lower-level managerial teams and upper-level managerial teams via the definitions provided in Table 1 (see types 37 and 38). In addition to level of hierarchy, these definitions use the amount of impact on organizational-level outcomes and the nature of the performance evaluation as distinguishing fea-

tures of teams. The top management team literature also focuses on hierarchical level to classify teams, and whereas these are clearly what Webber and Donahue refer to as upper-level teams, definitions of top management teams are somewhat more precise in defining what "level" means. Two definitions of top management teams are shown in Table 1 (see types 39 and 40). Although both definitions are precise, they are not entirely consistent. The first definition can only be applied to publicly traded corporations and uses the linkage between the team member and the board of directors of the company as a defining element (Michel & Hambrick, 1992). The second refers to the top managers of independent business units that may or may not be part of a publicly traded organization (Lin & Shih, 2008).

One element associated with teams at high levels of an organization is that the nature of the work is conceptual, not physical or behavioral. This is a distinction that was used by Stewart and Barrick (2000) to create a classification system differentiating between conceptual teams and behavioral teams. As is apparent in the definitions provided in Table 1 (see types 41 and 42), both types of teams are described as production teams, but this overall two-way classification is based on the team's standing on a number of different dimensions, including (1) the clarity of means-ends relations, (2) the role of planning, (3) the role of decision making, (4) the role of negotiation, and (5) the level of interdependence, interaction, and importance of team processes. Teams high in all five characteristics are labeled conceptual teams and teams that are low on all five are labeled behavioral teams.

Team Types versus Task Types

The Stewart and Barrick (2000) system combines information on a large number of dimensions to generate the conceptual versus behavioral classification. This is one example of a system that starts with a type of *team task* and then directly converts that into a *type of team*. Not all classification systems depend on the type of task, and, instead, we have seen systems that rely on distinctions related to the nature of people, the role of time, the locus of authority, the type of reward structures, and so on when constructing team types. However, although not all team types are based on task types, any task type can be converted into a team type under two conditions: (1) if the task types are exhaustive and (2) if the task types are mutually exclusive, which was true for Stewart and Barrick. All teams were either conceptual or behavioral, and each team was classified into one and only one type of task.

The potential to convert every task type into a team type implies that the forty-two entries we have documented in Table 1 are just the tip of the iceberg in terms of the potential for generating even *more* team types in the future. Indeed, task type was one of the dimensions used by Devine (2002) to generate another classification system that created fourteen new and different types of teams, over and above those documented in Table 1. This would push the total number of team types in the literature to fifty-six, but even the Devine system barely scratches the surface of task types that would be made available by any comprehensive job analysis system, such as the Position Analysis Questionnaire (McCormick, Jeanneret, & Meachem, 1972), the Work Design Questionnaire (Morgeson & Humphrey, 2005), or the O*NET (Peterson, Mumford, Borman, Jeanneret, & Fleishman, 1999). These job analysis systems define hundreds of different task types, each of which could conceivably be converted into a team type by a team researcher. Of course, the idea of generating even more categorical team types than those listed in Table 1 by converting every team task into a team type may not be the best approach for describing the nature of teams, and we offer a different approach for describing teams in the next section.

A DIMENSIONAL SCALING FRAMEWORK FOR DESCRIBING TEAMS

The literature on teams has had a long history of differentiating teams based on mutually exclusive classification systems. However, the taxonomic approach is not the only way to achieve this goal. Other areas of research have made differentiations among units of study by using scaling methods that quantify units on continuous dimensions and avoid either/or categorizations into qualitative types (Nunnally, 1978). For example, in the area of individual differences, mental abilities are often conceptualized using three dimensions: verbal ability, quantitative ability, and reasoning/deductive ability (Jensen,

1971). Scores on these dimensions are used in both research and practice, without converting them into the eight types that one might be able to theoretically construct by devolving these three independent and continuous variables into a dichotomized 2 × 2 × 2 framework with named cells. Similarly, in the area of personality measurement, the idea of creating and naming all thirty-two cells that could be constructed by converting scores on the Five Factor Model (Barrick & Mount, 1991) into some 2 × 2 × 2 × 2 × 2 framework would be unthinkable.

In the same way, the literature on teams might benefit by reaching consensus on the key underlying dimensions that serve as the critical theoretical and empirical differentiators when contrasting alternative teams, and then leaving the treatment at the dimension level instead of converting multiple dimensions into categorical team types. The list of key underlying dimensions could be developed, and there would be no need to convert these continuous and multidimensional data into dichotomous combinations, all of which would have to be named. Although this approach seems at odds with the historical tradition, it can, in fact, draw heavily on and leverage this historical tradition, because in all cases the team types that are defined in Table 1 are based on one or a combination of underlying continuous dimensions.

If one ignores the process by which each of the definitions provided in Table 1 converts underlying dimensions into team types, and instead focuses exclusively on the dimensions themselves, one can simply create a system of variables perceived as critical in past attempts to compare and contrast alternative teams. In the following section we describe a system of three constructs useful for this purpose. The goal of developing this new conceptual framework is to motivate management scholars to engage the topic in different ways in the hope of launching a new wave of thinking in future theory building and theory testing in this context (LePine & King, 2010). We consider these the critical variables that have been useful theoretically and empirically for past researchers, including those that developed team types, because all three of the constructs we discuss reflect underlying continuous variables that were used to generate many of the past classification decisions. Figure 1 depicts this framework, and we give several examples of team types discussed earlier in this article to illustrate where they would "fit" on the dimensions in our framework.

A Three-Dimensional Scaling Model for Team Description

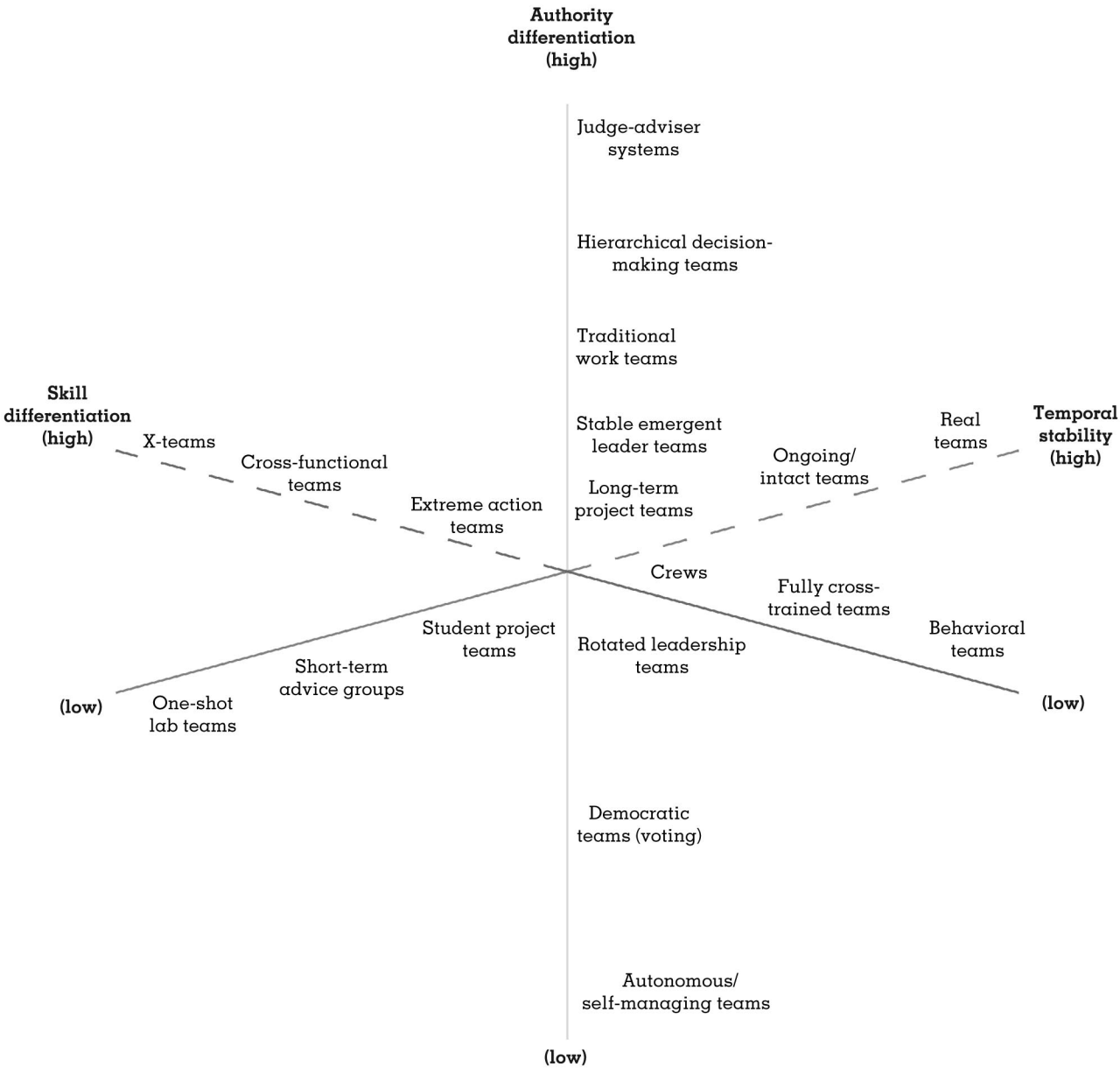
By definition, teams are made up of multiple individuals who are linked to each other (Ilgen, 1999), and these linkages form the basis of several different types of structural dependence. This structure dictates who performs various tasks, a dimension we refer to as *skill differentiation*, as well as who has authority to make various decisions when there is disagreement, a dimension we refer to as *authority differentiation*. Finally, the structural linkages may be short term or long-lasting, and, thus, over time, the *temporal stability* of team membership has critical implications. These three dimensions of structural dependence provide a parsimonious yet comprehensive set of variables for depicting, comparing, and contrasting alternative teams.

Although this approach might seem like a rejection of traditional approaches to team types that have relied on either/or categorical systems, in fact, past classification systems can be usefully leveraged in this direction because many of the prior categorization systems have invoked these dimensions as components of more complicated holistic configurations. For example, the superscripts in Table 1 denote which (if any) of these dimensions were invoked as one of the building blocks in the construction of higher-order superordinate team types described in that table. Across all forty-two isolated team types, 89 percent (thirty-seven of forty-two) of the team types invoked at least one of these dimensions. Still, the lack of consistency across categorization systems is also evident, in that only 9 percent (four of forty-two) invoked all three.

Skill Differentiation

Roughly, 55 percent (twenty-three of forty-two) of the team types described in Table 1 invoke skill differentiation as an important dimension for describing the nature of a team. As an example, the operating teams studied by Edmondson, Bohmer, and Pisano (2001) included a surgeon, anesthesiologist, and nurse, each of whom had

FIGURE 1
A Dimensional Scaling Framework for Describing Teams



their own unique skill set. In teams characterized by high skill differentiation, it typically takes a long time to develop the abilities associated with specific team members, and, thus, people are not easily interchangeable. In contrast, teams that are characterized by low skill differentiation have members who are high in substitutability such that team members are not bound to one unique role. For example, the service technician teams described by Mathieu et al. (2008) met as teams to discuss best practices and technological updates but were assigned to jobs at external work sites as individuals. As such, each team member had to be cross-trained and able to do all jobs at all sites, making the team members high in substitutability.

We take a broad perspective on the term *skill* here in order to also include differences in ex-

perience, education, culture, gender, or any other factor where differentiation is likely to have an impact on the ability of the team to perform the work. In their theoretical article on workgroup diversity and group performance, van Knippenberg, De Dreu, and Homan (2004) proposed that different types of diversity in teams affect the elaboration of task-relevant information (see also Homan et al., 2008) and thereby affect team performance. Consistent with this perspective, if members of particular groups are part of the team because they bring a unique perspective to the work that would be missing without them, this reflects skill differentiation as we conceptualize it here.

The dimension of skill differentiation was an important building block of several types of teams we came across in our earlier analysis, and, hence, these team types can be used as "anchors" along various points of the overall unidimensional continuum (see Figure 1). At the high end of this continuum, we find X-teams, which are defined by their members' unique relations with outside groups—hence their roles in the team are not easily substitutable (Ancona et al., 2002; see 27 in Table 1). Next along this dimension we find cross-functional teams, where the defining characteristic is that their members have different functional backgrounds (Denison et al., 1996; Lovelace et al., 2001; Pinto et al., 1993; see 23, 24, and 25 in Table 1). This is followed by extreme action teams, which are composed of members who have different skills (Klein et al., 2006; see 28 in Table 1) but which regularly have to incorporate new members, each of whom must have a set of common core skills.

Crews are then further along the continuum, characterized by high levels of role differentiation and role standardization (Salas, Burke, Bowers, & Wilson, 2001; Salas, Fowlkes, Stout, Milanovich, & Prince, 1999; see 29 in Table 1). Crews can be argued to score somewhat lower on skill differentiation than the aforementioned types of teams, because in some cases all members might be new to the current crew and are, thus, substitutable in this sense. In contrast, when teams are at the low end of the continuum, more than one team member can quite easily fulfill different roles. For example, fully cross-trained teams would meet this definition, but also included would be teams where training is not that critical because the low scope of the tasks means that almost anyone could pick up the skills quickly, as is the case with behavioral teams (Stewart & Barrick, 2000; see 42 in Table 1).

Authority Differentiation

In general, 38 percent (sixteen of forty-two) of the team types described in Table 1 discuss authority differentiation as a critical dimension for categorizing teams. In the face of disagreement, there may be one person who is formally assigned the leadership role in the team who unilaterally makes the decision. In contrast, in a different team decisions might be made by an informal emergent leader. Although one person wields a disproportionate amount of influence in each of these cases, the two cases differ in the sense that emergent leaders may be weaker and more task specific in their influence relative to formal leaders. In contrast, in other contexts no one person may possess an inordinate amount of influence and, hence, authority differentiation may be low. For example, in the face of disagreement, the team as a whole may resolve the conflict via a public debate that leads to opinion change and consensus. In yet other teams decisions in the face of disagreement might be made via voting procedures that may (or may not) be made public (secret ballots) or that may (or may not) follow a public debate. When voting is not unanimous, this means that opinion change has not been universal, and this could have an impact on future team processes and emergent states, making voting different from consensus building. Thus, like skill differentiation, authority differentiation is not a dichotomy, and many teams operate somewhere in between full leader control and complete self-management (Manz & Sims, 1987).

At the high end of this continuum, teams have a formal leader who has full authority to make decisions. As shown in Figure 1, this includes judge-adviser systems (Sniezek & Buckley, 1995; see 34 in Table 1), where the judge and the advisers do not share in the outcome of the decision, which serves as an anchor on this dimension. Also high on this dimension, but arguably a little less so than judge-adviser systems, are hierarchical decision-making teams (Hollenbeck et al., 1995; see 33 in Table 1), where those providing input are affected by the decision that

is rendered by the authority figure. Cohen and Bailey state that traditional work teams "are directed by supervisors who make most of the decisions" (1997: 242), so these teams would also rank high on this dimension (see 6 in Table 1). Teams in which leadership is emergent yet stable over time would rank intermediate on this continuum, slightly higher than teams that rely on situation-specific emergent leadership or rotated leadership. The lower end of this continuum is anchored with teams where decision authority lies in the hands of the team members themselves, such as self-managing teams that vote (Manz & Sims, 1987; see 35 in Table 1) or autonomous work teams (Taggar et al., 1999; see 36 in Table 1) that rely on consensus. Like skill differentiation, authority differentiation is likely to have a powerful impact on team processes, emergent states, and outcomes, and, thus, it becomes an important variable to describe in empirical studies and meta-analyses.

Temporal Stability

Approximately 57 percent (twenty-four of forty-two) of the team types described in Table 1 use some version of this as a dimension for categorizing teams. At the high end of this continuum, teams are stable and have a history and future together, with membership that does not change often or very easily. As shown in Figure 1, this is anchored by teams that Hackman (2002) refers to as real teams, where members may work together for as long as ten years. Also high but slightly lower on this continuum are ongoing teams (Devine et al., 1999; see 14 and 16 in Table 1), intact teams (Salas et al., 2008; see 18 in Table 1), and long-term teams (Joshi & Roh, 2009; see 20 in Table 1), many of which work together for up to a year on specific projects. In contrast, the ad hoc teams discussed by Devine et al. (1999; see 13 and 15 in Table 1) are an exemplar of teams scoring at the low end of the continuum, as are short-term teams (Joshi & Roh, 2009; see 19 in Table 1). Some student project teams may work together for ten to fifteen weeks, some advice groups may meet three to five times over the course of two to eight weeks, and some one-shot laboratory teams may only work together for a few hours.

Temporal stability, like the two other dimensions in our framework, is a critically important dimension for describing and differentiating teams, but in the team type literature "time" has often been regrettably lumped indiscriminately into the lab versus field distinction in a way that obscures its impact as documented in the wider literature on teams. There is a great deal of historical theoretical support for the notion that teams that are new and at earlier stages of development are fundamentally different from teams that are very mature or at later stages of working together (Gersick, 1988; Kelly & McGrath, 1985; Kozlowski, Gully, Nason, & Smith, 1999; Tuckman, 1965), and this is true inside and outside the laboratory. In addition, more recent episodic-based theories of teams highlight the performance, learning, and cohesiveness benefits of having gone through a large number of performance/feedback cycles (Marks, Mathieu, & Zaccaro, 2001; Mathieu & Button, 1992) over extended time periods, and the nature of the context in terms of field or lab is irrelevant to this conceptual treatment.

Taken together, the dimensions of skill differentiation, authority differentiation, and temporal stability constitute a parsimonious yet comprehensive and continuous three-dimensional conceptual space in which the alternative types of teams we reviewed (see Table 1) can be placed. These dimensions are grounded in historical precedence, and by that we mean that they form the basic building blocks for many of the classifications systems generated to date. In addition, there are theoretical reasons related to group processes and emergent states that would logically imply that these are differences that make a difference.

A ROAD MAP FOR APPLYING THE THREE-DIMENSIONAL MODEL

Given the long history and strong inclination within the literature on teams for developing team type systems, any suggestion to move from this approach to an approach based on dimensional scaling may seem unsettling and set up an uncertain future. However, we believe there are many specific ways to apply the three-dimensional scaling model introduced here that can improve conceptual theory building, empirical theory testing, and actual management practice in terms of composing and developing teams in applied contexts.

Using the Three-Dimensional Model to Build Theory

How to conceptually describe the nature of teams. Most theory building starts with strong description, and given the variability in the nature of teams, any scholar building a theory of teams must provide an answer to the question, "What kind of team is this?" In the past, the answer to this question in this literature has been to invent new and ever-expanding lists of team types. In the future, any theory builder could use the dimensional scaling approach to answer the same question, only with more precision and less ambiguity than a categorical system that forces unwarranted either/or distinctions. Instead of trying to pull from a list of forty-two or more abstract team types, and then retrofitting or squeezing teams into systems that were not tailored to the context, the approach that is supported by a dimensional scaling framework simply requires one to describe the teams that are the focus of one's theory building along three continua that have well-established meanings and history.

The dimensional scaling framework also eliminates the need for authors to generate a new team type when no existing team type can be retrofitted to their theory-building context. Future scholars simply have to provide three points along each of these continua to locate their own teams in this conceptual space. As an analogy, this is like moving from a navigational system relying on subjectively perceived constellations (i.e., are we under the Big Dipper or Little Dipper, or is this not a dipper at all but, rather, the Big Bear?) to one relying on GPS coordinates. One carefully constructed sentence would obviate the need for authors to choose and defend a specific team type.

In addition, researchers could use this model to structure their thinking when they are examining a particular type of team or family of teams. Thus, if one were trying to make sense of different teams that in the literature have all been labeled action teams, this framework could give some guidance for how to think through the differences or similarities by focusing on the properties highlighted by this model. Similarly, if a researcher were exploring flight crews in civilian and military contexts, this model might stimulate thoughts regarding the nature of differences between these teams that exist despite the common nature of the team task itself.

Although this system may not eliminate all ambiguity when describing the nature of the teams that one is theorizing about, it is demonstrably more precise than the status quo team type system. Table 1 reproduces direct quotes that have been used to define existing team types, and a close examination of these quotes shows how replete these definitions are with ambiguous qualifying language that defies any precise categorization attempts by researchers. The definitions use words like "sometimes" (as in sometimes this team type has this property but sometimes not), "usually" (usually this team type has this property but frequently it does not), "may" (this team type may have this property or it may not), "most" (most of this type have this property but a few do not), "typically" (typically these types of teams have this property but not always), "traditionally" (traditionally this type of team has this property but not now), "generally" (this type generally has this property but not in many specific contexts), and so on. Obviously, we do not recommend the use of typologies, but anyone who would endorse the typological approach recognizes the need to be able to support mutually exclusive and exhaustive classification, and this kind of language simply does not allow for this.

How to choose theoretical antecedents and boundary conditions. In addition to precisely describing what the phenomena of interest are, theory building also requires a description of relationships in terms of what is related to what, as well as boundary conditions (when, where, and with whom) associated with those relationships. One virtue of the three-dimensional scaling conceptualization described here is that it can be used to suggest new variables to consider in one's set of antecedents and boundary conditions. There is a great deal of past theory and research on the dimensions that make up this three-dimensional scaling framework (as mentioned earlier, 89 percent of the team types reviewed in this article invoked at least one dimension), and, hence, this promotes the ability to leverage this past work when specifying relationships while building theory.

For example, based on past theory and research on authority structures, a team that is high in authority differentiation might encounter problems with lower-level team members'

commitment or understanding of decisions that result in implementation problems (Vroom & Yetton, 1973). A team in this conceptual location may also struggle to develop future leaders, because low-level team members do not develop a lot of experience making and learning from their own decisions (Tyler & Lind, 1992; Vroom & Yetton, 1973). In contrast, a team that is currently at the far southern end of this continuum may encounter predictable problems associated with the use of consensus-based decision-making methods. For example, teams that rely heavily on consensus tend to take much longer to make decisions, and they often generate a great deal of public conflict in the process when people have strong and different opinions (Beersma & De Dreu, 2002; Romme, 2004).

Some teams attempt to resolve this by resorting to voting procedures, but this process may ignore and disenfranchise minorities or lone dissenters, thus creating subgroups and possibly future conflict (Homan et al., 2008). When strong differences of opinion create entrenched political subgroups or fault lines within the team (Lau & Murnighan, 1998), this promotes satisficing compromises that are attractive more for their ability to reduce conflict than for their actual potential to solve problems. In addition, there is often a diffusion of responsibility and low levels of personal accountability for consensus-based decisions, because specific decisions cannot be directly traced to specific individuals (see Liden et al., 1999, and Wallach, Kogan, & Bem, 1964).

Similarly, based on past theory and research on authority structures, a team that is very high in skill differentiation may encounter predictable problems with communication difficulties and conflict attributable to differences in perspectives, preferences, language, and experiences embodied in different members (Thompson, 1961). In addition, teams with narrowly defined roles are often more efficient than teams with broader roles, but they suffer in terms of their flexibility and ability to respond quickly to changes in their task environment (Hollenbeck et al., 2002). Narrowly defined roles also have advantages when it comes to team initial staffing but disadvantages when it comes to team member satisfaction and long-term retention (Parker, 2003). Alternatively, broadly defined roles increase opportunities for individual members of the team to express their individuality, but they often detract from cohesiveness and helping behavior within the team (Drach-Zahavy, 2004). Moreover, if a team is struggling with a complex problem because the members have generic skills but lack highly specialized knowledge, then a shift toward more narrowly defined roles may be required in order to more successfully accomplish the task (Moon et al., 2004).

Finally, most of the existing theory and research on temporal stability suggests that mature teams have much higher levels of member familiarity (Harrison, Mohammed, McGrath, Florey, & Vanderstoep, 2003; Littlepage, Robinson, & Reddington, 1997) and engage in much more implicit coordination (Cannon-Bowers, Salas, & Converse, 1993; Rico, Sánchez-Manzanares, Gil, & Gibson, 2008). Well-established teams also develop highly shared mental models (Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000; Mohammed, 2000) and more differentiated transactive memory systems (Moreland & Myaskovsky, 2000; Wegner, 1987) relative to new teams. Having a shared history has been shown to affect the dynamics of teamwork (Beersma et al., 2009; Johnson et al., 2006), and teams adapt more or less easily to new situations partly as a result of the nature of their shared experiences. Still, some of these virtues of maturity are offset by certain liabilities, in the sense that if a highly stable team seems to lack creativity or is experiencing the typical problems associated with groupthink (Janis, 1982), then the team might benefit from breaking up the unit and reforming into different teams.

In addition to this, extant theory and literature on these dimensions can also be leveraged to describe boundary conditions associated with various theories, in the sense that this can help answer the theoretical questions of where, when, and with whom various relationship are stronger or weaker. For example, Harrison, Price, and Bell (1998) showed that the relationship between different forms of diversity and team outcomes was moderated by temporal stability such that surface-level diversity was critical in new teams but deep-level diversity was more important in mature teams. Research also shows that temporal stability is a moderator of relationships of other antecedents to outcomes (Bell, 2007).

How to choose theoretical outcomes and mediators. Team type is traditionally treated as either an "input" in the popular "input-process-output" (IPO) model or a moderator of IPO rela-

tionships, and, hence, it is rarely, if ever, treated as a dependent variable or mediator variable in most theory-building efforts. This is exacerbated by the tendency to think about the nature of teams in dichotomous or nominal terms, because dependent variables in this field are typically conceptualized in continuous terms rather than categorical terms. A framework that treats the dimensions that determine the nature of the team as continuous variables is more conducive to conceptualizing one of these dimensions as an outcome, and this is especially valuable given the current emphasis placed on temporal issues and changes in teams over time (Ancona, Okhuysen, & Perlow, 2001). For example, research by Bunderson and Sutcliffe (2002) has shown that skill specialization changes over time such that some teams restructure themselves based on their experience. That is, this research shows that teams that experience failure often reduce their level of role specialization over time because of lack of trust in team members (and therefore they become a different type of team). In addition, structural adaptation theory (Beersma et al., 2009; Johnson et al., 2006) also proposes that teams change their decision-making structure over time in reaction to failure, which again places one of the more common building blocks of team types into the role of a dependent variable. Thus, research on the continuous dimensions that serve as the building blocks of team types shows that these change over time, so a dimensional scaling approach expands the choice of outcomes that might be the focus of theory-building efforts.

Once one begins thinking about team type as an outcome that may change over time, this also highlights the opportunity to choose the nature of the team as a mediator variable in one's theory that might explain why some team-related independent variable affects some team-related dependent variable. For example, if, in the face of failure, team members' natural reactions are to restructure their skill differentiation or authority differentiation in ways that loosen their interdependence, this could have domino-like effects on future team dynamics, team performance, and viability. Research that treats the nature of the team as a fixed and stable type simply does not promote theorizing about the nature of the team type as an outcome or mediating variable, whereas the dimensional scaling approach we propose does.

How to specify alternative forms of theoretical relationships. Beyond description and the contribution to one's ability to answer the theoretical questions that have to be addressed by a sound theory (i.e., what, why, where, when, and with whom), the dimensional scaling approach advocated here also promotes more complex choices regarding the specification of how the nature of the team might be related to team processes, emergent states, and outcomes. With dichotomous either/or systems or nominal categorical systems, the how question is reduced to a simple "more or less" answer that always presumes some underlying linear form.

In contrast, an approach that relies on dimensional scaling sets up meaningful continua that support the search for nonlinear relationships between the nature of the team, on the one hand, and team processes, emergent states, or outcomes, on the other hand. For example, Ellis et al. (2003) found that skill differentiation related to team learning in an inverted-U fashion such that when teams were very low in skill differentiation, the task scope for each team member was so high that it created an information overload problem that precluded learning. In contrast, when the teams were very high in skill differentiation, the lack of overlap in information collection and interpretation between members hindered meaningful social interaction and discussion, thus precluding learning. Instead, moderate levels of skill differentiation that allowed for some scope-reducing specialization, but at the same time some overlap in functional roles between members, proved to be the best of both worlds for promoting effective learning and performance. This inverted-U relationship could never be detected with nominal categorizations because its testing requires ordinal-level data. In general, the predilection toward nominal and categorical variables that characterizes team research serves as both a constraint with respect to how researchers think conceptually about relationships and as an impediment to the discovery of nonlinear relationships.

Using the Three-Dimensional Model in Empirical Research

How to empirically operationalize the nature of teams. Just as when building theory, researchers, when testing theory, must describe the exact nature of the teams they have studied.

The dimensional scaling framework eliminates the need for authors to squeeze their teams into a team type category that is not tailored to the specific teams or to invent a new team type. Instead, future researchers simply have to provide the three GPS coordinates that locate their own teams in this conceptual space or the range in variability characterizing the teams in that same space. For example, with respect to authority differentiation, a researcher can say that these teams "had a formal centralized decision maker, but in roughly half the cases, this person delegated specific decisions to lower-level members for tasks that were narrowly addressed by their unique skills." Or the researcher can say that these teams "relied on consensus to make decisions about half the time, but also voted on what to do about half the time." Note that with continuous systems qualifying language helps the research more precisely establish exactly where the teams reside on the continuum (e.g., this team is not at one anchor or another but, instead, in between two specific anchors), whereas in categorical systems qualifying language serves as an impediment to mutually exclusive categorization.

In fact, a dimensional scaling framework provides an easier and more flexible approach for addressing the needs of both researchers and consumers of research. Like routinely supplying a table of descriptive statistics and correlations, stating where teams reside on these specific dimensions should serve as the new standard operating procedure for describing the nature of one's teams in all method sections when answering the often asked question, "What kind of team is this?" It also provides a powerful framework for visually depicting the nature of entire programs of research, in the sense that a narrative or meta-analytic reviewer could use this to describe and visually depict the conceptual space where there is a great deal of research versus no research at all. In addition to showing descriptively where research is lacking, a dimensional scaling approach also provides a powerful framework for visually depicting where relationships between variables are strong, weak, or nonexistent (e.g., a particular relationship might be strong in a context where teams have high skill differentiation but weak in contexts where teams have low skill differentiation).

How to increase statistical power for detecting team-related effects. In order to empirically support theories that specify main effects, mediating effects, and moderator effects associated with the nature of the team, one needs some degree of statistical power. A framework based on a dimensional scaling approach is superior to a dichotomous or nominal approach because most processes, emergent states, and outcomes are measured with instruments that generate scores that are continuous and normally distributed (LePine et al., 2008). It is extremely rare for the dependent variable (or mediator) in a team study to be a dichotomy or a nominal variable, and it is a psychometric fact that when predictors and criteria fail to share the same distribution, this necessarily attenuates effect sizes, thus reducing the statistical power associated with any statistical test (Nunnally, 1978).

Thus, if dependent variables like team performance or frequency of communication or group cohesiveness are indeed continuous and normally distributed, then any study that creates a dichotomous or nominal independent variable immediately restricts the size and variability of any resultant effect. This directly threatens the ability to detect moderator effects or boundary conditions both within a single study and across studies as part of a meta-analysis. In some cases this cannot be avoided because the nature of the underlying predictor is actually nominal, but as we have shown, almost all of the dimensions that serve as building blocks for team types are continuous and normally distributed variables, which are then combined in idiosyncratic ways to create dichotomous or nominal superordinate categories.

Using the Three-Dimensional Model to Promote Managerial Practice

In addition to theoretical and empirical implications, the three-dimensional framework could also have practical value for diagnosing where a specific team resides in this conceptual space, predicting the virtues and liabilities of that specific location in conceptual space, as well as the virtues and liabilities associated with moving from that location to a different location. As we noted already, there is a great deal of evidence suggesting that certain types of teams are likely to experience certain strengths and weak-

nesses, and this can be used to inform practical decisions regarding organizational change.

For example, a team that has a high level of authority differentiation might encounter the typical problems with this structure (i.e., implementation problems due to lack of lower-level commitment or understanding of decisions or inability to develop future leaders). A team with this set of problems may want to move either south within this space a small degree (rotated leadership among the members) or more radically (self-management requiring consensus on most decisions). Alternatively, if the team is located in the southern region of this space, it may encounter the typical set of problems associated with teams that rely on consensus (i.e., slow decision making or high levels of public conflict or lack of accountability and diffusion of responsibility). A team with this set of problems may want to move north within this space either a small degree (rely on an agreed-upon informal emergent leader) or more radically (a hierarchical decision-making team where one person has unilateral and formal authority to render decisions after obtaining input from members).

Similarly, a team that is very high in skill differentiation may encounter predictable problems with this structure (i.e., communication difficulties attributable to differences in perspectives, preferences, language, and experiences embodied in different members), and these problems might be ameliorated by moving to a different space along this continuum by increasing the level of cross-training of all members. Alternatively, if a team is struggling with a complex problem because the members have generic skills but lack highly specialized knowledge, then a shift in space in the alternative direction might be required.

Finally, if a highly stable team seems to lack creativity or is experiencing the typical problems associated with groupthink, then the team might benefit from injecting new and different members (or removing some old and traditional members), thus lowering its temporal stability. Alternatively, if a team is lacking in identification because people enter and exit at will, making it impossible to even discern who is on and off the team, then movement to strengthen the boundary and create greater temporal stability might be required.

Thus, the three-dimensional framework we develop here could be used to generate a standardized diagnostic model for managers that would allow them to (1) locate precisely where their own team is in this conceptual space, (2) learn the typical virtues and liabilities associated with that space, and (3) predict the likely implications for moving the team to a different space via restructuring or membership change. The tight link between the theoretical model and the diagnostic tool helps support effective science-practitioner communication and promote evidence-based management.

A ROAD MAP FOR EXTENDING THE THREE-DIMENSIONAL MODEL

How to Expand the Nature or Number of Underlying Dimensions

One could accept the general argument that a dimensional scaling approach is a fundamentally better conceptual framework for describing or contrasting different teams relative to existing team type systems but still challenge the specific three-dimensional model proposed here. That is, one might argue that the field needs more than three continuous dimensions or a different set of continuous dimensions than we have proposed. Although we feel the need for this is somewhat countered by the fact that we leveraged many of the past team types in constructing this framework (and there is surprisingly good consensus on the critical underlying dimensions), this is ultimately an empirical question. Fortunately, the dimensional scaling approach is flexible and can be expanded if future empirical results demonstrate that some important dimension is missing from this framework when it comes to predicting real-world outcomes. One simply needs to add a description of the team on some fourth dimension (e.g., reward interdependence) and test to see if this has explanatory power over and above the three-dimensional model advocated here. If research supports the addition of some other critical dimension, a team's score on this dimension could simply be added to the vector of three scores that we propose here. Thus, this framework can serve as a catalyst that motivates future scaling research competitively testing alternative scaling models.

For example, because an increasing amount of work is conducted by virtual teams that are connected by technology rather than face-to-

face interaction, a fourth dimension that might be considered for this framework is the degree of virtual presence, which current scholars treat in continuous terms (see Schweitzer & Duxbury, 2010). In general, face-to-face teams share a tighter structural linkage because members share time and space, and virtual teams are less strongly linked because they fail to share time and space. However, there are many different technologies that can be employed by virtual teams that simulate, in various graded degrees, face-to-face communication, thus supporting the continuous dimensional scaling approach that describes the nature of the team with a continuous score.

Another way to expand the number of dimensions is to decompose some of those proposed here and empirically test the value of splitting what are traditionally treated as unidimensional constructs. As an analogy, although extraversion is traditionally treated as a unidimensional construct within the Five Factor Model, researchers have been able to show value in terms of predicting and explaining certain outcomes by splitting the "sociability-gregariousness" subdimension with the "surgency-dominance" subdimension of this trait (Hough, 1992; Lucas, Deiner, Grob, Suh, & Shao, 2000). In a similar fashion, although we follow the lead of most of other scholars who have focused on temporal issues in teams by defining temporal stability in terms of a team's past and future (Harrison et al., 1998; McGrath, 1984), future researchers may be able to show that there is predictive and explanatory value in distinguishing teams with a past from teams with a future.

Thus, there may be some "lame duck" teams that have a past but no future, as well as "start-up" teams that have a long-term expected future but no past. The broader construct of temporal stability would have to be decomposed to capture likely differences between these types of teams. As in the case with extraversion, however, one must still recognize that across most contexts the subdimensions are going to be highly related to each other, and in most cases teams that have had a substantive past are likely to have a substantive future. Still, the three-dimensional scaling framework provided here offers a systematic, conceptually meaningful, and cumulative way to think about this issue, beyond just taking the concept of lame duck team, throwing it on the pile of other categorical team types listed in Table 1, and labeling it team type no. 43.

Indeed, even if there is broad support and acceptance of this dimensional scaling approach, we suspect that given the range of contexts where one encounters teams and given the creativity of team researchers, there will always be some new and unique team that surfaces from field work (e.g., whistle-blowing Wikileaks teams). Dimensional scaling does not prevent this kind of discovery; however, it does provide the researcher with a structured framework for describing the common and unique aspects of this new team type and how it fits into a relatively parsimonious existing framework with well-known dimensions. Perhaps this existing framework will have to be expanded to include a new dimension so that it can capture this type of new team (i.e., team members have to work together in secrecy). Still, this would seem a preferable place for such a researcher to start and end, relative to having to compare this new team to each of the forty-two or more categorical team types identified in Table 1 and hoping to be able to then add it to the pile as team type no. 44.

Finally, although expandability is certainly a virtue of the dimensional scaling approach, one caveat to note is that there is some virtue to a three-dimensional framework because three dimensions are easy to physically represent and humans generally perceive objects in three dimensions. Still, the trade-off between broad coverage (as operationalized by more than three dimensions) and parsimony (or visualization) is debatable and empirically testable. We hope this model will motivate such a debate and empirical testing. Within the area of personality, for example, the consensus turned out to be that one really needed five dimensions to describe personality comprehensively, and this trumped the need for the conceptual parsimony of a three-dimensional system within that area of behavioral sciences.

How to Improve the Operationalization of Dimensions

Future research based on the framework we propose would require standardized methods for measuring these three dimensions, and there are both short- and long-term approaches to this

end. In the short-term, subject matter expert judgments could be used to place different teams in this space, guided by the anchors we provide here. This process could also be augmented by using some preexisting self-report measures that tap these dimensions in a general way (e.g., Campion, Medsker, & Higgs, 1993; Gulowsen, 1972; Levesque, Wilson, & Wholey, 2001; Manz & Sims, 1987; Uhl-Bien & Graen, 1998; Wageman, 2001; Wall, Kemp, Jackson, & Clegg, 1986).

Because most of the existing measures reviewed above were not specifically designed to tap the full range of the dimensions we propose here, however, a better long-term solution would be to develop new, more focused scales built expressly for the purpose of capturing this framework. Our emphasis on continuous and generalizable dimensions may mean that these new approaches have to deviate from the traditional practice of using summative scaling models for our measures. Instead, there may be a need to embrace deterministic scaling models (e.g., Guttman scales) or nonmonotone probability scaling models (e.g., Thurstone scales) that are more conducive to cross-sample comparisons (for a discussion of alternative psychometric scaling models, see Nunnally, 1978). Although it is beyond the scope of this article to conduct psychometric work per se, given the definitions of the constructs, the anchors provided here, and the existing measures as a starting point, the construction of these scales is not likely to be an insurmountable problem.

How to Use the Dimensional Scaling Approach to Reinforce or Revisit Past Research

In addition to promoting new ways of thinking about future research, the dimensional scaling approach also provides a lens for reinforcing or revisiting past programs of research and genres within the existing literature base. For example, given the emphasis that this framework places on the constructs of skill differentiation, authority differentiation, and temporal stability, revisiting what we have learned from literature on those constructs and expanding what we know are high priorities. For example, with respect to a construct like authority differentiation, Halevy, Chou, and Galinsky (2010) recently reviewed the literature on this construct (using the label *vertical differentiation*) and documented five specific sets of results from past programs of research that explain why decision-making schemes that reside at the hierarchical end of the decision-making continuum provide functional value for teams. They then laid out a series of the most pressing questions that need to be answered with respect to vertical differentiation as research on this topic moves forward. This review provides a good example of what we also need with respect to summarizing what we know (and need to know) regarding skill differentiation and temporal stability in teams.

The dimensional scaling approach also creates an opportunity to revisit the literature on task types in team contexts. As we noted earlier, most of the literature on team types goes beyond task characteristics when constructing team types, but as we also noted, any task type can be converted into a team type as long as the system generates comprehensive and mutually exclusive task types. The dimensional scaling approach offered does not place a premium on task types per se but instead recognizes how skill differentiation, authority differentiation, and temporal stability impact processes, emergent states, and outcomes in different teams that all may be working on the same task.

For example, two student project teams in a class may be working on the exact same task (a business case analysis), and yet they could reside in very different conceptual spaces as depicted in Figure 1. One team may be composed of members with four different majors (high skill differentiation), have a single member that makes most of the team's decisions because of referent or expert power (high authority differentiation), and may have worked together on many other projects as part of a multiyear program of study (high temporal stability). In contrast, another team may be composed of members who all share the same major, have no one person who is consistently influential across tasks, and may have never worked together on any prior projects. If one were to then take these two different types of teams and provide them a dramatically different task (planning a reception for a group of corporate recruiters visiting their campus), we suspect that task type would explain much less variance in processes, emergent states, and outcomes when compared to the combined effects of skill differentiation, authority differentiation, and temporal stability.

Still, research on task characteristics at the individual level leaves no doubt that people re-

act differently to different types of tasks (Hackman & Oldham, 1976). Thus, one can certainly not rule out the possibility that the framework presented here may need to expand and perhaps add a dimension that would capture some feature of the team's task beyond the three dimensions we isolate. For example, research on relational job design indicates that people respond differently to work that is prosocial in nature (i.e., has positively demonstrable effects on other people's lives), relative to work that cannot be framed in such a manner (Grant, 2007). The degree to which this type of task characteristic might attenuate, accentuate, moderate, or simply add to the effects of skill differentiation, authority differentiation, and temporal stability in terms of explaining variance in team processes, emergent states, and outcomes is a very worthy topic for future research.

SUMMARY AND CONCLUSION

There has been a very strong tendency within the literature on teams for investigators to generate different types of teams, but there has been little consensus in classification systems across investigators. This has impeded our conceptual ability to conduct meaningful comparisons and contrasts, thus limiting our ability to specify critical theoretical boundary conditions. It has also impaired our ability to accumulate results across studies via meta-analyses, thus limiting our ability to summarize the status of theory-testing results across contexts. It is somewhat ironic that scholars at the forefront of the knowledge base on teamwork would struggle to reach collaborative agreement on the most important types of teams that comprise the units of study in this field. Our hope is that this framework will redress this problem and initiate a conversation on how to best conceptualize differences between teams in a consistent, flexible, and efficient manner.

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