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A CONFIGURAL THEORY OF TEAM PROCESSES: ACCOUNTING FOR THE STRUCTURE OF TASKWORK AND TEAMWORK

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Theories of team processes have focused on content and temporal relevance, while largely ignoring implications of structure. We apply social network concepts to propose theory that articulates structural configurations of taskwork and teamwork processes in terms of closure, centralization, and subgrouping. Our theory challenges the conventional view that increases in team processes are inherently and uniformly beneficial and explains how structural configurations involve trade-offs that must be acknowledged in our research and practice.

Scholars have made a great deal of progress in defining team processes, specifying their content, and detailing their applicable timing (Marks, Mathieu, & Zaccaro, 2001). In particular, Marks and colleagues' framework of teamwork processes, distinguished from both taskwork (actions and interactions that involve accomplishment of core team tasks) and emergent states (characteristic levels of feelings or thoughts among team members), consists of *transition processes*, which occur prior to or between performance episodes when member interaction focuses primarily on evaluation and planning activities to guide team accomplishment of objectives; *action processes*, which occur during performance episodes when member interaction focuses primarily on coordination and monitoring activities that relate directly to accomplishment of objectives; and *interpersonal processes*, which are ongoing at all times when member interaction is focused on managing interpersonal relationships. These team processes have been conceptualized through composition models that reflect shared perceptions of the extent to which process interactions occur generally or uniformly among members. Teams that make greater use of these processes during the appropriate time frame are believed to operate more smoothly, to function more effectively, and to be more successful in accomplishing team goals and satisfying individual members' needs. Meta-analytic evidence demonstrates that these three team process dimensions are positively associated with team performance, member satisfaction, cohesion, and potency and that each reflects a broader overarching teamwork process construct (LePine, Piccolo, Jackson, Mathieu, & Saul, 2008).

It has long been recognized, however, that interaction in small groups and teams is inherently structural in nature (Katz & Kahn, 1978; Stogdill, 1959), occurring in patterns that are complex, dynamic, discontinuous, and nonuniform (Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Kozlowski, Gully, Nason, & Smith, 1999; Kozlowski & Klein, 2000; Mathieu, Maynard, Rapp, & Gilson, 2008; McGrath, 1997; McGrath, Arrow, & Berdahl, 2000; Stewart, Fulmer, & Barrick, 2005). Therefore, to better account for functioning and effectiveness of small groups and teams, the existing content-focused perspective on team process should be complemented with theory that explicitly considers the structure of team process. Such theory is vital to our understanding of team functioning and effectiveness. It would allow us to account for familiar team situations, such as when members exert disproportionate influence on team process interaction by virtue of the positions they occupy, their relative status, or their standing with regard to cliques that exist within the team (Mathieu et al., 2008). Such theory might also question conventional

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wisdom that teamwork is inherently good and that the more there is of it the better off the team will be. Rather, because of differences in taskwork arrangements, coupled with limitations on team members' time, attention, and ability to manage multiple relationships, there may be advantages to certain configurations of teamwork interaction relative to uniform increases in levels of teamwork interaction.

The structural perspective of team phenomena we are suggesting here is not without precedent in the literature. For example, Stewart et al. (2005) examined variance and skewness measures of team task and social roles to investigate the relationship between team member personality and team effectiveness. LePine (2003, 2005) examined role structure adaptation, or adjustments to task-focused interactions in response to unforeseen changes that make routine patterns of team interaction problematic. Hollenbeck and colleagues studied patterns of general team communication, hierarchies, and roles to understand asymmetries in structural adaptation (e.g., Davison, Hollenbeck, Barnes, Sleesman, & Ilgen, 2012; Hollenbeck, Ellis, Humphrey, Garza, & Ilgen, 2011; Hollenbeck et al., 2002). Finally, researchers have assessed the implications for team effectiveness of relationships that are instrumental (e.g., "To what extent do you go to this person to ask for advice?") and expressive (e.g., "To what extent do you socialize with this person outside the work setting?") in nature (e.g., Balkundi, Barsness, & Michael, 2009; Hansen, 1999; Mehra, Dixon, Brass, & Robertson, 2006; Oh, Chung, & Labianca, 2004; Reagans & Zuckerman, 2001; Sparrowe, Liden, Wayne, & Kraimer, 2001). Unfortunately, although each of these independent lines of research has helped us appreciate features of teams that are inherently structural, there is no cohesive overarching theoretical framework that explains how configurations of different team processes, both independently and jointly, influence team effectiveness. The general purpose of this article is to address this shortcoming in our theoretical understanding of teams.

Specifically, we describe compilation emergence of team process interaction captured through structural configurations derived from social network analysis, and we propose how these configurations change our predictions about relationships between team processes and team effectiveness. We advance teamwork theory by describing in detail key *patterns* of team member interaction, rather than focusing solely on the general level or shared perception of team interaction, and by explaining how these patterns manifest in relationships with team effectiveness that are more complex than those traditionally predicted by current teamwork theory. An important advantage of recognizing configurations of team processes is that it becomes possible to better understand and manage trade-offs associated with various configurations (Coleman, 1988; Granovetter, 2005; Obstfeldt, 2005; Oh, Labianca, & Chung, 2006). Furthermore, our application of the Marks et al. (2001) framework advances social network research by expanding the content of interaction beyond examinations of relations as being generically instrumental (e.g., work-related advice) or expressive (e.g., friendship). That is, we position taskwork and teamwork as alternative network relations that connect team members. In sum, the theory we advance serves to account for the specific types of resources and information flows that can explain more comprehensively why team processes influence team effectiveness.

A CONFIGURAL THEORY OF TEAM PROCESSES

Kozlowski and Klein (2000) distinguished unit-level constructs that emerge from the characteristics, behaviors, or cognitions of unit members as having either *shared* or *configural* properties. Shared unit constructs describe characteristics that are common to or shared by the members of the unit. Shared unit properties emerge as a consensual, collective aspect of the unit as a whole and are based on *composition* models of emergence. Composition models assume isomorphism between manifestations of constructs at different levels and rely on within-unit consensus (agreement) or consistency (reliability) to justify composition of the unit-level construct.

Configural unit constructs reflect the array, pattern, or configuration of individual member characteristics or interactions. Unlike shared unit properties, configural unit properties do not converge or coalesce among members; instead, they are based on *compilation* models of emergence. Compilation models do not assume isomorphism and convergence but, rather, discontinuity and complex nonlinear emergence of constructs between levels. These models are not concerned with agreement or consistency among members with respect to some general team property but with patterns, distribution, and variability among specific member contributions. Because the structure of team processes exists in the pattern of interactions among team members (Morgeson & Hofmann, 1999), compilation models are a prerequisite for a configural theory of team process. Moreover, given that team process interaction involves both taskwork and teamwork, a comprehensive theory of team process should account for configurations of both types of member interaction.

Compilation Emergence of Taskwork, Teamwork, and Multiplex Processes

Taskwork involves members' interactions with tasks, tools, machines, and systems to carry out the team's work (Bowers, Braun, & Morgan, 1997: 90). In compilation terms, a taskwork network emerges as the set of ties or connections between members who are *jointly* involved with the same tasks, tools, or systems. In other words, members who are involved in the same task or who share a tool or work on the same system have a taskwork tie. A stronger taskwork tie indicates that a pair of team members shares many tasks or tools or shares tasks or tools in a way that constitutes a high level of member involvement. A weaker taskwork tie indicates that a pair of members has few tasks or tools in common or that their sharing of tasks or tools constitutes a low level of member involvement. At any point in time, teams must manage task accomplishment in the pursuit of multiple goals requiring different contributions from their members (Marks et al., 2001; McGrath, 1991). The taskwork network depicts how member taskwork contributions are arranged. Team taskwork ties may arise by formal means—for example, through explicit task assignments or through tasks inherent to members' positions in a team hierarchy—or they may arise more organically—for example, through self-managed teams' decisions on how to allocate taskwork. Furthermore, task relations may change and develop over time as existing team members alter task sequencing and develop additional procedures or as team memberships change, with new members rotating in and out of existing teams. In contrast to traditional approaches, which depict members' general shared perceptions of the extent to which tasks are related (Campion, Medsker, & Higgs, 1993), taskwork networks depict the structure of workflow relations across team members directly (Kozlowski et al., 1999: 251), indicating who depends on whom to accomplish work team member by team member.

Whereas the taskwork network depicts *what* the team members are doing together with regard to task-focused activities, the teamwork network depicts *how* they actually are interacting to accomplish those tasks. Teamwork interaction involves member interactions to direct, align, coordinate, and monitor taskwork to achieve collective goals (Marks et al., 2001: 357). As a separate compilation, the teamwork network emerges as the set of ties or connections between members who interact to set goals, make plans, coordinate, help, and motivate each other. In other words, team members who indicate they set goals and make plans together, who monitor each other's progress and provide each other backup, or who work to manage each other's motivation and stress levels have a teamwork tie. In Table 1 we present several example questions that would reflect teamwork ties among members. A stronger teamwork tie indicates that a pair of team members significantly interacts to make plans, track progress, and motivate each other. A weaker teamwork tie indicates that a pair of team members interacts very little to discuss team goals, coordinate and provide assistance, or encourage each other.

It is important to note here that we do not assume that taskwork structures necessarily produce corresponding teamwork structures. Members of most teams are free to orchestrate and support the work as well as manage socio-emotional dynamics as they wish, for most of these supportive interactions are more spontaneous and discretionary relative to interactions that are focused on taskwork (LePine, Hanson, Borman, & Motowidlo, 2000). Team members sharing a task may plan and set goals together, or they may not. They may track their progress together and help each other, or they may not. They may encourage and motivate each other, or they may not. Thus, what team members are assigned to do may be quite different from how they actually go about doing it (Marks et al., 2001). Because of this lack of correspondence, a configural theory of team processes must ac-

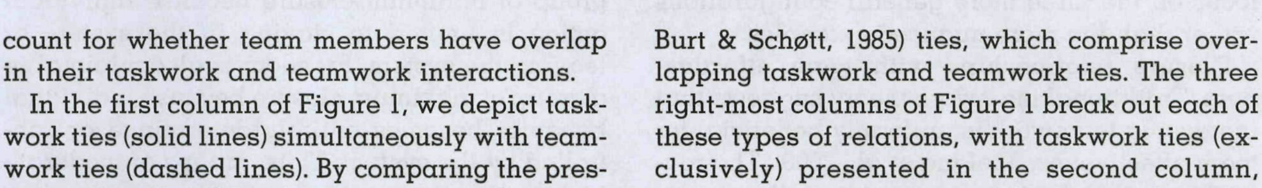
TABLE 1
Teamwork Network Sociometric Survey Questions

Marks et al. (2001) Teamwork Process Dimensions	Example Questions
	Among the members of your team . . .
Transition	
Mission analysis	With whom do you discuss the team's tasks, the resources you need, and the challenges you expect to face?
Goal specification	With whom do you set and prioritize goals?
Strategy formulation	With whom do you develop alternative strategies for accomplishing your tasks?
Action	
Monitoring progress	With whom do you track progress toward the team's goals?
Systems monitoring	With whom do you track team resources and changing conditions outside the team?
Team monitoring and backup	Whom do you help complete their tasks? (giving ties)
	Who helps you complete your tasks? (receiving ties)
Coordination	With whom do you coordinate and integrate your work efforts?
Interpersonal	
Conflict management	With whom can you have a healthy debate with minimal dysfunctional conflict?
Motivation and confidence building	Whom do you encourage and motivate, especially when things are difficult? (giving ties)
	Who encourages and motivates you, especially when things are difficult? (receiving ties)
Affect management	Whom do you help manage their stress in order to keep a good emotional balance in the team? (giving ties)
	Who helps you manage your stress in order to keep a good emotional balance in the team? (receiving ties)

count for whether team members have overlap in their taskwork and teamwork interactions.

In the first column of Figure 1, we depict taskwork ties (solid lines) simultaneously with teamwork ties (dashed lines). By comparing the presence of taskwork and teamwork ties between team members, it becomes apparent that there are three general types of team member relationships: (1) simplex taskwork ties, where no corresponding teamwork tie exists; (2) simplex teamwork ties, where no corresponding taskwork tie exists; and (3) multiplex ("bundled"; Burt & Schøtt, 1985) ties, which comprise overlapping taskwork and teamwork ties. The three right-most columns of Figure 1 break out each of these types of relations, with taskwork ties (exclusively) presented in the second column, teamwork ties (exclusively) presented in the third column, and multiplex taskwork-teamwork ties presented in the fourth column. In sum, the taskwork network, based on the tasks members are jointly involved in, is distinct from the teamwork network, based on how team members interact to accomplish those tasks; furthermore,

FIGURE 1
Taskwork and Teamwork Network Compilation Emergence



the overlap (or lack thereof) of these networks can be accounted for with multiplex taskwork-teamwork ties, simplex taskwork ties, and simplex teamwork ties.

Configurations of Taskwork, Teamwork, and Multiplex Processes

There are many potential configurations that could reflect between-team differences in the structure of taskwork and teamwork interaction. Unfortunately, there is no direct guidance regarding the set of configural concepts that could be used to sufficiently reflect team process phenomena. Early research on collective units and organizational systems, however, suggests there are three fundamental elements of structure that can describe the most essential patterns of interaction in teams. These elements consist of (1) the level of interconnectedness or closure; (2) the relative centralization of hierarchy, status, position, or power; and (3) the extent of specialization, departmentalization, or subgrouping (Katz & Kahn, 1978; Stogdill, 1959; Thompson, 1967). We recognize that several specific indices exist to capture each of these basic structures, but for our purpose it is sufficient to focus on the three more general configurations rather than the more nuanced examples.

Closure relationships with team effectiveness. Traditional teamwork theory suggests that increasing teamwork is uniformly beneficial for team effectiveness (LePine et al., 2008). The reasoning is that for teams to successfully accomplish their goals, they need to have a solid understanding of their objectives, develop strategies and contingencies for accomplishing those objectives, track their progress and any other environmental or system factors that affect that progress, coordinate their efforts, and provide help when needed, all while channeling conflicts and emotions for positive team ends (Marks et al., 2001). Thus, to the extent that teams increasingly execute these processes, they should be increasingly effective. Similarly, social network scholars suggest that closure, which refers to increasing interconnectedness in team network interaction, is beneficial because the number of connections indicates a team's capacity to execute tasks and coordinate its actions, thereby enhancing its performance (Balkundi & Harrison, 2006; Hansen, 1999; Reagans & Zuckerman, 2001). However, although increasing team interaction may be beneficial for these reasons, these same interactions come at a cost.

Higher levels of taskwork increase the likelihood that members approach peak levels where the workload begins to overwhelm their capacity, which increases stress, reduces motivation, and hampers individual performance (Beehr, Walsh, & Taber, 1976). Also, although closed networks are more conducive to initiating coordinated action by facilitating the prealignment of members' interests and the development of norms that constrain opportunistic action (Coleman, 1988; Granovetter, 2005), they also pose greater obstacles to the generation of new and innovative ideas by reducing access to novel perspectives, increasing redundancy of information circulating within the network, and constraining individual autonomy to initiate action (Burt, 1992; Granovetter, 1973; Obstfeld, 2005). Consistent with this notion, theory on group interaction systems suggests that groups with moderate closure offer members the greatest freedom to function (Stogdill, 1959). Since a group can only exist under the constraint that its members remain in the system and continue to interact with each other, freedom is minimal in a group of minimum closure because individual action is limited to staying in the system or leaving the system. Freedom is also minimal in a group of maximum closure because individual behavior becomes entirely determined or controlled by the system. Thus, groups of moderate taskwork closure provide members with some predictability of expectations for actions initiated by other members of the group but also permit individuals to have some areas of action (initiative) that are not responses to the actions of other members.

With respect to teamwork, Marks et al. (2001) recognized that there is a significant communication component required from each of the teamwork processes that must operate in tandem with the information generation component. For example, the transition process of mission analysis not only involves interpreting the team's mission but also includes verbal discussion to ensure that relevant team members have a shared vision of the task purpose and its related objectives (2001: 365). The action process of monitoring goals "involves not only detecting progress *but transmitting that progress to team members*" (2001: 366; emphasis added). As a final example, the interpersonal process of affect management requires not only assessing team member emotional levels but also actively communicating to calm members down, control frustration levels, boost morale, and provide empathy (2001: 369). Thus, inherent in each of the teamwork processes is a communication requirement of additional time, attention, and energy from each team member, beyond attention that must be dedicated to taskwork. Because individual actors within the team's system of actors have limits on the attention they can devote to these communications, there is a maximum point at which the benefits of increased coordination become overwhelmed by the costs of communication.

In sum, similar to traditional reasoning, at low levels increased closure in unitary taskwork and teamwork networks brings benefits to team effectiveness because of much greater capacity to coordinate actions, prealign expectations, and establish norms constraining opportunism, but it also brings some burden of increased communication, lost autonomy, and reduced innovativeness. The initial increases in closure are expected to result in a positive relationship with team effectiveness. However, there comes a point at which increasing closure adds little in terms of coordination but imposes still greater costs and constraints in terms of communication and autonomy, resulting in decreasing returns and a negative relationship with team effectiveness. Thus, rather than expecting linear positive relationships, these dynamics result in a negative curvilinear or inverted-U-shaped relationship with team effectiveness. We are not proposing, however, that this curvilinear effect is symmetrical. Several studies of simplex team networks have shown significant positive linear effects between team closure and effectiveness (Balkundi & Harrison, 2006), indicating that there is an overall positive effect of closure. Yet two studies of informal friendship networks have demonstrated that the positive linear trend is accompanied by a significant negative curvilinear relationship (Balkundi, Kilduff, Barsness, & Michael, 2007; Oh et al., 2004). These findings suggest that gains from closure are generally greater than its costs up to the point of very high levels of closure—at which point the incremental gains are outstripped by the incremental costs, and the relationship with team effectiveness levels off.

As we noted above, existing research on configural team concepts has focused on simplex relations. Yet we described earlier how a configural approach to taskwork and teamwork interactions allows researchers to understand and examine the implications of their multiplexity or simultaneous overlap. Before continuing, it is important to mention that this form of multiplexity is not the multiplicative interaction of differing levels of taskwork and teamwork closure. Rather, it concerns the direct examination of multiplex ties and closure thereof as a relation of its own. In other words, multiplex closure represents increasing joint presence of taskwork and teamwork ties between the same team members, not just increasing ties of either type in the team generally. Multiplex relationships are fundamentally different from those comprising simplex tie content since they are a stronger form of relationship (Oh et al., 2006; Scott, 2000). Indeed, as a unique and stronger relation, multiplex ties have the potential to amplify the dynamics of the relationships with team effectiveness discussed above.

We expect that, at low levels, increasing closure of multiplex taskwork-teamwork ties will rapidly generate coordination and trust benefits for team members as they focus their efforts on strategizing, tracking, and encouraging a limited number of taskwork partners for whom such interaction ought to matter most. However, very strong ties require consistent interaction to maintain, and individual constraints on time, attention, and energy keep people from engaging in more than several such relationships (Markovsky & Chaffee, 1995). Because the addition of many more strong ties requires much more intensive interaction for their maintenance, the burdens of communication and losses of autonomy accrue much more quickly for multiplex ties than for simplex ties. As individuals become enmeshed in networks via very strong relations, they become shackled by structure, they become less identifiable as distinct actors, and they lose the freedom to generate ideas and initiate action (Markovsky & Lawler, 1994). In essence, we suggest that for multiplex taskwork-teamwork ties, the benefits accrue rapidly but the costs also become apparent earlier. Thus, the expected relationship between multiplex closure and team effectiveness is more strongly peaked in its inverted-U shape. Furthermore, instead of a positive linear trend, as with simplex ties, the maximum benefit for multiplex ties occurs at more moderate levels of closure, resulting in little to no positive linear trend. Thus, we propose an alternative to the typically expected linear relationship between team process interactions and team effectiveness.

> *Proposition 1: For simplex taskwork and teamwork ties, closure has a positive linear trend and a negative curvilinear relationship with team effectiveness. For multiplex taskwork-teamwork ties, closure has little to no positive linear trend and a significantly more negative curvilinear relationship with team effectiveness (i.e., the positive and negative slopes are steeper).*

Centralization relationships with team effectiveness. Centralization within team networks refers to the relative concentration of interaction around one or a few core members while more peripheral members remain more disconnected (Freeman, 1979; Wasserman & Faust, 1994). The centralization of taskwork and teamwork networks is important to consider for team effectiveness not only because it accounts for additional dynamics that are difficult to observe in traditional conceptualizations of team process but also because these dynamics are distinct from those of closure, described above (e.g., teams with the same levels of closure may have near total centralization or complete decentralization). As in our earlier discussion, relationships of centralization of team processes with team effectiveness are complicated because this configuration, too, involves trade-offs. As Hollenbeck et al. have noted (2011: 65), formal theories and empirical evidence suggest that there is no one best structure in terms of centralization versus decentralization, and one can find both conceptual justification and empirical data suggesting that each alternative has its own set of virtues and liabilities (Burns & Stalker, 1961; Drazin & Van de Ven, 1985; Hollenbeck et al., 2002; Pennings, 1992). We argue here that a configural approach to team processes can advance our understanding beyond this general idea that there are trade-offs.

Centralized taskwork can be beneficial for team effectiveness. The reason is that, in general, it is an efficient means of channeling information throughout a collective (Leavitt, 1951; Shaw, 1964). This efficiency comes about because a central actor can have a better overall understanding of the entire task environment, can coordinate to avoid redundancy in actions and potential cannibalization of efforts where the decisions of one team member undermine those of another, and can serve as a vehicle ensuring that best practices are rapidly diffused throughout the team (Hollenbeck et al., 2011). Centralized taskwork structures also tend to reduce decision-making errors, since courses of action proposed from the periphery generally have to be reviewed and approved by a central actor prior to execution. Such a second look increases the likelihood that teams can prevent mishandling of routine matters, especially if the central actor has more experience, knowledge, or expertise relative to the peripheral members (Hollenbeck et al., 2011).

It is also clear, however, that centralized taskwork structures create peripheral member dependence, which reduces both these members' possibilities for action and their willingness to perform at optimum levels (Shaw, 1964). In a centralized group, peripheral members readily perceive that the central person is autonomous and controls the group with respect to task-focused contributions and interactions. This reduces peripheral members' satisfaction and motivation by inhibiting the gratification of culturally supported needs for autonomy, recognition, and achievement (Shaw, 1964). By creating a high number of communication channels for the central position and limiting alternative channels of information flow between peripheral actors, centralization also increases the risk that the central individual becomes saturated with information requests and communication responsibilities that could be more effectively shared by the whole team (Shaw, 1964). Furthermore, overwhelmed central individuals are prone to distort information they pass on, even if it is not their intention to do so (Balkundi et al., 2009; Brass, Butterfield, & Skaggs, 1998). Cross and Parker's (2004) case study showed that a central broker who spanned disconnected peripheral team members became overwhelmed by the coordination task, producing bottlenecks in the flow of communication and harming the team. Paradoxically, instead of increasing shared understanding of the team's work problems, central actors may actually amplify the differences between the peripheral actors they bridge (Balkundi et al., 2009).

Although prior research has been unable to wholly reconcile these trade-offs of centralization (Zhang & Peterson, 2011), a solution becomes possible once taskwork and teamwork networks are considered together. Specifically, there are good reasons to believe that the liabilities of taskwork centralization can be ameliorated by the virtues of teamwork decentralization. When taskwork is centralized for its efficiency advantages, the corresponding drawbacks of dependence, saturation, and information distortion can be reduced through the use of a simultaneous decentralized teamwork network. The decentralized teamwork structure provides members with flexibility to monitor each other's progress, coordinate, and motivate without having to communicate these activities through a central actor. When examining teams with centralized versus decentralized taskwork structures, for example, Hollenbeck et al. noted that "in order to be effective, all the teams had to balance the workload in real time" (2011: 69). Informal communication among members was not constrained, they were able to warn each other of threats headed their way, and they were able to "hand off" resources that moved from one member's area to another. As a result, teams with a centralized taskwork structure performed well when they used a decentralized structure to engage in teamwork.

In sum, we argue that as team taskwork centralization increases, team effectiveness will be greatest for teams that enact decentralized teamwork. This is because team member dependence, saturation, and information distortion, which are characteristics of centralized taskwork networks, can be ameliorated through the flexibility, autonomy, and adaptability of a corresponding decentralized teamwork network. At the same time, teams with highly centralized taskwork and overlapping centralized teamwork (multiplex centralization) will be least effective, because the costs of centralization described earlier will be compounded, without any of the compensating benefits of decentralization.

> *Proposition 2: Centralization of taskwork will be associated with higher team effectiveness when paired with decentralized teamwork. Centralization of multiplex taskwork-teamwork ties will be negatively related to team effectiveness.*

Subgroup relationships with team effectiveness. Subgrouping within team networks refers to increased concentration of connection among subsets of members along with decreased concentration of connection between subsets (Knoke & Yang, 2008; Wasserman & Faust, 1994). Subgroups represent important patterns of taskwork and teamwork interaction because they deal with efficiencies that are gained by subdivision and specialization of work tasks, as well as obstacles to communication and the transfer of resources in the team (Scott, 2000). Furthermore, as in the case of centralization, these dynamics are difficult to account for in traditional conceptualizations of team process, and they may also be independent from configural patterns of closure and centralization (e.g., teams with similar levels of closure or centralization may have clear subgroups or none at all; Read & Wilson, 1998).

Cohesive subgroups are theoretically important because social forces operate through direct contact among subgroup members, through indirect contact transmitted via intermediaries, or through the relative cohesion within as compared to outside the subgroup (Wasserman & Faust, 1994: 251). As a result, greater homogeneity tends to develop among persons who have relatively frequent face-to-face contact or who are connected through intermediaries, and less homogeneity tends to develop among persons who have less frequent contact (Friedkin, 1984; McPherson, Smith-Lovin, & Cook, 2001). In addition, persons who are in positions to broker between competing factions can be viewed as being located either in enviable positions of power (Burt, 1992) or, conversely, in unfortunate positions of behavioral constraint (Krackhardt, 1999). Recent theory suggests that subgroups form on different bases, whether identity-based subgroups driven by social identity processes, resource-based subgroups driven by social dominance processes, or knowledge-based subgroups driven by information-processing processes (Carton & Cummings, 2012). Our focus is on knowledge-based subgroups, which, applied to our framework, are taskwork subgroups based on joint task involvement corresponding to member differences in knowledge, expertise, or function. Such teams are often designed with such specialization in mind in order to capitalize on unique team member expertise (Carton & Cummings, 2012; van Knippenberg, De Dreu, & Homan, 2004).

Subgroups have a positive impact because they are designed to take advantage of efficiencies associated with team member specialization (Burns & Stalker, 1961). Subgroups of task specialists are also beneficial because members function as supportive cohorts—they share common experience, language, cues, and symbols and engage in richer debate and information exchange (Gibson & Vermeulen, 2003). Subgroups may provide the psychological support necessary for team members to actively pursue and express their points of view (Asch, 1952). In addition, the presence of distinct bases of knowledge, experience, and information between subgroups of specialists can spur teams to consider and benefit from alternative sources of knowledge (Carton & Cummings, 2012; Mannix & Neale, 2005; Reagans & Zuckerman, 2001; Reagans, Zuckerman, & McEvily, 2004). Thus, the division of labor into knowledge-based subgroups can benefit teams by allowing them to take advantage of unique members' specialized expertise, by providing subgroup members with supportive cohorts of individuals with whom they can experiment and test new ideas before risking them to the whole group, and by giving teams alternative pools from which to draw diverse and nonredundant information.

Differentiation into subgroups can also create problems for teams in terms of their ability to integrate diverse knowledge so that it becomes actionable and useful (Carton & Cummings, 2012). The existence of separate "thought worlds" in the same team can result in differing mental models and a failure to converge on a common set of assumptions about the problems the whole team faces or a shared interpretation about how they should go about solving these problems (Cannon-Bowers, Salas, & Converse, 1993; Dougherty, 1992; Mathieu, Goodwin, Heffner, Salas, & Cannon-Bowers, 2000; Okhuysen & Bechky, 2009). Furthermore, positive ingroup biases and negative outgroup biases generated in the presence of tightly knit subgroups may limit the absorption and elaboration of alternative information generated external to the subgroup (Oh et al., 2006; Tajfel & Turner, 1986). Group faultlines research suggests that when subgroups are particularly strong, subgroup members may develop an "us versus them" mentality, and cross-group interactions and communications are more likely to be perceived as interfering, particularly if between-subgroup perceptions are negative (Lau & Murnighan, 1998, 2005). Cross-subgroup information exchanges that would otherwise be perceived as helpful feedback or constructive criticism, for instance, might be seen instead as an attack (Bartel, 2001). Such perceived threats can then accentuate subgroup boundaries, biases, and differentiation, further eroding a group's processes and performance. Ingroup biases also increase the probability that subgroups focus on ingroup goals at the expense of superordinate goals and can lead to negative stereotyping of other groups, which becomes a justification for maintaining social distance and secrecy (Ashforth & Mael, 1989; Davison et al., 2012).

A solution to the seemingly irreconcilable trade-offs involved in taskwork subgrouping becomes possible by considering a separate teamwork network as a means by which to enjoy subgrouping's advantages while minimizing its drawbacks. Research on team boundary spanning indicates that successful teams pay attention to managing activities both within and across team boundaries (Ancona, 1990; Ancona & Caldwell, 1992). According to this perspective, teams are most successful not only when coordinating activities within the team but also when directing significant attention to the pattern of external activities in pursuit of outside feedback, support, resources, and negotiation. When applied to the subgroup level, teams that differentiate into subgroups will need team members to adopt integrating roles in order to be effective (Davison et al., 2012; Oh et al., 2006).

One way that teams manage taskwork subgroup boundaries is by encouraging team members to form teamwork ties with members of other taskwork subgroups. Given limited time, attention, and resources, integrators need to develop ties between subgroups in the most effective way because all the members of each subgroup cannot develop and maintain teamwork ties with all the members of every other subgroup. Doing so would negate the efficiency desired by subdividing taskwork in the first place. Moreover, forming teamwork ties across subgroups imposes additional demands on integrators/liaisons above and beyond their own taskwork. Boundary spanning across subgroups is challenging and stressful for individuals, requiring considerable effort and time (Aldrich & Herker, 1977; Marrone, Tesluk, & Carson, 2007). Ancona and Caldwell noted in their qualitative findings that, in the eyes of one team leader, although each member of a particular group could go out and coordinate his or her part of the project, this was not thought to be a good idea: "You need to know where to go, who to see, how to talk to them, and not everyone can do that. Besides, some design engineers work better with uninterrupted time, so specialized liaison activity was organized" (1992: 646).

Research on multiteam systems suggests that cross-subgroup team liaison activity is most effective when carried out not by all team members, nor by a sole team member, but by a limited number of integrators suited to the role (Davison et al., 2012; Marrone et al., 2007). Thus, teams that seek to have a moderate level of teamwork ties between at least one member of each subgroup will be most successful (Krackhardt & Brass, 1994; Oh et al., 2006). This will allow the teams to quickly access and integrate information and resources in the various taskwork subgroups without being overwhelmed with the demands of managing excessive cross-subgroup relationships. If an integrator has many ties with people in only one or two subgroups, members of disconnected subgroups may be dissatisfied (Krackhardt & Brass, 1994). The fragmented group can suffer from a lack of communication and increasing conflict, resulting in lower group performance. Instead, an integrator's ability to maintain a strong relationship with at least one member of each subgroup will enhance overall group effectiveness (Oh et al., 2006).

> *Proposition 3: Subgrouping of taskwork will be associated with higher team effectiveness when paired with a moderate level of cross-subgroup teamwork ties. Subgrouping of multiplex taskwork-teamwork ties will be negatively related to team effectiveness.*

Task complexity as a moderator. Although our propositions are already fairly involved, the relationships are further complicated by task complexity, which refers to the level and complexity of the information-processing requirements for successful task completion (Gladstein, 1984). Simple task environments are static, routine, and certain, with loose coupling and minimal temporal pacing or entrainment requirements. Such tasks require minimal collaboration and information processing within and among team members. In contrast, complex task environments are dynamic, nonroutine, and uncertain, with tight coupling and demanding temporal pacing and high entrainment. Such tasks are more challenging to coordinate, with greater levels of synchronized collaboration and information sharing required among team members (Bell & Kozlowski, 2002; Kozlowski et al., 1999; Tushman, 1977). Because teamwork functions as an integrative mechanism (Marks et al., 2001), the importance of integrative efforts depends on the complexity of the team task (Gladstein, 1984; Kozlowski et al., 1999). Integrative interaction patterns have been associated with higher performance in more complex, uncertain, and nonroutine task settings, whereas they have been associated with decreased performance in simple, stable, and routine task settings (Tushman, 1977). As a result, we expect that taskwork and teamwork configuration relationships with team effectiveness, particularly those involving multiplex taskwork-teamwork ties, will vary depending on the configuration's alignment with the information-processing requirements of the team's task.

As previously discussed, the benefits of multiplex *closure* include coordination, trust, and member interest alignment, while drawbacks include reduced autonomy and increased communication burdens. Increased information-processing requirements, tighter coupling, and increased temporal entrainment associated with task complexity put a premium on obtaining the benefits of closure, despite its costs. With complex tasks, teams have a greater need to develop appropriate strategies and contingency plans, to synchronize and monitor work effort, and to manage pressures and conflicts that can erode motivation and morale (Marks et al., 2001). The resulting benefits of these teamwork interactions for team effectiveness are much greater relative to their costs in terms of effort, time, and attention. As a result, when tasks are complex, teams can continue to enjoy gains at higher and higher levels of multiplex taskwork-teamwork closure.

In contrast, when tasks are simple and straightforward, teams have much less need to plan and strategize, they have much less to coordinate, and they have fewer pressures and conflicts to manage. As a result, integrative teamwork interaction has much less of a role, and time and effort spent in these interactions may simply be wasted and result in member frustration because attention is directed away from productive work on the task (Hackman, Brousseau, & Weiss, 1976). Thus, when tasks are simple, teams begin to suffer losses from multiplex taskwork-teamwork closure at much lower levels. In terms of moderating the curvilinear relationship of multiplex closure with team effectiveness, we expect the peak of the proposed curve to shift as task complexity increases. When tasks are simple and the costs of multiplex closure quickly outweigh the benefits, the peak of the curve shifts left (observed as a significant negative linear trend accompanying the negative curvilinear relationship). When tasks are complex and benefits continue to outweigh costs, the peak of the curve shifts right (observed as a significant positive linear trend accompanying the negative curvilinear relationship).

> *Proposition 4: Task complexity moderates the curvilinear relationship between multiplex taskwork-teamwork closure and team effectiveness. For simple tasks, the negative curvilinear relationship is accompanied by a negative linear trend reflecting more quickly decreasing returns to increased multiplexity. For complex tasks, the negative curvilinear relationship is accompanied by a positive linear trend reflecting more prolonged returns to increased multiplexity.*

In terms of *centralization*, advantages involve efficient channeling of information, avoided redundancy of effort, and reduced errors in decision making. Drawbacks include peripheral member dependence and demotivation, as well as potential saturation of and information distortion by a central actor. As tasks become more complex, the decision-making environment becomes more dynamic and information-processing requirements become greater. In this complex task environment centralized network saturation is much more likely to overwhelm expected efficiencies not only because the communication demands upon a central person are greater but also because the individual's own task requirements are more demanding (Shaw, 1964). In contrast, with simple tasks, information-processing demands decrease and the decision-making environment is more stable. As the central person's task and communication demands are reduced, concerns over saturation and information distortion are minimized. In an experiment with a simple problem-solving task, Leavitt (1951) showed that communication networks constrained to have high centralization resulted in faster task completion. Thus, simplicity and stability in the task environment make it more likely that the efficiency benefits of centralized taskwork-teamwork ties persist, whereas complexity makes it more likely that these benefits are overtaken by saturation, bottlenecks, and information distortion.

> *Proposition 5: Task complexity moderates the relationship between multiplex taskwork-teamwork centralization and team effectiveness. In simple task environments multiplex centralization will be more positively related to team effectiveness. In complex environments multiplex centralization will be more negatively related to team effectiveness.*

Finally, in terms of *subgrouping*, previously discussed advantages involve efficiency associated with specialization and support, while drawbacks involve difficulties with integration and mental model convergence. Complex task environments place a premium on integrative structures that allow teams to access and integrate diverse pools of information located within subgroups of specialists (Hansen, 1999; Reagans & Zuckerman, 2001; Reagans et al., 2004). With complex tasks, any gains of efficiency from focusing teamwork within specialized taskwork subgroups can be quickly overcome by failures to synchronize and combine the subcomponent work and information generated within those subgroups. Simple tasks, in contrast, allow multiplex taskwork-teamwork subgroups to operate relatively efficiently and independently because there is less need to integrate and coordinate between subgroups. Team members conserve energy and attention by focusing their teamwork interaction within a taskwork subgroup, rather than between them.

> *Proposition 6: Task complexity moderates the relationship between multi-*

plex taskwork-teamwork subgrouping and team effectiveness. In simple task environments multiplex subgrouping will be more positively related to team effectiveness. In complex task environments multiplex subgrouping will be more negatively related to team effectiveness.

DISCUSSION

Consistent with Carton and Cummings's (2012) imperative call for researchers to consider the structure and content of interaction within a unified theory, we assert that scholars should consider closure, centralization, and subgrouping configurations of taskwork, teamwork, and multiplex taskwork-teamwork ties in studies of team effectiveness. Below we discuss implications of this perspective for future research and practice.

Team Network Configurations in Future Team Effectiveness Research

The theory we present in this manuscript challenges researchers to take more varied and nuanced positions in hypothesizing relationships among team processes and team effectiveness. Indeed, as teams become increasingly complex, dynamic, and dispersed (Tannenbaum, Mathieu, Salas, & Cohen, 2012), our explanations of team effectiveness need to evolve and adapt to account for this complexity (DeCostanza, DiRosa, Rogers, Slaughter, & Estrada, 2012). Previous research has provided a great deal of insight regarding our understanding of team effectiveness (LePine et al., 2008). However, teams involve uneven member contributions, as well as nonredundant perceptions and motivations, making it difficult to understand team functioning through traditional assumptions of uniformity and corresponding linear aggregations (Mathieu et al., 2008; Murase, Doty, Wax, DeChurch, & Contractor, 2012).

Reconciling trade-offs. By considering configurations of taskwork and teamwork closure, centralization, and subgrouping, it becomes possible to reconcile the varying and sometimes opposing mechanisms through which team process interaction influences team effectiveness. For example, we have suggested that closure increases team effectiveness through increased trust, member interest alignment, and reduced opportunism. Yet these benefits are balanced against increasing drawbacks in the form of communication burdens, reduced autonomy, and reduced innovativeness. Centralization is linked to team effectiveness through efficient dispersion of information, reduced duplication of effort, and increased accuracy in decision making, yet these effects can be limited by increased dependence and demotivation of peripheral members, as well as information distortion, whether intentional or accidental, by overwhelmed central members. Finally, subgrouping can be associated with greater team effectiveness through efficiencies gained by specialization and rich information exchange in supportive cohorts. However, supportive subgroups can limit effectiveness through ingroup biases that inhibit cross-subgroup integration and mental model convergence. Beyond suggesting that teams encounter trade-offs in configurations of taskwork and teamwork, our perspective allows researchers to consider how disadvantages associated with centralization or subgrouping of a taskwork network can be compensated for by the advantages of decentralization or cross-subgroup integration of a teamwork network. In sum, by considering the simultaneous opposing effects of these mechanisms, as well as how they can be reconciled in examinations of team process interaction and team effectiveness, we can gain a more complete understanding of why teams succeed or fail.

Integrating structural elements. We recognize that implementing the approach advanced here imposes new challenges for scholars in terms of data gathering, operationalization of variables, and complex analyses involving altogether new tools. However, we are not advocating complexity just for complexity's sake. Rather, we believe the approach will inspire scholars to think differently about team processes, with the result being explanations of team functioning and effectiveness that are more integrative and complete. Beyond direct tests of our propositions, for example, scholars can examine effects of closure, centralization, and subgrouping together, as opposed to in isolation, as in previous research (e.g., Balkundi & Harrison, 2006; Hollenbeck et al., 2011; Lau & Murnighan, 2005; Leavitt, 1951; Marks, DeChurch, Mathieu, Panzer, & Alonso, 2005). Such an approach is consistent with our theorizing insofar as these configural concepts are functionally distinct, and it is consistent with empirical research demonstrating that these configural concepts are largely uncorrelated (Read & Wilson, 1998; Sparrowe et al., 2001; Zhang & Peterson, 2011). Including multiple configural predictors may be particularly useful in helping us understand which aspects of structure are most and least important. The few studies that have examined closure and centralization in tandem (e.g., Balkundi et al., 2009; Cummings & Cross, 2003; Sparrowe et al., 2001; Zhang & Peterson, 2011) have demonstrated promise for this approach.

Unpacking teamwork interactions. In this article we have considered teamwork as a unified relation because meta-analytic evidence suggests that Marks et al.'s (2001) teamwork process dimensions load on a single higher-order overall teamwork quality factor (LePine et al., 2008). However, the underlying process dimensions represent conceptually distinct content, and when considered in an "unpacked" fashion, they may yield predictions that vary from what we have proposed here. For example, whereas it might be detrimental to centralize helping and backup behavior because no one team member can be available to assist all others while simultaneously accomplishing his or her own work (e.g., Barnes et al., 2008), effects may be somewhat different for centralization of motivation and confidence building. Indeed, under certain circumstances one highly enthusiastic cheerleader or motivator may be sufficient to influence the morale and "mood" of the team.[1] In sum, our understanding of teams will benefit from convergent validity tests of process dimension networks and from an examination of their structures' possibilities for varied prediction of team effectiveness.

Shared and configural constructs as complements. We note that our configural approach is not intended to replace what we have learned from the traditional approach to team processes; rather, it builds on and complements it. The two approaches are based on different assumptions regarding collective construct emergence, and, accordingly, their resulting operationalizations reflect different types of collective constructs. Research on informant accuracy suggests that shared perceptions of team properties and their corresponding structural configurations are not necessarily related (Bernard, Killworth, Kronenfeld, & Sailer, 1984). Because these are distinct concepts, researchers have an opportunity to test their relative and incremental validities for predicting team effectiveness. Moreover, scholars could develop and examine substantive theory that included both configural patterns and shared perceptions of team process. It may be, for example, that the influence of team process closure or centralization on team effectiveness is mediated in part by the team's shared perceptions of the general extent to which team processes occur. Such a theory could be grounded in the idea that effective team interaction signals to members that the team is functioning well, thereby motivating members to focus energy on team ends. In sum, explanations of team effectiveness can improve as researchers consider whether the team perception of process and the structural patterns of team member interactions independently and jointly explain team effectiveness beyond the explanation offered by either in isolation.

Managing Team Network Configurations to Enhance Team Effectiveness

Finally, we comment on how a manager who depends on team members for output—or how team members themselves—can use an understanding of configurations to organize taskwork and teamwork in a way that fosters team effectiveness. First, although conventional wisdom might suggest that team members should work together to the greatest extent possible on all tasks, excessive teamwork imposes communication burdens that may distract members from accomplishing tasks. It also reduces autonomy and freedom, which may result in reduced team innovation. Accordingly, a team manager or team members may choose to limit teamwork interaction to more moderate levels in order to maintain coordination but preserve autonomy. Of course, our theory also suggests that the decision to purposely limit teamwork requires consideration of the complexity of the task at hand. With very simple tasks, reducing the emphasis on teamwork may be particularly beneficial. However, as the level of complexity increases, there may be benefits to dedicating significant

[1] We thank an anonymous reviewer for bringing this point to our attention.

time and attention to integrative teamwork interaction. Thus, to the extent that teams are involved with different tasks that vary with respect to their complexity, teamwork training could emphasize *when* to engage in teamwork, rather than just *how*.

Along the same lines, training efforts could focus on with *whom* to interact. For example, teams that aim to achieve efficiency through centralized taskwork could end up with overwhelmed central members and unmotivated peripheral members. Application of our theory suggests that these problems could be ameliorated with training encouraging peripheral members to informally coordinate, seek help and assistance, and encourage each other without communicating through the central actor. Teams that do so could more effectively balance workloads, reduce the likelihood of bottlenecks, and facilitate mutual performance monitoring and error detection (Kozlowski et al., 1999). These effects, again, are likely to be contingent on the complexity of the team's task situation. In very simple tasks where central actors have sufficient time to process information from each peripheral member separately, the central actor will not likely become saturated, and there will be less need to offload informal coordination capability (Kozlowski et al., 1999). However, with very complex tasks, team members must realize that the likelihood of centralized actor saturation is very high. Thus, they should avoid such problems in the first place by distributing taskwork in a more decentralized fashion.

As another example, teams that subdivide taskwork with the hope of achieving efficiency gains through specialization, but that also realize that doing so will increase their likelihood of encountering integration difficulties and divergence in mental models, may overcome these challenges by assigning capable members as cross-subgroup liaisons who regularly cross subgroup boundaries to discuss plans, track progress, and manage conflicts between subgroups (Davison et al., 2012). Whether such challenges exist depend, as discussed, on the complexity of the task situation. Simple task situations may allow teams to be successful with liaisons engaging in very minimal boundary-spanning activity, whereas complex task situations may allow teams to be successful only when liaisons engage in very extensive boundary-spanning activity.

It is important to note that a team's ability to revise and reconfigure its patterns of task and teamwork interaction presupposes the team's ability to understand its current configurations (Kozlowski et al., 1999). Research using sociometric badge data has shown that teams can instantly diagnose their patterns of interaction when presented with visual maps of their communication (Pentland, 2012). Further, this research has shown that managers can use such visualizations as a training tool to help teams quickly improve their patterns of interaction and resulting team performance, and much of this improvement occurs without making any changes in team membership. Thus, helping team members understand and alter their configurations of teamwork and taskwork is a powerful way that managers can help teams enjoy the benefits while avoiding the pitfalls of complex team interactions.

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