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# Embracing Complexity: Reviewing the Past Decade of Team Effectiveness Research

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## Keywords

teamwork, processes, emergent states, composition, structure

## Abstract

We conceptualize organizational teams as dynamic systems evolving in response to their environments. We then review the past 10 years of team effectiveness research and summarize its implications by categorizing studies under three main overlapping and coevolving dimensions: compositional features, structural features, and mediating mechanisms. We highlight prominent work that focused on variables in each of these dimensions and discuss their key relationships with team outcomes. Furthermore, we review how contextual factors impact team effectiveness. On the basis of this review, we advocate that future research seek to examine team relationships through a dynamic, multilevel perspective, while incorporating new and novel measurement techniques. We submit that the future of teams research may benefit from a conceptualization of them as dynamic networks and modeling them as small complex systems.

## INTRODUCTION

Given the modern-day hypercompetitive and fluid environment, organizations have adopted team-based designs to maximize the value of their human capital. Teams enable organizations the flexibility to compose and reconfigure their team memberships to align members' competencies with task demands. In short, teams have become the basic building blocks of present day organizational designs, and the research literature has expanded exponentially in the past two decades (see also Mathieu et al. 2017, 2018).

Here we review recent developments in the teams literature and identify areas for future research and application. We note that several high profile and quality reviews of the groups literature have appeared in the past 15 years (e.g., Kozlowski & Ilgen 2006, Mathieu et al. 2008), and the body of work is vast and too numerous to review comprehensively. Therefore, we focus our attention on work produced in the decade since Mathieu et al. (2008) and describe how research and application have advanced over that period. Notably, Mathieu et al. (2008, p. 463) concluded their review with the following recommendation:

> [As] we move forward, we need to not only build on what we have, but be willing to take great strides and in some cases leaps to ensure that we are capturing and embracing the complexities of current team arrangements and seeking to better understand them rather than to fit them into our current frameworks. We encourage researchers to "go there" in the next decade.

In many ways, we believe that their recommendation has been heeded, as many scholars have embraced the complexity of modern-day team arrangements and sought to understand them in that light. However, we conclude that much remains to be understood. Although we incorporate insights from groups research in general, we focus on the effectiveness of work teams, which are defined as the following (Kozlowski & Ilgen 2006, p. 79):

> (*a*) two or more individuals who (*b*) socially interact (face-to-face or, increasingly, virtually); (*c*) possess one or more common goals; (*d*) are brought together to perform organizationally relevant tasks; (*e*) exhibit interdependencies with respect to workflow, goals, and outcomes; (*f*) have different roles and responsibilities; and (*g*) are together embedded in an encompassing organizational system, with boundaries and linkages to the broader system context and task environment.

Notably, some authors distinguish between the terms work groups and teams—usually with the latter referring to situations where members have designated positions (e.g., surgeon, scrub nurse)—but for our purposes we use the terms interchangeably. Mathieu et al. (2018) chronicled the evolution of groups research and illustrated how the fields of Industrial/Organizational Psychology and Organizational Behavior have become the nexus of work in the past quarter century. Much of this research was guided by an input-process-outcome (IPO) framework first proposed by McGrath (1964) and refined by Hackman & Morris (1975). In that framework, inputs describe antecedent factors that enable and constrain members' interactions. These include individual team member characteristics (e.g., competencies, personalities), team-level factors (e.g., task structure, external leader influences), and organizational and contextual factors (e.g., organizational design features, environmental complexity). Processes describe members' interactions directed toward task accomplishment. Processes are important because they describe how team inputs are transformed into outcomes. Notably, Marks et al. (2001) and Ilgen et al. (2005) observed that many of the mediational factors that link inputs and outcomes are not behavioral processes, but include collective affect and cognitions. Accordingly, the term mediating mechanisms (M) has come to replace the term processes in IMO models. Outcomes are results and by-products of team activity that are valued by one or more constituencies (Mathieu et al. 2000). Broadly speaking, these may

include performance (e.g., quality and quantity) and members' affective reactions (e.g., satisfaction, commitment, viability).

The IMO model served as a unifying framework for groups research and was expanded over time to better emphasize the influence of task characteristics and an appreciation for temporal dynamics (e.g., Arrow et al. 2000, Ilgen et al. 2005, Levine & Moreland 2012). However, the past few decades have witnessed many theoretical advancements viewing teams as dynamic, multilevel, and complex systems, and developments in terms of research methodologies, measurement systems, and analytic tools are beginning to enable tests of much more complex theories (Mathieu et al. 2018). Whereas research has often neglected the temporal aspects of team functioning (McGrath & Tschan 2007), recent scholars have emphasized the dynamic nature of teams (Cronin et al. 2011, Humphrey & Aime 2014). The trend appears to be taking root as dynamic views of team composition (e.g., Mathieu et al. 2014), contexts (e.g., Maloney et al. 2016), processes (e.g., Humphrey & Aime 2014), and emergent states (e.g., Waller et al. 2016) have been advanced recently.

Given the trends noted above, Mathieu et al. (2017) offered a newer perspective whereby team inputs, mediating mechanisms, and structural features are conceived as overlapping coevolving facets of teams that collectively combine to generate effectiveness, as depicted in **Figure 1**. This approach preserves the core elements of the IMO framework with structural and compositional features (Regions A and B) as key inputs and mediating mechanisms (Region C) functioning as key process and emergent state functions. However, this approach also formally recognizes the

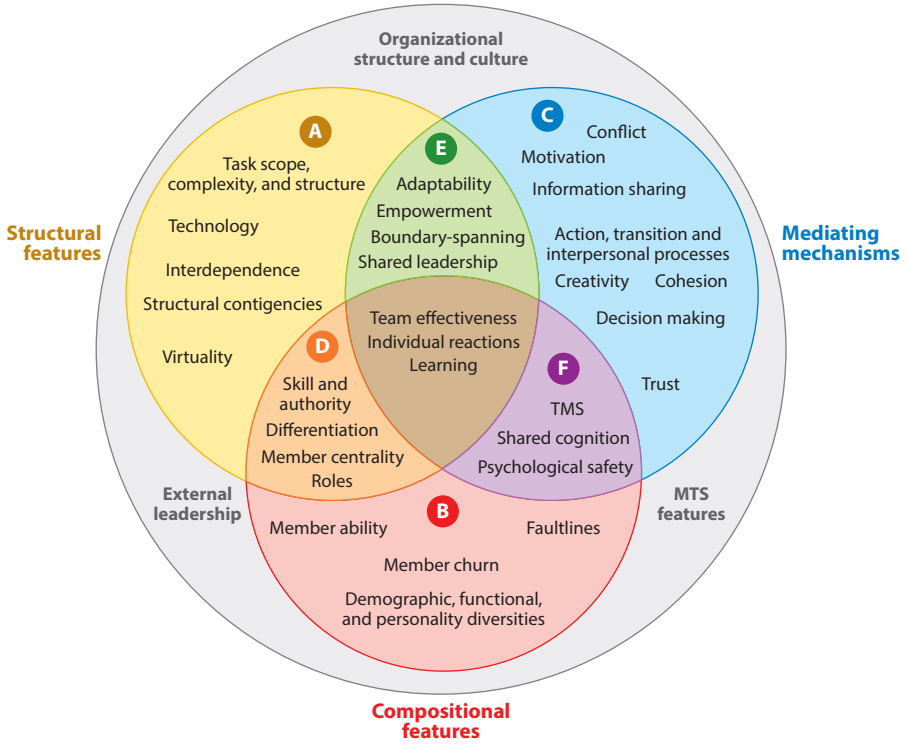


**Figure 1**

Co-evolving team compositional and structural features, mediating mechanisms, external influences, and outcomes. Adapted from Mathieu et al. (2017). Copyright 2017 by the American Psychological Association. Abbreviations: MTS, multiteam systems; TMS, transactive memory system.

reoccurring and time-dependent nature of relationships and that many salient team variables lay at the cross sections of traditional IMO demarcations, as noted by intersecting Regions D, E, and F. For example, the concept of team empowerment embodies both structural features such as the distribution of authority and responsibility in an organization, as well as mediating aspects associated with members' perceptions and motivations. We employ this overlapping Venn diagram approach to organize our review of the literature.

## TEAM EFFECTIVENESS

Whereas several parties may have a vested interest in team functioning, usually the two primary constituencies are (*a*) team members and (*b*) other parties who have an interest in how well the team performs. The latter group would include other parties who rely on the outcomes of a team such as external stake holders, other teams, and customers, in short, anyone outside of the team that has a value stake in the team's functioning. In addition, collectively members are an important constituency, as their willingness to work together again, their commitment to the team and to the organization, and their personal reactions are all important outcomes to consider. Moreover, individual members have a vested interest in the functioning of their team, as they stand to reap rewards, gain valuable experience, learn new things and develop new skills, operate in an enriched environment, etc.

Following the rationale outlined above, Mathieu & Gilson (2012) considered team effectiveness broadly in terms of two types of outcomes: (*a*) tangible outputs or products of team interaction and (*b*) influences on team members. Tangible outcomes can be further classified into three types: (*a*) productivity, (*b*) efficiency, and (*c*) quality. Productivity is defined in terms of quantitative counts of some unit that a team produces (e.g., sales logged, clients served, or engagements completed). Efficiency is a related concept but is defined in terms of quantitative counts of units produced relative to some standard or benchmark (e.g., products relative to raw materials consumed, time required to reach a decision versus time allocated, sales relative to quotas). Quality represents an assessment of the value or worth of outputs (e.g., product rejection rates, decision quality, customer satisfaction, safety rates). In all cases, such outcomes accumulate over time, necessitating a temporal focus to be meaningful.

The second general category of team outcomes can be defined in terms of influences on members. More generally, this category can be thought of as including collective or individualistic outcomes. The collective level of analysis includes shared experiences, such as cohesion or psychological safety, which conceptually are experienced similarly by all members. In contrast, the individual level outcomes refer to attitudes, reactions, learning, and behaviors of individuals that may vary not only between teams, but also within teams. Whether team emergent states are considered as antecedents, correlates, or consequences of team interactions is determined, in large part, by the design that researchers employ. Psychological states require some period of time and experience to develop and to crystallize, particularly if they describe collective properties (Morgeson & Hofmann 1999). In this regard, states are dynamic, again reifying the importance of considering the temporal issues associated with indexing team effectiveness.

## REVIEW METHODOLOGY

### Literature Search

We initiated a review of the teams literature since Mathieu et al. (2008). Specifically, using the SCOPUS online database, we searched for articles that included the terms "team" or "groups" in the title, abstract, or keywords. We limited our search to the following journals known to be prime

outlets for teams and groups research (Baumann 2013): *Academy of Management Journal*, *Academy of Management Review*, *Organization Science*, *Strategic Management Journal*, *Administrative Science Quarterly*, *Journal of Applied Psychology*, *Journal of Management*, *Journal of Organizational Behavior*, *Personnel Psychology*, *Group Dynamics*, and *Small Group Research*. This initial search yielded 1,509 articles. We then conducted a manual review of each article to eliminate ones not focused on teams, which reduced the set to 685 articles, of which 386 were field studies, 146 were laboratory studies, 22 were hybrid studies (e.g., high-end simulations, student consulting teams, mixed samples), and 131 theoretical or other types of articles.

We coded the research designs employed by the investigations and found 327 were cross-sectional, 83 longitudinal, 166 experiments, and 43 qualitative. In addition, 50 investigations used a mixed-methods approach. Ninety-one studies were multilevel in nature, 70 were either theory or review papers, and 29 were meta-analyses. We concentrate our current review on this body of work, but we also refer to other work that pertains to work group research trends over the past decade or so.



### Meta-Analyses

Meta-analyses are powerful tools that summarize the average effect sizes and cross-sample variability of relationships in the literature. We relied on others' meta-analyses to provide quick summaries of what is known in the teams literature, which relationships are variable versus consistent across settings, as well as which issues remain underexplored. Our review described above included 29 meta-analyses involving team constructs, which includes 11 meta-analyses derived from an expanded search beginning in 1998 rather than 2008. **Tables 1** and **2** contain weighted (by number of teams included in the averages) corrected correlations from 25 of the 29 meta-analyses. The other four meta-analyses focused on variables not central to our review. **Table 1** contains team structural and compositional variables with the associated mediators and outcomes, whereas **Table 2** contains the relationships between mediators and team outcomes. We refer to these tables throughout the review.

## STRUCTURAL FEATURES: REGION A

The structural region contains variables such as task scope and complexity, team interdependence, team virtuality, and a team's structural contingencies. Our review identified 99 studies in which a team structural feature held a central or key peripheral role. We provide below key meta-analytic findings and exemplary articles for each representative variable.

### Structural Contingencies

Team structural contingencies derive from contingency theories of structure that generally claim there is no one optimal way to structure an organization, but that external demands should determine the structure (Dimotakis et al. 2012). There was little recent meta-analytic evidence on structural contingencies with the possible exception that high-performance managerial practices (e.g., knowledge management systems, organizational decentralization, high performance work systems) were positively associated with emergent states (Seibert et al. 2011). Dimotakis et al. (2012) provide a classic example of a study examining how a team structured divisionally or functionally can moderate relationships between member orientations and their corresponding behavior and affect. Another interesting study comes from Stuart (2017), who uses a network perspective to address team structural contingencies when a central member leaves their work team. Using a sample of professional hockey teams, Stuart found that when a team's central player is injured,

**Table 1 Meta-analytic correlations between team compositional and structural features, mediators, and outcomes**

| Predictor | Type | Mediators | | | Outcomes | |
|---|---|---|---|---|---|---|
| | | Team processes | Emergent states | Hybrid | Attitudinal outcomes | Team performance |
| Job-relevant diversity | C | | $\rho = -.02^{h,m}$ | | | $\rho = .07^{b,h,i,m}$ |
| Background diversity | C | | $\rho = -.02^{h,m}$ | | | $\rho = -.06^{b,h,i,m}$ |
| Team longevity | C | | | | | $\rho = -.06^{i}$ |
| Team conscientiousness | C | | | | | $\rho = .11^{a}$ |
| Team agreeableness | C | | | | | $\rho = .12^{a}$ |
| Team extraversion | C | | | | | $\rho = .09^{a}$ |
| Team emotional stability | C | | | | | $\rho = .04^{a}$ |
| Team openness to experience | C | | | | | $\rho = .05^{a}$ |
| Team collectivism | C | | | | | $\rho = .25^{a}$ |
| Team general mental ability | C | | | | | $\rho = .27^{a}$ |
| Preference for teamwork | C | | | | | $\rho = .18^{a}$ |
| Emotional intelligence | C | | | | | $\rho = .18^{a}$ |
| Learning orientations | C | | $\rho = .40^{g}$ | | | |
| Psychological safety | C & M | $\rho = .50^{g}$ | | $\rho = .52^{g}$ | $\rho = .57^{g}$ | $\rho =.29^{g}$ |
| Team cognition | C & M | $\rho = .35^{e,f}$ | | | | $\rho = .37^{e,f,i}$ |
| Task orientation | C & M | | | | | $\rho = .45^{i}$ |
| Supportive work contexts | C & M | | $\rho = 0.40^{g}$ | | | |
| Member similarity | C & S | $\rho = .22^{j}$ | | | | |
| Team size | C & S | | $\rho = -.12^{k}$ | | | $\rho = .259^{i}$ |
| Task interdependence | S | $\rho = .395^{c}$ | $\rho = .36^{c}$ | | | $\rho = .13^{c,i}$ |
| Goal interdependence | S | $\rho = .43^{c}$ | $\rho = .25^{c}$ | | | $\rho = .27^{c,i}$ |
| Task demonstrability | S | $\rho = .45^{j}$ | | | | |
| Informational independence | S | $\rho = .52^{j}$ | | | | |
| Cooperation during discussion | S | $\rho = .57^{j}$ | | | | |
| High-performance managerial practices | S | | $\rho = .52^{k}$ | | | |
| Empowerment | S & M | | | | | $\rho = .51^{k}$ |
| Discussion structure | S & M | $\rho = .41^{j}$ | | | | |
| Shared leadership | S & M | | | $\rho = .44^{l}$ | $\rho = .45^{l}$ | $\rho = .21^{d,l}$ |
| Boundary spanning | S & M | | | | | $\rho = .45^{i}$ |
| Work design characteristics | S & M | | $\rho = .40^{g,k}$ | | | |

Meta-analyses: (*a*) Bell (2007), (*b*) Bell et al. (2011), (*c*) Courtright et al. (2015), (*d*) D'Innocenzo et al. (2016), (*e*) DeChurch & Mesmer-Magnus (2010a), (*f*) DeChurch & Mesmer-Magnus (2010b), (*g*) Frazier et al. (2017), (*h*) Horwitz & Horwitz (2007), (*i*) Hülsheger et al. (2009), (*j*) Mesmer-Magnus & DeChurch (2009), (*k*) Seibert et al. (2011), (*l*) Wang et al. (2014), (*m*) Webber & Donahue (2001).
Type codes: C, Compositional; S, Structural; M, Mediating.

teams maintain or even reduce their interaction patterns with other team members. In other words, teams fail to experiment with new plays and patterns with other players, even though doing so was positively related with team performance. This article highlights how a network perspective allows scholars to consider not only the formal structure adopted (i.e., functional or divisional), but also how the pattern and structure of within-team ties operate within that structure in dynamic environments. This is a promising direction for future research.

**Table 2 Meta-analytic correlations between team mediators and outcomes**

| Predictor | Outcomes | |
|---|---|---|
| | Team performance | Attitudinal outcomes |
| Participative safety | $\rho = .15^{i}$ | |
| Support for innovation | $\rho = .58^{i}$ | |
| Cohesion | $\rho = .21^{a,i}$ | |
| Social cohesion | $\rho = .26^{c,d}$ | |
| Task cohesion | $\rho = .30^{c,d}$ | |
| Team efficacy | $\rho = .41^{h}$ | |
| Team potency | $\rho = .37^{h}$ | |
| Team efficacy and potency | $\rho = .35^{h}$ | |
| Task conflict | $\rho = .00^{f,i}$ | $\rho = -.27^{f}$ |
| Relationship conflict | $\rho = -.14^{f,i}$ | $\rho = -.52^{f}$ |
| Process conflict | $\rho = -.16^{f}$ | $\rho = -.56^{f}$ |
| Avoiding (team conflict processes) | $\rho = -.17^{g}$ | $\rho = -.12^{g}$ |
| Competing (team conflict processes) | $\rho = -.23^{g}$ | $\rho = -.20^{g}$ |
| Openness (team conflict processes) | $\rho = .33^{g}$ | $\rho = .45^{g}$ |
| Collaborating (team conflict processes) | $\rho = .31^{g}$ | $\rho = .51^{g}$ |
| Intrateam trust | $\rho = .29^{b,e}$ | $\rho = .66^{b}$ |
| Information sharing | $\rho = 0.41^{i,m}$ | $\rho = 0.41^{m}$ |
| Organizational citizenship behavior | $\rho = .29$n | |
| Team building | $\rho = .31^{j}$ | |
| Problem solving | $\rho = .24^{j}$ | |
| Role clarification | $\rho = .35^{j}$ | |
| Group positive affect | $\rho = .33^{k}$ | |
| Group negative affect | $\rho = -.20^{k}$ | |
| Social integration | $\rho = .27^{k}$ | |
| Mission analysis | $\rho = .27^{l}$ | $\rho = .32^{l}$ |
| Goal specification | $\rho = .32^{j, k, l}$ | $\rho = .36^{l}$ |
| Strategy formulation | $\rho = .35^{l}$ | $\rho = .38^{l}$ |
| Monitoring progress | $\rho = .25^{l}$ | $\rho = .30^{l}$ |
| System monitoring | $\rho = .17^{l}$ | $\rho = .29^{l}$ |
| Team monitoring | $\rho = .30^{l}$ | $\rho = .29^{l}$ |
| Coordination | $\rho = .29^{l}$ | $\rho = .34^{l}$ |
| Conflict management | $\rho = .26^{l}$ | $\rho = .32^{l}$ |
| Motivation | $\rho = .34^{l}$ | $\rho = .41^{l}$ |
| Affect management | $\rho = .30^{l}$ | $\rho = .47^{l}$ |
| Transition processes | $\rho = .29^{l}$ | $\rho = .45^{l}$ |
| Action processes | $\rho = .29^{l}$ | $\rho = .46^{l}$ |
| Interpersonal processes | $\rho = .29^{j, l}$ | $\rho = .37^{l}$ |
| Team processes | $\rho = .31^{l}$ | $\rho = .43^{l}$ |

(*a*) Beal et al. (2003), (*b*) Breuer et al. (2016), (*c*) Castaño et al. (2013), (*d*) Chiocchio & Essiembre (2009), (*e*) De Jong et al. (2016), (*f*) De Wit et al. (2012), (*g*) DeChurch et al. (2013), (*h*) Gully et al. (2002), (*i*) Hülsheger et al. (2009), (*j*) Klein et al (2009), (*k*) Knight & Eisenkraft (2015), (*l*) LePine et al. (2008), (*m*) Mesmer-Magnus & DeChurch (2009), (*n*) Nielsen et al. (2009).

## Task Scope and Complexity

Task scope represents the number of actions required for a task (Mathieu et al. 2017). Task complexity consists of three facets: (*a*) component complexity (i.e., skills and information needed to execute task), (*b*) coordination demands (i.e., required interdependence of required actions to execute task), and (*c*) dynamic complexity (i.e., different actions to execute tasks are required over time) (Mathieu et al. 2017). As shown in **Table 1**, Mesmer-Magnus & DeChurch (2009) found task demonstrability, decision structure, and discussion cooperation were positively associated with team processes. Work design characteristics including task complexity have been positively associated with emergent states (Frazier et al. 2017, Seibert et al. 2011). Additionally, De Wit et al. (2012) found that task type did not moderate the relationship between task conflict and performance, which stands in contrast to previous findings from De Dreu & Weingart (2003). Finally, contradicting results also emerged regarding the effect of task complexity on shared leadership. Wang et al. (2014) found that task complexity significantly strengthened the relationship between shared leadership and team performance, whereas D'Innocenzo et al. (2016) found the opposite, that task complexity significantly weakened the relationship between shared leadership and team performance. Vashdi et al. (2013) studied the moderating effect task complexity has on action team learning, team workload sharing/helping, and the number of adverse events and task durations for surgical teams. They found that high task complexity negatively moderated both the relationship between team workload sharing and the duration of surgeries, as well as the relationship between team helping and duration. In other words, the benefits of workload sharing and team helping were most prevalent in highly complex tasks. Their findings of the moderating effects of task complexity on the relationship between action team learning and the number of adverse surgical events indicated low task complexity negatively moderated the relationship (i.e., less adverse events occurred), whereas medium levels of complexity positively moderated the relationship (i.e., increase in adverse events). High levels of complexity did not have a significant moderating effect. In sum, recent research provides evidence that scholars should consider the scope and complexity of the focal team's task, as differing degrees of task scope and complexity consistently exhibit moderating effects on hypothesized relationships.

## Interdependence

Courtright et al. (2015) defined structural interdependence as "features of the team" that can be manipulated (e.g., resources, workflows, goals, rewards, etc.) by team leaders or members. In their meta-analysis, Courtright et al. found that both structural task (i.e., resource and workflow) and outcome (i.e., goal and reward) forms of interdependence were positively associated with team processes and emergent states. Finally, along with Hülsheger et al. (2009), they found a positive relationship between structural task and outcome interdependence and performance. Task interdependence has also been found to be a significant moderator in meta-analytic relationships such as between team trust and performance (De Jong et al. 2016), teamwork process and effectiveness (LePine et al. 2008), team cognition and team process (DeChurch & Mesmer-Magnus 2010a), cohesion and performance (Beal et al. 2003), as well as efficacy and performance (Gully et al. 2002). One exemplary article dealing with multiple interdependencies considered the impact of such interdependencies within the top management team. Hambrick et al. (2015, p. 451) found that horizontal ("the degree to which…actions and effectiveness of peers affect one another"), vertical ("degree to which members are peers"), and outcome interdependence ("degree to which members receive payoffs for firm (or group) performance rather than subunit or individual performance") strengthened the positive relationships between top management team heterogeneity and turnover as well as firm performance. The general theme across the reviewed literature, as

with task scope and complexity, is that scholars need to theorize and analyze the influence of differing degrees of a team's interdependence (be it task or outcome based) on expected relationships as interdependence frequently moderates these relationships.

### Team Virtuality/Technology

An increasingly important aspect of team structure is the degree of team virtuality (Gilson et al. 2015). One can generally view team virtuality on a continuum from low virtuality (e.g., all in-person communication between members) to high virtuality (e.g., no in-person communication between members) (Perry et al. 2016). To date, only one meta-analysis has considered team virtuality as a moderator, and found that it moderated the relationship between team trust and team performance such that trust was more important to performance in virtual teams than in face-to-face teams (Breuer et al. 2016). Our review did identify 34 articles that dealt with virtuality or technology in some fashion, indicative of an increasing trend. One exemplary article by Mannucci (2017) went beyond observing the impact of high or low virtuality on a relationship by considering the impact that characteristics (e.g., size and diffusion) of the portfolio of technological tools used by animated movie creator teams and members with proficiency in tool use had on team creativity. In sum, authors have generally conceptualized virtuality on a high–low continuum, and it has shown an increasing presence in the literature. However, recent research indicates that scholars are considering increasingly complex research designs to unpack specific mechanisms in which virtuality influences expected relationships. Echoing Gilson et al.'s (2015) observations and consistent with recent trends, we also observe team virtuality and technology as a burgeoning area of scholarly research.

## COMPOSITIONAL FEATURES: REGION B

We collected more than 150 studies that focus on the influence of compositional features of teams—defined as "the combination of members' characteristics" (Mathieu et al. 2017). Research on team composition tends to explore its role as an antecedent of various "processes, emergent states, and ultimately outcomes" (Mathieu et al. 2008). Team composition is conceived in terms of average member characteristics (e.g., Bell 2007, Stewart 2006), various forms of diversity (e.g., Bell et al. 2011), and more complex configurations such as faultlines (see also, Mathieu et al. 2017). Meta-analyses have examined several team compositional features that are discussed below and summarized in **Table 1**.

### Average Member Attributes

Mean values or summary indexes refer to members' attributes averaged as a collective (Mathieu et al. 2008). Scholars elsewhere found evidence for average cognitive ability as a predictor of team performance (Devine & Philips 2001). For example, Stewart (2006) found that average cognitive abilities such as team member mental ability and average expertise (i.e., experience and education) predicted team performance. Additionally, Bell (2007) demonstrated that in the field, despite individual-level attributes, a team's average conscientiousness, agreeableness, and extraversion, positively predicted performance. In fact, in a multilevel study, average extraversion positively related to individual helping behaviors when mediated by cooperative group norms (Gonzalez-Mulé et al. 2014). Furthermore, Hülsheger et al. (2009) showed that the relationship between task orientation and innovation was stronger when aggregated to the team level than the individual level. Other scholars noted in a longitudinal study of self-managing teams, that the average cultural value orientation levels of a team can have differing effects, such that low average uncertainty

avoidance and high average relationship orientations exhibited higher performance than high uncertainty avoidance and low relationship orientations, respectively (depending on team formation) (Cheng et al. 2012). This generally suggests that exploring compositional variables as a summary index is worthwhile to continue as more complex compositional arrangements are also explored as related to team effectiveness.

## Diversity

Diversity was one of the most frequent keywords in this region with more than 76 articles considering numerous diversity factors or "the heterogeneity of team member characteristics" (Mathieu et al. 2008). For example, Mesmer-Magnus & DeChurch (2009) noted group member homogeneity had a positive effect on a team's information sharing, which provided support for the idea that team heterogeneity influences team effectiveness. We first discuss three types of diversity below: surface-level, deep-level, and functional diversity.

## Surface-Level Diversity

Surface-level diversity is defined as "overt demographic characteristics" that are readily apparent to others (Bell 2007). Although Horwitz & Horwitz (2007) do not find support for biodemographic diversity on performance, Bell et al. (2011) concluded that race and sex diversity have small, but significant, negative relationships with team performance, whereas age diversity and team performance were unrelated. Other scholars found that the interaction of visionary leaders' behaviors (i.e., value-based and future-oriented behaviors that influence that of their followers) and leaders' categorizations (i.e., classifying members into subgroups) with team ethnic diversity led to poor financial performance (Greer et al. 2012), whereas team ethnic diversity proved to be beneficial for financial performance in the absence of leaders' categorizations. However, in another study, gender diversity was negatively related to conflict under more inclusive climates (Nishii 2013).

## Deep-Level Diversity

Deep-level diversity focuses on "psychological characteristics such as personality factors, values, and attitudes" (Bell 2007). Bell (2007) synthesized previous work on individual differences, specifying that deep-level compositional variables, including team "Big Five" compositional measures, collectivism, emotional intelligence, and preference for teamwork, were predictors of team performance. Although significant and positive relationships between personality factors and performance and other behavioral outcomes were confirmed by other scholars (e.g., Courtright et al. 2017, Gonzalez-Mulé et al. 2014, Hu & Judge 2017), contradicting results are still evident in differing circumstances (e.g., de Jong et al. 2013). Emotional intelligence, however, positively related to performance through team elaboration in informationally diverse settings (Wang 2015). In fact, teamwork effectiveness was greater for those with higher levels of emotional intelligence, even above that of personality traits (Farh et al. 2012).

## Functional Diversity

Functional diversity refers to a team composed of individuals from different functional areas or backgrounds. Bunderson & Sutcliffe (2002) distinguished between team functional diversity, which is typically calculated by categorizing members as representing one (dominant) functional category, versus intrapersonal functional diversity, which refers to the variety of backgrounds and experiences that members have had in the past (on average). For instance, Cannella et al. (2008)

discovered a positive relationship between both dominant and intrapersonal functional diversity and firm performance, although the effect of dominant functional diversity was moderated by the internal and external context. Despite this distinction, Bell et al.'s (2011) meta-analysis noted that the majority of studies they analyzed did not distinguish between dominant and intrapersonal. Thus, their meta-analysis found that functional background and educational diversity have positive relationships with team performance, team creativity, and innovation. Bell et al. (2011) found agreement with Horwitz & Horwitz's (2007) meta-analytic finding of a positive relationship between task-related diversity and team performance. Nevertheless, the relationship between diversity and team performance, even along this dimension, is inconsistent as other scholars revealed inconclusive results along with small effect sizes (Hülsheger et al. 2009).

### Faultlines

Faultlines are the "hypothetical dividing lines that split a group into subgroups based on one or more attributes" (Mathieu et al. 2008). They hold value in the compositional literature with approximately 15% of the composition-focused articles mentioning it in either the title, abstract, and/or keywords. To date, scholars have argued that faultlines produce negative effects on performance outcomes (e.g., Bezrukova et al. 2016) with a few articles suggesting that they may also yield benefits such as higher creative task performance (e.g., Ellis et al. 2013). Meyer et al. (2014) asserted that the context and types of subgroupings underlining faultlines are important drivers of whether they prove beneficial or detrimental to team processes and outcomes. Meyer et al. added that multiple measures of faultlines have been developed, and it remains unclear the extent to which they are valid and impact the results of investigations. However, using research teams, Ren et al. (2015) discovered that higher levels of friendship and animosity ties moderate the negative effects of faultlines on team performance, such that higher friendship ties mitigated its effect whereas animosity strengthened it. Another notable study experimentally explored approaches to combat the damaging effects of faultlines and provided evidence for self-disclosure as a potential remedy (Chiu & Staples 2013).

Although various compositional variables have been widely studied with respect to related team effectiveness outcomes, earlier studies on different diversities, for example, exhibited small but significant effects. Over time, researchers explored compositional variables using more complex research designs. They concluded that compositional variables have differing effects on team effectiveness outcomes depending on the measurement and the context. However, since Mathieu et al. (2014) called for a more dynamic and temporal perspective, other scholars have attempted to examine temporal effects regarding compositional variables (i.e., deep- and surface-level diversities) on team performance (e.g., Srikanth et al. 2016).

## MEDIATING MECHANISMS: REGION C

Salas et al. (2017b) characterize team mediators in terms of members' "ABC's" (i.e., Affect, Behaviors, and Cognitions). Members' behaviors correspond to what Marks et al. (2001, p. 357) defined as team processes: "members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing taskwork to achieve collective goals." Alternatively, members' affect and cognitions correspond to what Marks et al. (2001, p. 357) referred to as team emergent states: "constructs that characterize properties of the team that are typically dynamic in nature and vary as a function of team context, inputs, processes, and outcomes." Our review identified 292 studies that focused on the influence of mediating features of teams or their embedding environment (Region C). Representative variables included conflict, creativity, cohesion, trust, decision making, information sharing, and team processes. Although

we discuss each of these variables below, meta-analyses have highlighted numerous relationships involving these and other variables as summarized in **Table 2**.

## Team Processes

Marks et al. (2001) also argued that team processes contain 10 facets that map onto three dimensions—transition, action, and interpersonal processes—and occur in varying episodic cycles. Transition processes include mission analysis, goal specification, and strategy formulation. Action processes include monitoring progress, system monitoring, team monitoring, and coordination. Interpersonal processes include conflict management, motivation, and affect management. LePine et al. (2008) used factor analysis to meta-analytically confirm that these 10 team process items map onto the three hypothesized higher-order constructs. As shown in **Table 2**, team process mediators exhibited positive relationships with team performance and attitudinal outcomes. Team size and interdependence tended to moderate the team process–outcome relationships (Klein et al. 2009, LePine et al. 2008). In addition to the meta-analytic results, scholars discovered team processes play a role in many other important outcomes. One study looked at 78 teams within a grocery store chain and found that interpersonal processes play a role in team effectiveness and organizational commitment (Killumets et al. 2015).

## Information Sharing

Information sharing is a process in "which team members collectively utilize their available informational resources" (Mesmer-Magnus & DeChurch 2009, p. 535) and positively relates to team performance and attitudinal outcomes (Hülsheger et al. 2009). In addition, scholars have discovered that information sharing can be influenced by task conflict, such that when task conflict is posed as a debate rather than a disagreement, information sharing will be higher (Tsai & Bendersky 2016). Also, scholars have found that, in teams of three working in a city-management decision-making simulation, information sharing mediates the relationship between psychological collectivism and reactive strategy adaptation (Randall et al. 2011).

In summary, team processes have been shown to play a crucial role in the team effectiveness literature in both the attitudinal and performance categories. In the past decade, scholars such as LePine et al. (2008) have verified frameworks with which to better look at team processes. Going forward, these frameworks should be measured in their entirety rather than in the context of a singular dimension (i.e., interpersonal processes) to better understand team processes' relationship with team effectiveness.

## Emergent States

Many emergent states fall under the mediating section of **Figure 1**. Team cohesion reflects the bond among the members of the group (Beal et al. 2003). Team cohesion has been identified to have a positive relationship with team performance (Hülsheger et al. 2009, Beal et al. 2003). Cohesion has also been split into two types: task and social cohesion. Both task cohesion (i.e., a general orientation toward achieving the group's goals and objectives) and social cohesion (i.e., to a shared liking or attraction to the group; Evans & Jarvis 1980) have been found to have a positive relationship with team performance, with task cohesion the stronger of the two (Castaño et al. 2013, Chiocchio & Essiembre 2009). In a longitudinal, ten-week study done in a complex business simulation, Mathieu et al. (2015a) found that time moderated the cohesion and team performance relationship, in that as time increases this relationship strengthens.

Another emergent state that falls under the mediator category is intrateam trust or "trust among team members" (de Jong et al. 2016, p. 1134). Meta-analytic results have shown that team

trust positively influences both team performance outcomes as well as attitudinal outcomes (De Jong et al. 2016, Breuer et al. 2016). This relationship may be moderated by task interdependence, skill differentiation, or authority differentiation (De Jong et al. 2016). Scholars have found that team trust mediates many other relationships including the relationship between deferential leader treatment and procedural justice (Liu et al. 2014).

Team climate has many specific types including innovation climate, psychological safety climate, group voice climate, and safety climate. However, very little has been done to meta-analyze these types of climate. Support for innovation was shown to have a positive relationship with team performance outcomes (Hülsheger et al. 2009). Many studies, however, recently have identified relationships between specific types of climate and outcomes. For instance, innovation climate has been connected to team innovation performance (Chen et al. 2013), team justice climate has been related to team effectiveness (Cole et al. 2013), and procedural justice climate and service climate have been found to influence organizational citizenship behaviors (Walumbwa & Schaubroeck 2009).

Team potency is a team's collective belief about the team's ability to be successful (Shea & Guzzo 1987). Meta-analytic results have shown that team potency is related significantly and positively to team performance (Gully et al. 2002). One interesting antecedent found was leader personality and specifically leader conscientiousness and its relationship with team in-role performance as mediated by team potency (Hu & Judge 2017).

In sum, the emergent states literature has been rapidly growing over the past decade, and the general theme is that these mediators are distinct from team processes and have relationships with team performance. Future research should continue to examine the growing body of emergent states as not all have been fully covered, especially regarding their relationship with time.

## Conflict

A broad definition of conflict is "the process emerging from perceived incompatibilities or differences among group members" (De Wit et al. 2012). As laid out by De Wit et al. (2012), there are three main forms of conflict: task, relationship, and process. Meta-analytic results of task conflict (i.e., disagreements about the content and outcomes of the task itself) have shown that it has a negative relationship with attitudinal outcomes and a neutral relationship with team performance (De Wit et al. 2012, Hülsheger et al. 2009). However, some individual studies have demonstrated a positive correlation between task conflict and group performance (Chun & Choi 2014, Bradley et al. 2012). Additionally, Bradley et al. (2012) identified psychological safety as a moderator of this relationship. Relationship conflict is defined by De Wit et al. (2012, p. 362) as "disagreements among group members about interpersonal issues, such as personality differences or differences in norms and values." Meta-analytic results link relationship conflict negatively to performance and with even stronger negative relationships to attitudinal outcomes such as commitment, satisfaction, and identification (De Wit et al. 2012, Hülsheger et al. 2009). Scholars have further identified relationship conflict to be associated with variables such as personality (de Jong et al. 2013) and task conflict (Martínez-Moreno et al. 2012, Choi & Cho 2011). Finally, "disagreements among group members about the logistics of task accomplishment" (De Wit et al. 2012, p. 362) are known as process conflict. Meta-analytic results have shown processes conflict to have a strong negative relationship with attitudinal outcomes and a negative relationship with team performance, as shown in **Table 2** (De Wit et al. 2012). In sum, conflict in general maintains a negative relationship with attitudinal outcomes in the scope of team effectiveness. More research should be conducted to further differentiate the different types of conflict and their individual effects on team effectiveness variables.

## COMPOSITIONAL AND STRUCTURAL: REGION D

Region D represents variables that overlap with both compositional and structural features, as distinguished by Mathieu et al. (2017). Illustrative variables in this region are skill differentiation, authority differentiation, member centrality, and roles. Our review identified more than 140 articles that featured variables from this region. Unlike core compositional variables—and similar to structural variables—they often served as moderators.

### Skill and Authority Differentiation

Skill and authority differentiation are defined as "the degree to which individuals on the team are readily substitutable for one another when it comes to task execution" and "the degree to which decision-making authority is vested in one single individual or is distributed among team members," respectively (Mathieu et al. 2017, p. 456). Hollenbeck et al. (2012) conceptualized three dimensions with which to distinguish types of teams. They argued that skill and authority differentiation, along with temporal stability, are important team distinguishing factors, to which others have suggested dimensions such as virtuality (Foster et al. 2015). Such an organizing scheme is needed as we uncovered 25 team types that have been discussed since 2008 (see Chiocchio & Essiembre 2009 for a meta-analysis). A meta-analysis found that both skill and authority differentiation moderated the positive relationship between team trust and performance such that the relationship strengthened as differentiation increased (De Jong et al. 2016).

### Member Centrality

When members of a team hold a position that provides access to both social and information resources that others lack, they are considered to benefit from centrality (Klein et al. 2004). Often indexed in terms of social connections (e.g., friendship) or position in a workflow, central positions in a team network can yield more power to a member but also generate greater stress levels. Although frequently studied, our search query did not reveal any meta-analytic studies with member centrality as the main variable. Nonetheless, in agreement with past research, current studies continue to validate the influence member centrality has on team effectiveness. As an example, a study measuring in-degree centrality to define a leader's prestige found that team conflict was lower and team viability was higher for teams high in leader centrality, whereas teams with leaders high in normalized betweenness centrality experienced the opposite effect (Balkundi et al. 2009). Balkundi et al. (2011) also found evidence supporting the idea that leaders who scored high in degree centrality were viewed as charismatic, which was then positively associated with team task performance. A related concept has been advanced by Humphrey et al. (2009), who distinguished between "core" and "peripheral" team members, ascribing similar dynamics associated with core members as have been discussed with respect to highly central members.

### Roles

Research on roles has defined roles in one of two ways: role is defined by the characteristics of the position itself, or role is defined by the person in the given position (Mathieu et al. 2015b). Although past literature exists in support of teams having a balanced set of roles (e.g., Belbin 1985), research regarding its influence on team effectiveness has yet to find common ground, potentially due to other factors such as gender differences and team types (Mathieu et al. 2015b). To further specify the types of roles and their effects, scholars Mumford et al. (2008) developed and tested what they termed the Team Role Test, which measured team members' role knowledge depending on the context. They concluded that role knowledge is an indicator of team member role

performance even above Big Five and mental ability. As another example, Humphrey et al. (2009) tested out a role composition theory distinguishing between a core and noncore role holder. In their study, the two types of roles moderated the relationship between job-related skills and team performance such that the relationship was stronger when job-related skills were implemented by core role holders. They also suggested that teams who invest in their core role holders may benefit from higher performance (Humphrey et al. 2009). In a more recent example, self-organizing teams—positively related to team performance and coordination—were shown to involve more role variability; however, too much variability may be detrimental for the team (Jobidon et al. 2017).

### Team Size

The number of members on any given team is an important factor in team effectiveness. However, determining the optimal number of individuals for a team is difficult. Team size has been shown to be positively associated with innovation (Hülsheger et al. 2009) and moderates the relationships between team building and team effectiveness (Klein et al. 2009) as well as team process and effectiveness (LePine et al. 2008). Conversely, a negative relationship between team size and quality of group experience is also evident (Aubé et al. 2011). At the same time, research shows that downsizing a team, mediated by team adaptability, may have a negative impact on team performance, which could potentially be buffered via emotional stability and extraversion (DeRue et al. 2008). As another exemplar, military action teams gained mental efficacy when they were larger in size, which positively influenced their effectiveness (Hirschfeld & Bernerth 2008).

In sum, variables that fall under compositional and structural features have been shown to strengthen relationships with team effectiveness outcomes under certain circumstances. Therefore, researchers must continue to consider these variables as moderators on team relationships. However, future research should investigate and synthesize to what degree these variables matter and in which specific contexts.

## STRUCTURAL AND MEDIATING FEATURES: REGION E

Region E houses variables that simultaneously represent an aspect of structural team features as well as mediators consistent with the logic of Mathieu et al. (2017). Representative variables of this region include team adaptability, empowerment, boundary spanning behaviors, and shared leadership. Our review identified 66 studies providing a central role to variables that had structural and mediating qualities. Key meta-analytic findings and representative articles are below.

### Team Adaptability

Team adaptability is defined as a team's ability to modify its cognitive, affective, motivational, and behavioral properties in response to the demands of the situation or an environmental change (Baard et al. 2014). Although no meta-analyses within the scope of our review included team adaptability either as a primary or moderating variable, Baard et al. (2014) provided a narrative review of the literature on both individual and team adaptation. While recognizing that excellent work has been performed to date, Baard et al. (2014, p. 88) asserted that theoretical integration was needed for "…*adaptation*…to be meaningful scientifically." Accordingly, they proposed a multilevel conceptual architecture of adaption emphasizing the mechanisms of adaptation across organizational levels as moderated by differing degrees of task complexity. Providing scholars a "common language" to discuss adaptation should aid in continuing to build knowledge of team adaptation in a structured and incremental fashion.

Hale et al. (2016) theorized how bank teams would adapt to turnover events. Utilizing a discontinuous growth model, the authors found that teams adapted similarly with the loss of either an employee or a manager but did not adapt as well with both an employee and a manager exit. Adaptation was even more difficult for highly interdependent teams. This study highlights the importance of understanding compositional and structural features of the team in its environment, and how these features are dynamic across time, in studying team adaptation. Ben-Menahem et al. (2016) provide a complementary methodological approach with their in-depth qualitative interviews of team adaptability in the pharmaceutical industry. Their findings showed that teams have both formal and informal processes for revealing their interdependencies and as these interdependencies are revealed, team adaptation to the new information occurs.

## Team Empowerment

Team empowerment is an emergent state that arises from team structural features such as formal roles and responsibilities, work design, and the characteristics of team members and the team leader (Maynard et al. 2012). In their meta-analysis, Seibert et al. (2011) found a strong positive relationship between team empowerment and team performance. They also submitted that leadership, work design characteristics, socio-political support, and high-performance managerial practices are significant influences on team empowerment levels.

An exemplary longitudinal study by Lorinkova et al. (2013) experimentally manipulated the leadership style of certain participants (either directive or empowering leadership), and then tracked its impact over 10 rounds of performance data. Their findings indicated that teams with directive leaders initially performed better, but teams with empowering leaders ended with the higher performance due in part to empowering leadership as mediated through team empowerment. Luciano et al. (2014) illustrated that both average (across teams) and relative (per team) team-oriented behaviors from external leaders related significantly to team empowerment.

## Boundary Spanning

Team boundary spanning is defined as "the team's actions to establish linkages and manage interactions with parties in the external environment" (Marrone 2010, p. 914). Boundary spanning received little meta-analytic attention within the scope of our literature review, with only Hülsheger et al. (2009) finding a positive association between external communication (communication outside of the team) and team innovation. Elsewhere, De Vries et al. (2014) conducted a multilevel, multi-study investigation of the antecedents and consequences of team boundary spanning. They hypothesized that individual boundary spanning behavior (aggregated to the team level using a network-type measure) occurred due to the breadth of an individual's functional experience, their interpersonal cognitive complexity, and their organizational identification. Furthermore, they found a positive relationship between team performance and the degree to which its members collaborated with other teams, indicative of performance benefits of boundary spanning. In sum, although boundary spanning had minimal representation in our review, it appears to be on an upward trajectory and we expect it to gain traction given the increasing importance of multiteam systems and use of social network analysis techniques.

## Shared Leadership

Shared leadership is "an emergent and dynamic team phenomenon whereby leadership roles and influence are distributed among team members" (D'Innocenzo et al. 2016, p. 1968). There have been a handful of recent meta-analyses on shared leadership, two of which fall within the scope of

our literature review. Both meta-analyses showed a positive relationship between shared leadership and team performance (D'Innocenzo et al. 2016, Wang et al. 2014). Moreover, they found conflicting results regarding the moderating effect task complexity has on the shared leadership–team performance relationship (see above). Furthermore, Wang et al. (2014) found that shared leadership was positively associated with team attitudinal outcomes as well as team emergent states and processes.

Mathieu et al. (2015a) modeled the influence of shared leadership over time and found it to be a potent predictor of team cohesion, and thereby, team performance trajectories. Aime et al. (2014) suggested that team members share power with one another in response to shifts in situational demands. Their work contributed by addressing "several questions posed in the shared leadership literature, including: what is being shared, how that sharing occurs, and why some people step up and lead without formal authority" (Aime et al. 2014, p. 329). Importantly, shared leadership may come in many different forms, including the rotation of the leadership role among members, the distribution of leadership responsibilities among team members, or members collectively fulfilling leadership functions. Carter et al. (2015) described how social network designs and analyses are particularly well suited for illustrating these distinctions and studying the evolution of, and influence of, collective forms of leadership.

## COMPOSITIONAL AND MEDIATING FEATURES: REGION F

Region F represents variables that overlap with both compositional and mediating features and contained more than 80 articles. These studies tended to associate team compositional variables with emergent states. For instance, shared mental models played a mediating role in many relationships but were represented by the alignment of different members' individual mental models. Representative variables in this section include psychological safety, transactive memory systems, shared cognition and mental models, and task orientation.

### Psychological Safety

Team psychological safety is a "sense of confidence that the team will not embarrass, reject, or punish someone for speaking up" (Edmondson 1999, p. 350). Recent meta-analytic results have shown psychological safety to be a predictor of team outcomes such as task performance and members' attitudinal outcomes such as commitment and satisfaction. Moderators such as positive leader relations have been found to influence the relationship between psychological safety and performance; however, the influence of other potential moderators on psychological safety's relationship with team outcomes is still unclear (Frazier et al. 2017). Scholars have also identified psychological safety as a moderator between utilitarianism and unethical outcomes, and interestingly, higher levels of psychological safety led to more unethical outcomes (Pearsall & Ellis 2011). Recently, many scholars have called for studying psychological safety through a dynamic lens. Hood et al. (2016) adhere to this call with their time-lagged study that looks at the mediating relationship of psychological safety between group affectivity and the transactive memory system (TMS). They find that groups with more negative affectivity have lower levels of psychological safety and therefore have negative association with TMS.

### Shared Cognition/Mental Models

Shared cognition generally refers to "team members' shared understanding of team tasks, equipment, roles, goals, and abilities" (Lim & Klein 2006, p. 403). Meta-analytic results have

demonstrated that team cognition, which largely encompasses shared cognition and mental models, has a significant relationship with team performance (DeChurch & Mesmer-Magnus 2010a). One important moderator identified among DeChurch & Mesmer Magnus's (2010a) meta-analytic results was the type of shared cognition emergence, specifically compositional or compilational emergence. Compilational emergence is defined by DeChurch & Mesmer-Magnus (2010a, p. 35) as the "construct manifested at the team level is different in form to the individual-level counterpart." Compilational style measures of shared cognition exhibited stronger relationships with team performance than did compositional style measures (DeChurch & Mesmer-Magnus 2010a). Scholars have also recently identified shared cognition and mental models as having a relationship with other important variables. For instance, collective efficacy moderates the relationship between task mental models and team effectiveness, but this did not generalize to team mental models (Mathieu et al. 2009). In addition, Kellermanns et al. (2008) have found that constructive confrontation norms positively moderate shared mental models' relationship with decision quality.

### Transactive Memory System

Scholars have defined TMS as a "collection of knowledge possessed by each team member and a collective awareness of who knows what" (Mathieu et al. 2008, p. 431). TMS has been previously shown to have a relationship with team performance outcomes (Littlepage et al. 2008, Maynard et al. 2012). For example, TMS plays a role, including that between the loss of a critical member and team performance, such that when a critical member is lost, TMS will be reduced, therefore also reducing team performance (Christian et al. 2014). Notably, TMS is an example of what Mathieu et al. (2008) referred to as a blended construct and includes composition/structural (i.e., specialization), process (i.e., coordination), and emergent state (i.e., credibility) elements. This and similar constructs underscore the importance of moving beyond the IPO model to consider more synergistic views of team constructs.

In sum, compositional and mediating variables generally had a relationship with team performance variables, but little research was seen on attitudinal variables. Future research might focus on looking more into these attitudinal variables as well as the less studied constructs such as task orientation and transactive memory systems.

## CONTEXTUAL FEATURES

Our review identified 124 articles that referred to team contexts. Contextual influences are generally viewed in terms of facilitating or constraining certain team processes, or placing premiums on different types of outcomes (e.g., efficiencies versus creativity). Mathieu et al. (2008) conceptualized contextual influences on teams as emanating either from the organization (i.e., occurs within the team's organization) or its environment (i.e., occurs outside of the organization). Moreover, the temporal norms and stability of contextual influences, such as that outlined in event system theory, can also constitute aspects of context (Morgeson et al. 2015). Thus, we organize contextual influences on teams as occurring (*a*) either within or outside of the organization and (*b*) either continuous or discontinuous influences.

### Contextual Influences Within the Organization

Although no meta-analytic evidence is available, many authors mentioned organizational culture as a potential driver or moderator of team relationships in their articles. For instance, Bezrukova et al. (2012) conducted an intriguing study finding that a results-oriented organizational culture,

aligned across levels of the organization, reversed the negative relationship between faultlines and performance. Elsewhere, Hartnell et al. (2016) examined the interaction (or fit) between leadership in the C-Suite and organizational culture. Results indicated organizational culture could actually substitute for leadership if the two are redundant. When not redundant, CEO leadership is effective at transmitting motivational and psychological resources. Whereas organizational culture did not show a substantially large footprint in our literature review, external leadership is almost certainly the most frequent contextual influence.

External leadership played at least a moderating or covariate role in six meta-analyses and was positively associated with team psychological safety and empowerment (Frazier et al. 2017, Seibert et al. 2011). Additionally, external leader effects were included in meta-analyses to show incremental validity of team-member exchange and intrateam trust in predicting a variety of outcomes (Banks et al. 2014, De Jong et al. 2016). Given that our review identified 147 articles addressing leadership, we choose to focus on representative studies that examined (*a*) the upper echelons, (*b*) multiteam systems, and (*c*) leader/follower individual differences.

Ou et al. (2014) conducted a fascinating mixed-methods study that indicated CEO humility related to an empowering organizational climate as mediated through CEO empowering leadership and TMT integration. In turn, empowering organizational climate affected middle managers' responses in terms of work engagement, affective commitment, and work performance. In their study of multiteam system performance, Davison et al. (2012) examined the differential effects of vertical coordination (i.e., boundary spanning and/or leadership roles) between point and support teams (component teams) as well as the differential effects of component team leadership and multiteam system leadership (i.e., the integration team). They found coordination between system leadership and component team boundary spanners positively related to performance if the actions emphasize the critical component team. Authors found cross-component team coordination has a detrimental performance impact. Finally, Hu & Judge (2017) found that team members' power distance values moderated the relationship between leader agreeableness, conscientiousness, and openness and a team's potency and relational identification, which in turn significantly affected teams' in-role and extrarole performance. These results indicate that external leadership continues to be a critical influence on team effectiveness at varying levels across the organization.

Leader change/exit may be representative of a discrete and discontinuous influence on a team. For instance, Sauer (2011) illustrated that new low-status leaders tend to be more effective with a directive style, whereas new high-status leaders may be more effective with a participative style. Using a longitudinal, real-time, qualitative case study, Balogun et al. (2015) examined how a senior management team handled sensemaking and the associated response to a firm-wide strategic change. Their study exemplified how scholars may study the effect of discontinuous and discrete contextual influences on team processes and effectiveness.

## Contextual Influences Outside the Organization

The primary contextual influence originating outside the organization is the regional or national culture in which the organization is embedded. Meta-analytic activity in the past 10 years suggests that many authors are increasingly considering whether cultural values moderate team-level relations. The landmark meta-analysis for cultural effects across individual, group, and country levels comes from Taras et al. (2010), who examined the influence of cultural differences in individualism, power distance, uncertainty avoidance, and masculinity on various group attitudes, behaviors, and performance. Courtright et al. (2015) found stronger relationships between task and outcome interdependence and task and relational team functioning in collectivistic cultures, but that these effects did not extend to performance. Bell (2007) found that higher average team collectivism

and members' preference for teamwork positively related to team performance in field studies. De Wit et al. (2012) hypothesized, but found no significant moderation, that groups embedded in national cultures that differ on Hofstede's (2003) cultural dimensions would differ in the relationships between task and relationship conflict and performance. As for specific studies focusing on the impact of cultural differences, Gelfand et al. (2013) found that previous findings of US teams outperforming solo negotiators did not generalize to Taiwanese teams who performed better as solo negotiators. Cramton & Hinds (2014) used a qualitative approach to understand how distributed work teams adapt to cross-cultural differences while concurrently being embedded in their local culture. Their findings suggested that local embeddedness and interdependence across sites drive cultural adaptation.

As for discrete and discontinuous environmental influences, Hoisl et al. (2017) considered how the relationship between R&D task-related diversity and the performance of Formula 1 race car teams was moderated by their hypercompetitive environments. They found that hypercompetitive environments created an inverse-U relationship between R&D task-related diversity and performance.

## TEAM INTERVENTIONS

The teams literature has also generated many valuable guidelines for practice. For instance, getting teams off to a good start is vital to their success. Preparation tools such as planning (e.g., Weingart 1992) and team charters—a mechanism to help members discuss and decide roles and work processes—have been shown to improve team dynamics (e.g., communication, effort, etc.) and performance (Mathieu & Rapp 2009, Aaron et al. 2014). Meta-analytic reviews of the effectiveness of team building (Klein et al. 2009) have revealed their benefits are significant and that their impact tends to grow stronger the longer teams are together (Bradley et al. 2003). Elsewhere, team training interventions have been found to be powerful and to yield moderate to high effect sizes in terms of members' reactions and learning, and team mediators and outcomes (Hughes et al. 2016, Salas et al. 2008, Tannenbaum & Yukl 1992). Formal after-action reviews or debriefs have been shown to be powerful mechanisms for reviewing team functioning, facilitating team learning, and improving subsequent performance (Tannenbaum & Cerasoli 2013).

It is also the case that team interventions have been widely adopted in many industries. For example, Crew Resource Management (CRM) was introduced in both military and commercial aviation to address problems attributable to poor teamwork (Wiener et al. 2010). Adaptations of CRM protocols—adjusted for industry-specific challenges—are now common in fire and emergency services, healthcare, off-shore oil drilling platforms, and elsewhere (Salas et al. 2017a). In particular, a version of CRM referred to as TEAMSTEPPS has proven to be quite effective in healthcare contexts (Hughes et al. 2016).

Teamwork applications have also recently been applied to large interdisciplinary teams tackling significant scientific challenges such as the Human Genome Project, Cancer Care, or preparations for a Mission to Mars (Falk-Krzesinski et al. 2010). In short, both the science and practice of work groups have advanced substantially in the past decade or two; however, many unaddressed questions remain. For instance, although we know that preparatory actions such as pre-mission team training or developing team charters are effective, to what extent are natural processes such as team reflexivity valuable and how can they be encouraged (Schippers et al. 2015)? Notably, although after action review (AAR)/debriefing interventions are powerful and effective, are they best delivered by a trained facilitator or a team's formal leader or best conducted by team members themselves?

Regardless of what sort of team intervention one might consider, there are several other practical questions to be considered and tested regarding their timing and delivery. For instance, if a given intervention has been shown to be effective, when should it first be introduced? Is the intervention most effective if introduced at the beginning of a team, after they encounter their first stressful event, or at the anticipated mid-point of their lifecycle? How often should teams, for instance, conduct AARs? Is the effectiveness of team building enhanced—or does their impact wane—with repeated applications? Much remains to be learned concerning how to best administer and orchestrate the portfolio of team-focused interventions.

## TEAMS AS COMPLEX MULTILEVEL DYNAMIC SYSTEMS

Despite all the progress in recent years, we believe that work group research is poised to enter a new era. Widespread adoption of the IPO framework, the ease of survey data collection, and scholars' desires to conduct field investigations and employ sophisticated statistical techniques have combined to yield a prototypical research design where members' reports of team properties are associated with some index of their effectiveness. Rich observational studies are few and far between, field experiments are uncommon, and action research is all but absent in the teams literature. Fortunately, we appear to be at the dawn of a new era and we see three promising factors that should advance teams research in the near future: advanced theories, methodologies, and tools for modeling dynamic team properties; a greater appreciation for, and sophisticated conceptions of, team task environments; and conceptions of teams as "meso" entities in multilevel environments (see **Table 3**).

**Table 3 Five directions for future research**

| Recommendations | Specific examples |
|---|---|
| Consider dynamic and contextual features. | Operationalize team environments and tasks as dynamic features influencing team processes, states, and outcomes. |
| | Explore how emergent states emerge (i.e., form) over time and their dynamic properties thereafter. |
| | Conceptualize and model team compositions as fluid and changing over time. |
| Use network and multilevel perspectives. | Explore team virtuality and technology with more complex research designs. |
| | Build and analyze theory concerning the influence of varying degrees of members' interdependencies. |
| Assess the implementation and further influence of team interventions. | Test the various timing of team interventions (i.e. beginning, mid-point, or following a particular event). |
| | Observe the effects of more (or less) frequent uses of interventions (e.g., team building, after action reviews). |
| Examine the relative and combined influences of different interventions. | Do early interventions such as team charters enhance or replace the value of team building exercises? |
| | Do team composition interventions impact the value of team training interventions? |
| Measure constructs in accordance with frameworks. | Measure team processes (e.g., transition, action, and interpersonal) when they are conceptualized to be occurring. |
| | Measure emergent states concurrent with environmental triggering events (e.g., resilience with task challenges). |

More than a decade ago McGrath & Tschan (2007, p. 4) argued that "[i]t is clear from examination of the research literature on groups in organizations that most of that work involves observations at single points in time or very short before–after intervals." Subsequently, along with other scholars, Humphrey & Aime (2014) submitted that the dynamics inherent in team constructs such as processes and states are generally treated as static variables in teams research and proposed agendas for future research. But team processes and states are not the only factors that are variable over time. Generally speaking, team tasks and contexts have been modeled as static entities that enable or constrain members' actions, but they also may vary over time (Hinsz et al. 2009). What has not been emphasized as much, however, is a view of team environments as dynamic factors. However, recently, Maloney et al. (2016) and Mathieu et al. (2017) have called for a far more detailed and enriched view of the impact of dynamic contextual features on team functioning and outcomes. For example, Morgeson et al. (2015) advanced an event-based theory of organizational environments, focusing on the novelty, disruptiveness, and criticality of external organizational events as drivers of system functioning. This approach is consistent with Arrow et al.'s (2000) view of groups as dynamic complex systems. In short, team task environments are multidimensional fluid entities that should be conceptualized and treated as dynamic drivers of team processes, states, and outcomes.

Teams have also been increasingly viewed as entities that function in larger systems such as multiteam systems (MTSs; see Davison et al. 2012, Zaccaro et al. 2012). Luciano et al. (2018a) asserted that "MTSs are tightly coupled networks of teams that pursue at least one shared superordinate goal in addition to their component team goals" (p. 1066). In these arrangements, teams not only have to accomplish their own proximal goals, but they also have to coordinate their activities with other closely coupled teams to collectively achieve one or more distal shared goals. In short, teams become nodes or entities that need to operate in a complex network of relationships in order to achieve one or more higher-order goals.

Studying teams as fluid entities that operate in dynamic situations requires a paradigm shift in how research is conducted. It is simply not possible to model and understand such phenomena via the administration of a few waves of surveys. And whereas observational and other qualitative methodologies are well suited for revealing dynamics, they are time and labor intensive, and very challenging to deploy in complex team environments. However, George et al. (2014, p. 325) asserted that "evolving practices - using big data - can allow us to study entire organizations and workgroups in near-real time to predict individual and group behaviors, team social dynamics, coordination challenges, and performance outcomes." For example, computer-aided text and speech analyses as well as wearable sensors are two of the newer measurement technologies that offer much promise for generating continuous data streams for use in modeling dynamic team phenomena.

The analysis of team members' communications has been a mainstay of groups research from the dawn of the discipline. However, such analysis has typically been a painstaking endeavor involving recording communications, transcriptions, developing coding schemes, training coders, multiple revisions, etc. Computer-aided text analysis (CATA) of written communications can be used as a sophisticated form of content analysis to quantify word use and patterns to make inferences about team processes (Krippendorff 2004). CATA analysis is increasing in importance, with more sophisticated CATA algorithms consistently emerging, such as scoring multiword phrases and deriving semantic meanings from larger passages (e.g., Carley et al. 2013).

Wearable sensors are small devices that can record behavioral streams such as members' spatial propinquity and their body movements, as well as their speech patterns (Mukhopadhyay 2015). To the extent that members' physical positions, posture, locomotion, etc., reveal important aspects of teamwork, these devices can generate continuous streams of information. Whereas CATA yields

information about what is being said, analyses of individuals' amount, frequency, and amplitude of talking can be indexed over time using wearable sensors. Pairing teammates' speech patterns can yield a variety of interactional indices such as turn-taking, interruptions, mirroring, and speech distribution, which have been associated with constructs such as cohesion (e.g., Hung & Gatica-Perez 2010).

The construct validity of these newer measurement techniques needs to be scrutinized, and numerous decisions concerning the sampling, indexing, and aggregation of time-based data need to be considered (see Luciano et al. 2018b). Nevertheless, these emerging technologies offer great promise for generating real-time longitudinal data that will enable sophisticated modeling of actual team dynamics.

With the advancement of dynamic theories of teamwork and the advent of digital trace measures, the prototypical research design is quickly evolving. Rather than associating a few static depictions of team processes and states with later accumulated outcome indices, teams are increasingly being viewed as dynamic networks of activities coevolving with environmental pressures and challenges. For instance, Leenders et al. (2016) proposed a time-dependent relational events methodology, defining a relational event as "…an interaction initiated by one team member to one or more other team members at a particular point in time … [*and*] is minimally characterized by the time at which the interaction was initiated, the team member who initiated it, and the team member(s) who were the recipients" (pp. 97–98; *emphasis added*). Leenders et al. (2016) argue that relational events represent a more informative unit of investigation. They went on to describe sequential structure signatures, which refer to hypothesized patterns of interactions over time. In other words, using time-ordered networks, the rate and extent to which a particular hypothesized configuration of relations emerges over time can be tested. For instance, Klonek et al. (2016) used sequential structure analyses to examine the emergence of different communication patterns during team meetings. Koujaku et al. (2016) illustrated how network analyses can be used to identify and represent different forms of subgrouping that could be aligned with different configural constructs. Leveraging dynamic network data from digital trace measures and viewing teams as dynamic networks liberate the field to investigate traditional topics in far more detailed and nuanced fashions than have been feasible in the past, and pave the way to studying new questions.

The analytic tools for modeling dynamic networks are also rapidly evolving. For example, exponential random graph modeling (ERGM) enables scholars to specify and model "graph motifs," which are researchers' beliefs about the potential nature and interrelationships among actors (e.g., unit members). Sewell & Chen (2016) have demonstrated how ERGM models can be used to model dynamic properties over time. Recent advancements have proposed multilevel exponential random graph modeling (MERGMs), which are capable of simultaneously analyzing networks that are nested in the traditional sense (e.g., Zappa & Robins 2016). These, too, have been extended to model relationships over time (Carley et al. 2013).

## CONCLUSION

We believe that teams literature has matured tremendously in the past decade or two. Much has been learned and codified via meta-analyses. Team interventions have matured and demonstrated their efficacy when targeted at different leverage points in team lifecycles and episodic processing, and proven valuable for enhancing team effectiveness and human welfare in many industries. The classic IPO model and its derivatives (e.g., IMO; Ilgen et al. 2005) have proven to be valuable heuristics—but it is time to move on. Teams are increasingly being conceptualized as dynamic networks of activities that reside in a multilevel context and coevolving with environmental

variables. Dynamic theories are being advanced, digital trace measurement protocols are being developed, and innovative research designs and analytic techniques are being implemented. The future of teams research looks to be exciting, and we look forward to a review of progress in the next decade.

## DISCLOSURE STATEMENT

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**Errata**

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