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FOCAL ARTICLE

Teams Are Changing: Are Research and Practice Evolving Fast Enough?

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Abstract

In the past, there was a fairly strong alignment between what teams experienced, the topics that team researchers were studying, and the practices that organizations used to manage their teams. However, the nature of teams and the environment in which they operate has changed, and as a result, new needs have emerged. Although there have been some innovative advancements, research and practice have not always adjusted to remain aligned with emerging needs. We highlight 3 significant change themes that are affecting teams: (a) dynamic composition, (b) technology and distance, and (c) empowerment and delayering. For each theme, we share our observations, review the related science and identify future research needs, and specify challenges and recommendations for employing effective team-based practices in applied settings. We conclude with thoughts about the future and suggest that new theories, research methods, and analyses may be needed to study the new team dynamics.

Teams have been an important part of organizational life for a long time. Organizations use teams to tackle many of their most difficult and pressing needs. As such, researchers have studied team dynamics and have attempted to uncover how best to ensure team effectiveness. Much has been learned, and substantial progress has been made on the science and practice of team effectiveness in the past few decades. Yet, we have reached a turning point for the study and application of teams. Traditionally, a team has been defined by certain characteristics. Consider, for example, two commonly cited definitions of teams:

- Salas, Dickinson, Converse, and Tannenbaum (1992) defined a team as ''a distinguishable set of two or more people who interact, dynamically, interdependently, and adaptively toward a common and valued goal/objective/mission, who have each been assigned specific roles or functions to perform, and who have a limited life-span of membership'' (p. 4).
- Kozlowski and Bell (2003) defined teams as collectives ''who exist to perform organizationally relevant

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> tasks, share one or more common goals, interact socially, exhibit task interdependencies, maintain and manage boundaries, and are embedded in an organizational context that sets boundaries, constrains the team, and influences exchanges with other units in the broader entity'' (p. 334).

Historically, both researchers and practitioners have implicitly assumed that most teams possess a few common characteristics. In general, it appears that research studies and team-based practices were designed with a focus on teams whose membership (a) was fairly stable over time, (b) was assigned solely or primarily to that team, (c) shared common goals, (d) performed in defined roles, (e) worked on fairly well-defined and consistent tasks, and (f) existed in a common location.

For example, a production team in a manufacturing setting typically possessed many of the characteristics described above, and prior research and practices could be considered relevant for such a team. So in the past, there was a fairly strong alignment between what teams were really experiencing (needs), the topics that team researchers were studying (research), and the practices that organizations used to manage their teams (practices). However, the nature of teams and the environment in which they operate has changed, and as a result, new needs have emerged. Team research and practice have not always adjusted to remain aligned with those emerging needs.

What's Changed and Why?

We have entered a new era. Today, most teams operate in a more fluid, dynamic, and complex environment than in the past. They change and adapt more frequently, operate with looser boundaries, and are more likely to be geographically dispersed. They experience more competing demands, are likely to be more heterogeneous in composition, and rely more on technology than did teams in prior generations. Teams have become so ubiquitous that many employees, and managers, take them for granted and assume that they will be effective.

These changes have been stimulated by a series of well-documented business trends. The drive for economic efficiencies, triggered in part by fierce competition, has placed pressure on organizations to become leaner, quicker, and more responsive. Companies feel the need to get to market, respond to issues, and make adjustments faster. To meet these environmental and competitive demands, many organizations are using work teams as a way to be more agile (e.g., Campion, Medsker, & Higgs, 1993; Mathieu, Maynard, Rapp, & Gilson, 2008; Sundstrom, 1999). As a result, teams are formed, reconfigured, and sometimes disbanded rather quickly. In some cases, teams are formed with conscious forethought; in other cases, they are assembled informally, spontaneously, or haphazardly. Regardless, given the prevalent use of teams, many employees are members of multiple teams simultaneously.

Organizations are increasingly operating in a global marketplace. Companies recognize that complex problems are often best tackled by a team of people with diverse expertise, regardless of their location. Technological advancements, coupled with the high cost of travel, are enabling and encouraging the use of more virtual teams (VTs). A team can easily be made up of people who work in different time zones, and some members may even have different primary organizational affiliations. Having a diverse, geographically dispersed team creates great opportunities and also presents its own unique challenges.

A heightened emphasis on talent management means that organizations are more apt to see employees as an organizational asset and not simply a local asset. High-potential employees are reassigned frequently to meet organizational needs and continue their personal growth, often joining intact work teams ''midstream.'' Temporary project teams help companies remain agile, and assignments to them may also be considered to be a developmental

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opportunity, even when it is in addition to an employee's regular job.

Given these changes, now is a good time to reconsider some of the implicit assumptions that have been underlying team research and practice. For example, past researchers have typically assumed that factors such as team membership, structure, roles, goals, and level of interdependence would remain consistent and universally applicable throughout the team during a study. These factors have typically been treated as stable, independent variables, or measured once and used as correlates, rather than viewed as dynamic variables that might change over time or manifest themselves differently throughout a team. Yet some researchers have recently advocated exactly the opposite perspective—that perhaps teams should be designed to exploit the diversity of members and their interactions over time (e.g., Harrison & Humphrey, 2010).

Researchers have attempted to categorize teams into major ''team types'' (e.g., production, action, and decision making). Such categorizations were useful for highlighting some differences between teams, but they can also be limiting for understanding team effectiveness (e.g., are all problem solving teams really similar?). In some ways, it may be better to consider the nature of various pressure points, challenges, and enablers that teams possess and experience rather than archetypical team types (see Wildman, Thayer, Rosen, Salas, Mathieu, & Rayne, in press). Over the years, many excellent team studies have been conducted. Some of them are helpful for understanding the new team dynamics, and some emerging research appears to be quite promising, but gaps do exist between today's needs and the current state of team research.

There have been assumptions made on the practice side as well. Historically, team-based practices—the way teams were structured, formed, managed, developed, and rewarded—were established to fit a traditional type of team. Although some team practices have naturally evolved to address emerging needs and challenges faced by teams today, other practices warrant further attention. For example, if roles, goals, and tasks are assumed to be stable, then the way team members are selected can be largely informed by a candidate's readiness to perform a specific role. But what happens when the roles or missions are more dynamic? Will a candidate be able to support the team's emergent needs? If a team's membership is assumed to remain fairly constant, then it makes sense to train them when the team is formed but not necessarily a year later. But what happens next year, when 75% of the team membership changes over the course of a project?

The premise of this article is that the fundamental nature of teams has been changing. Although team-based organizations are becoming more popular and are arguably the norm these days, the way teams are designed, implemented, used, and transitioned is markedly changing. Research and practices employed to promote team effectiveness need to keep up with emergent needs. Although some team-related dynamics remain the same (e.g., the need to align individual competencies and expectations with a team's needs and requirements), other dynamics are changing and some existing challenges are becoming more prevalent or pressing.

Below, we identify three significant change themes that are affecting the nature of teams and the environment in which they operate: (a) dynamic composition, (b) technology and distance, and (c) empowerment and delayering. These are not the only changes, but we believe they are the most prevalent and impactful ones. For each theme, we first describe the changes we are seeing. These observations are based solely on our experiences with a fairly broad spectrum of teams rather than from the research literature. Hopefully, these reveal a few emerging team ''needs'' from a practitioner perspective. We then briefly review the science related to that theme, noting where existing research can provide useful insights and posing research questions where future studies are needed.

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Finally, for each theme, based on both our observations and the research, we identify a set of challenges and recommendations for employing effective team-based practices in applied settings. As an *Industrial and Organizational Psychology* focal article, we encourage readers to consider how our observations and recommendations compare with their own experiences and research, identifying where there are similarities as well as points of departure.

Theme 1: Dynamic Composition

The traditional team consisted of a defined set of employees. Although members of the team might interact with people outside their team, the boundaries were clear. They belonged to ''their'' work team. Team members were chosen to be on that team and for the most part, although the leader would periodically need to replace team members due to attrition, team composition remained fairly stable.

Today, however, teams exhibit far greater fluidity. New team members join and others leave with greater regularity and not simply because of turnover. Movement is the ''new normal.'' In many cases, the intent is for membership changes to be planned and orchestrated, rather than chaotic or circumstantial, although of course, in practice, both planned and emergent changes often occur.

Some organizations use temporary teams as a primary building block. For example, professional service firms such as accounting, marketing, engineering, law, information technology, and consulting firms form project teams to address specific needs. Within a corporation, temporary project teams are also quite common, for example, to develop a new product, support a change effort, or implement a new system. For these teams, membership change is to be expected. Temporary teams often adjust membership on the fly. A new team member might be added because a different skill was needed. An existing team member might be reassigned to address a more pressing need in another project. Team size might contract or expand over time. Ultimately, the team will disband and members will be assigned to another newly formed team or will join an existing team in progress.

Another new type of configuration is referred to as *flash* teams. These include emergency surgery teams, disaster support teams, airline crews, and journalism teams. They are quickly formed to address a need, whether an emergency (e.g., a disaster) or a more routine requirement (e.g., fly to Topeka, research, and write a newspaper article before deadline), they then quickly disband to perform other assignments. Some of the team members may have never worked together before or have done so quite infrequently. It is easy to see how the dynamics of such teams are different from those of teams for whom the team formation and performance cycle is more prolonged. Although most teams may not be flash teams, many teams now need to form and prepare on an accelerated schedule.

Some teams, intentionally or not, develop inner and outer circles. The inner circle or ''core'' might consist of people who are expected to be prime contributors and remain with the team, whereas the outer circle or ''peripheral'' could include individuals who will likely play more minor roles and be with the team for a shorter time period. In other cases, the circles may be more closely defined by organizational affiliation. A work team might have permanent employees (inner circle) who work together with temporary workers, contractors, or consultants who are primarily employed by an external firm (outer circle). When there are inner and outer circles, membership changes often are not evenly distributed throughout the team but instead occur more frequently in the outer circle.

It is increasingly common for individuals to be members of multiple teams or have multiple affiliations. In a basic case, employees might be members of their permanent departmental work team while also assigned to participate in temporary project teams. In the case of a team with an inner core of employees and an outer core of contractors, each contractor

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generally belongs to multiple teams with different organizational affiliations, one of those being their home company and the others as temporary assignments. In the most extreme case, team members might be teamed with competitors. This happens when competitors join together to collaborate on a specific endeavor, for example, on a joint venture, industry consortium, or collaborative research effort.

All these changes have implications for team research and practice. Below we examine the related research and identify where insights exist and gaps remain for understanding teams with dynamic composition. We then highlight a few implications and recommendations for team-based practices.

Research on Dynamic Composition

Most team composition research indexes members' characteristics and models their influence on later team process or effectiveness criteria. In effect, team membership is treated as though it is a static variable. However, in many, if not most, modern-day organizations, members move in and out of teams, altering the mix of individuals' histories of working together and member characteristics (Arrow, 1997; Arrow & McGrath, 1995; Hirst, 2009). Military teams have member turnover and replacements for a number of reasons. Similarly, in commercial organizations, production, sales, and other types of teams experience membership changes as a result of both turnover and hiring. Even the rosters of professional sports teams change over time. This raises the question of how member movement in and out of teams influences their effectiveness.

Membership Fluidity

Membership dynamics (Arrow & McGrath, 1995) are likely to have both positive and negative effects on teams. Specifically, fluidity of team members can provide the means for knowledge transfer (e.g., best practices) and other resources between groups (Ancona & Caldwell, 1998; Arrow & Crosson, 2003; Lewis, Belliveau, Herndon, & Keller, 2007). In addition, membership adjustments can allow for better alignment with a dynamic environment and may aid in keeping the team flexible and thus able to make adjustments when required in a time of crisis. However, membership changes may also diminish the stability of patterns of member production, member support, and group production (Arrow & McGrath, 1995).

Such conflicting effects point to the fact that more research is needed that addresses membership dynamics. Specifically, research to date has not adequately examined the characteristics of team members who are leaving as well as of those joining the team. For example, prior research has not given adequate consideration to the specific knowledge, skills, ability, and other characteristics (KSAOs) of ''leavers'' and ''joiners,'' as well as their familiarity with current team members (''stayers''). Harrison, Mohammed, McGrath, Florey, and Vanderstoep (2003) noted that only 15 (9.3%) of the 161 empirical studies that they reviewed from 1990 and 2001 in three of the more prominent applied psychology journals (*Organizational Behavior and Human Decision Process*, *Personnel Psychology*, and *Journal of Applied Psychology*) accounted for team familiarity. Thus, research has not given sufficient attention to the impact that team familiarity may have on team interactions and ultimately on team performance outcomes.

However, having a history of interaction with other team members does not always pay positive dividends. For example, in a laboratory study, Kim (1997) found that team experience had a significant, negative relationship with team performance. Similarly, Littlepage, Robison, and Reddington (1997) failed to find support for their hypothesized positive relationship between team experience and team performance within two of three laboratory studies. Elsewhere, Hirst (2009) found that the effects of membership change on team discussion and performance differed as a function of how long teams had been

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together. In short, when previous team experiences were not positive, they may actually hinder future team efforts.

Team composition research has not typically considered characteristics of leavers and joiners and how they change the relative mix of team member KSAOs. If a replacement member possesses a different array of KSAOs, compared to a leaver, then clearly job performance and team work would be affected. Because team-specific KSAOs related to teamwork develop over time and experience between teammates (Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995), replacements may set the system back to an earlier stage of development if a nucleus of the team is not retained (e.g., Hill & Gruner, 1973). How far back this goes is likely to be a function of the attributes of stayers, replacements, and the developmental phenomena associated with achieving synergies. In summary, research is needed to investigate how the rates and different types of member movements (i.e., the characteristics of leavers and replacements) influence the compositional mix of teams over time and thereby affect their effectiveness.

Reconfiguring Teams

Many organizations are designed, whether intentionally or otherwise, to operate as a cluster of reconfiguring temporary teams (Ellis et al., 2003). In such designs, combinations of members are brought together for a particular task, project, or activity, after which they disband and become available for new assignments (e.g., Webber & Klimoski, 2004). For example, many accounting and consulting firms construct project teams based on factors such as experience within a particular industry or experience working with a specific client. The number and combination of team members may well vary as a direct consequence of task demands and individual availability, as well as indirectly on the basis of demands for members on other assignments. As another example, the mix of firefighters who report to a given incident is a function of the nature of the fire (e.g., high rise building vs. a residential or forest fire), the location of the fire relative to stations, the availability of crews given other calls, and other factors. Consequently, commanders not only need to develop a strategy for handling the incident, they also must determine how to deploy their human resources given the mix of who is available at any given time.

One advantage of adopting such a project-based approach toward team staffing is the assumption that it facilitates the transfer of knowledge and the alignment of member KSAOs with task demands (e.g., Ancona & Caldwell, 1998; Mohrman, Cohen, & Mohrman, 1995). However, to the extent that project-based staffing reduces knowledge about and familiarity with other team members, it may also have negative implications. At issue then is that research to date has not adequately accounted for the fact that for each team configuration there is a network of intermember histories of working together. Some members may have worked extensively together, whereas others may be meeting for the first time. Understanding the influence of these compositional networks represents a daunting challenge for researchers and practitioners alike. In summary, we need to investigate how the rates and different types of member movements (i.e., the characteristics of leavers and recruits) influence the compositional mix of teams over time and thereby influence their effectiveness.

Multiple Team Memberships

Some scholars have acknowledged that individuals often belong to multiple teams simultaneously (e.g., Espinosa, Cummings, Wilson, & Pearce, 2003; Maynard, Mathieu, Gilson, & Rapp, in press; Mortensen, Woolley, & O'Leary, 2007; O'Leary, Mortensen, & Woolley, 2011), but there is scant research devoted to how this influences either teams or individuals. For instance, in project-based settings, individuals are often part of a resource pool that is drawn from according to some combination of their KSAOs and the needs of the project

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or team task, although at times, the people who are available are not always those with the best KSAOs. Individuals may simultaneously be members of four or five teams. How do such work arrangements influence individuals' contributions, identity, and so forth to each team? What impact does this have on the members themselves? Does it matter if they occupy similar or widely different roles across those various team memberships? Although this type of work arrangement is quite prominent these days, very little is known about its implications for either teams or individuals.

When individuals are assigned to multiple teams, there are varieties of ways their time can be allocated across teams. For instance, a team member assigned to four teams may allocate 70% of his or her time to one team and 10% to each of the remaining three or split time evenly among all teams. How team members allocate their time across multiple teams has the potential to influence the processes and effectiveness of any given team. For example, Cummings (2007) found that teams comprised of members who committed a higher percentage of time to the focal team demonstrated superior performance, relative to teams comprising members who allocated a smaller percentage of their time to the focal team. In a related vein, Gonzalez and Mark (2004) distinguished between central and peripheral working spheres or units of work. A central working sphere is one in which an individual is more involved, whereas peripheral refers to one in which the involvement is limited.

As multiple team memberships (MTMs) become more prevalent, individuals must decide how to allocate their time between teams and at a particular point in time which team(s) is going to be more central or peripheral. The extent to which team members allocate their time to a given team will influence the attention given to team processes. For example, Mortensen et al. (2007) interviewed a study participant who explained, ''On my main project, I work 50% of my time .... On this other project, I am just a consultant, like 4 hours a week, because they need me for a particular part'' (p. 9). When individuals are simultaneously members of multiple teams, how they allocate their time, attention, priorities, identity, and so forth all become salient issues—but are little understood at present.

In summary, team composition is anything but static in modern-day team arrangements—but it is rarely studied as such in the extant literature. Fluid, dynamic teams are more challenging to study than stable, traditional teams. Table 1 lists several topics that we believe offer fruitful directions for future research in this area.

Dynamic Composition: Implications for Practice

Below we identify a few implications and recommendations for team-based practice given the changes associated with dynamic team composition. In general, there is a need to better equip team designers and team leaders to rapidly and effectively form and develop teams when team membership is more fluid and dynamic.

- *Team formation*. Many teams are being formed quite rapidly, often without a great deal of forethought. Organizations need to help leaders quickly and logically choose team members in a manner that optimizes overall team composition and probability of success. Some organizations have experimented with team formation templates and tipsheets that guide team designers to not only assess whether individual team members are qualified to fulfill a particular position on the team but also consider whether potential team members can work well together, whether the team will have enough people who care about ''teamwork,'' and whether key groups will be appropriately represented on the team. There is a clear need for tools to help form teams quickly but logically.
- *Sense of identity and role clarity*. Membership on multiple teams, inner and outer circles, and unclear boundaries

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Table 1. *Suggestions for New Directions in Teams Research: Dynamic Composition*

- How does the fluidity of team membership (leavers and joiners) influence team composition of KSAOs and subsequently team processes and performance?
- What are the times and conditions when teams are most vulnerable to and affected by changes in membership and which position changes are most disruptive?
- What are the consequences of planned versus unplanned membership changes, and how can teams mitigate potential disruptions?
- What are the implications of individuals simultaneously serving on multiple teams for (a) organizational effectiveness across teams, (b) a team's effectiveness, and (c) individual well-being?
- How can organizations most effectively deploy and develop their human resources in the context of reconfiguring team designs?
- What factors enhance the effectiveness of *flash* teams, and what can be learned that applies to teams that also need to form and develop rapidly?
- What are the consequences on comprising teams with team members from different and even competing organizations or with inner and outer circles of membership? How are conflicts of interest resolved when some member experiences loyalty to several teams with disparate goals?
- How are critical team states, such as trust, identity, and shared cognition, influenced by dynamic team composition?
- How do fluid teams safeguard intellectual property and confidential information?

can create ambiguity about identity and responsibilities. Team leaders need guidance on how to create an appropriate sense of team identity and ensure sufficient role clarity in dynamic and ambiguous work environments. For example, when team members have multiple allegiances, additional time should be allocated during early team meetings to clarify team boundaries and roles, including an explicit discussion of shared goals given team members' different affiliations.

- *Transportable teamwork competencies*. It is increasingly common for individuals to change teams regularly and serve as members of more than one team at a time. Therefore, organizations can benefit from building ''transportable'' teamwork competencies that employees can use in almost any of their team assignments. For example, when a team member learns how to facilitate a team debrief or becomes more skilled at resolving a conflict, she can ''transport'' those skills to multiple team settings. Organizations should identify the most useful transportable teamwork competencies and incorporate those into their training efforts.
- *Rapid integration*. Teams are often launched quite quickly and new team members frequently join teams in progress. Organizations need to find ways to accelerate team readiness and help orient and prepare new team members. There is a need to establish ''quick-start'' protocols for rapid team launches and ''join-in-progress'' protocols to ensure new team members are brought up to speed quickly and seamlessly. In addition, for teams that experience frequent member turnover, a training refresher plan should be established when the team is formed because new members will not have participated in any of the training initially provided to the team.
- *Workload and team assignments*. Holding a ''regular'' job and serving on several temporary teams can create the ''full plate'' syndrome; this is a particular problem for people with skills that are in high demand. Decision

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makers need to consciously weigh each potential team member's capacity when forming teams, including the explicit identification of their current obligations. Overloading highly valuable employees with too many team assignments renders them less useful and can lead to burnout. Overreliance on a few key players may also be a diagnostic sign that indicates a shortage of talent in a key area.

- *Multiteam evaluation and rewards*. Most performance evaluation systems are designed to assess performance in one's core job. Unfortunately, some employees end up being ''punished'' for having a diminished focus on their core job because they were also given other high priority team assignments. In organizations that regularly assign individuals to project teams in addition to core job responsibilities, supervisors must be trained to discuss and clarify the relative priorities of core and project assignments with their employees. In addition, performance evaluations should be based, in part, on input from project team leaders, and rewards should reflect an employee's overall contributions to the organization, including their work on various team assignments.
- *Handoffs and transitions*. When teams must coordinate with other teams and membership is dynamic, handoffs to and from the team become increasingly important and challenging. In organizations for which handoffs are common, a careful assessment should be conducted to determine the number and type of people who need to remain with a team to ensure sufficient stability or who need to overlap with a subsequent crew or shift to allow for a seamless handoff. The medical world has been focusing extensively on handoffs for the past several years, and perhaps some of their work with checklists and training could be extended to apply to other types of organizations.

Theme 2: Technology and Distance

Technology has changed the way that many teams operate. Improved knowledge repositories, data storage, and connectivity have made it easier for all team members to access information, regardless of their location. For example, a teammate or team leader may be able to view other members' work, ascertain their availability, and track their progress remotely. Several team members can work on a document together, either separately or simultaneously. At a call or service center, work can be distributed to another team member automatically based on work flow data.

Advancements in communication and collaboration technologies have enabled teams to interact at a distance. Some teams rely quite extensively on technology-based communications and meetings, others less so. For many teams, there are fewer face-to-face interactions and meetings than there were in the past. As automation increases, we are starting to see how technology may even replace some team members. For example, rather than asking a teammate for advice, a team member may start to see an expert system as the ''go-to person'' on their team. As an extreme case, the military is attempting to develop intelligent automated agents to substitute for team members or portray enemy forces during team training exercises.

Collectively, these technologies have implications for a wide range of team processes, including planning, communicating, coordinating, decision making, and leading. A team leader's ability to review work and communicate at a distance can influence how she interacts with her team. Technology can provide greater transparency and change how team members are able to monitor and back-up one another. Even team composition has been affected by technology. For example, in the past, a person who lived in a different time zone might not have been considered as a potential team member. Now that person could be chosen to be part of the team because the expectation is that technology will allow

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him or her to remain sufficiently connected. Technology has enabled the formation of more culturally and geographically diverse teams. It also appears to have contributed to more people serving on multiple teams simultaneously, as it is now easier to add someone at a distance to a team ''to ensure their unit is represented.''

Technology has the potential to enhance teamwork and team effectiveness. But teams face a new set of challenges as a result of technological advancements. For example, greater connectivity enables easier monitoring. Consider the use of Global Positioning Systems (GPS) that allow a command center to monitor exactly where all firefighters are in a burning structure, along with their oxygen levels, vital signs, and environmental conditions. Similarly, video cameras allow on-shore and off-shore oil-rig team members to see one another at all times. Although there are many advantages to such connectivity, any technology that allows greater monitoring may also evoke concerns about ''big brother'' intrusiveness and stimulate distrust.

The ability of a team member to immediately ask questions of, seek feedback from, and provide input to another team member—even after normal work hours—can present its own set of challenges. Easy access to data, and the incessant exchange of communications, can produce information overload. Technology allows team members to connect and interact 24 hours per day. Communications can take place through a wide range of modalities ranging from face-to-face to e-mail and phone to videoconferencing and social media. In fact, some companies routinely employ tools, such as telepresence and other high-fidelity videoconferencing tools, and have even experimented with the use of virtual presence or holographic videoconferencing, all with the goal to provide team members with a greater sense of collocation.

Team members from different generations or cultural backgrounds can have different expectations about the use of technology. For example, in a team we are familiar with, younger team members prefer to communicate through technology such as texting or social media, whereas older team members want to talk via the phone or in person, creating some divergent communication patterns and potential fault lines. In addition, communicating through a technological medium can sometimes mask or exacerbate cultural differences, for instance, when culturally relevant nonverbal cues in a videoconference or phrases in an e-mail are misunderstood.

In short, the new reality of being accessible 24/7 means that teamwork invades employees work–life balance, further exacerbating stress. Working with team members across multiple time zones can create additional scheduling challenges. Although work–life balance can be a concern even without teamwork demands, being a member of one or more global VTs certainly means that such intrusions will be a frequent occurrence. Most teams now need to establish ways of using technology so it is perceived positively and not as the enemy.

As a more dramatic example of how technology will increasingly affect team dynamics, robots and avatars are gradually transforming their role from tools controlled by humans into entities that are more like full-fledged members of a team, capable of acting autonomously and communicating with their human counterparts. ''Robot'' team members and ''intelligent agents'' will eventually play significant roles in military, space flight, medical, and emergency response teams, as well as any other situation where a significant risk to human life could be posed. Although most of us will not be interacting with robots in the near future, many of us may be interacting with knowledge repositories, expert databases, forecasting and decision aid tools, and other semi-intelligent information sources that will serve, in a sense, as a different form of team member.

Technology is unlikely to reverse course. New developments are certainly forthcoming. Therefore, it is critical that our research helps us understand how technology affects team processes and effectiveness and that we establish team-based practices

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that capitalize on technological capabilities and help mitigate or avoid potential pitfalls.

Research on Technology and Distance

Early research on VTs (see Martins, Gilson, & Maynard, 2004, for a review) found that virtuality was a double-edged sword. Although technology served to bring diverse and dispersed members together, teams that interacted virtually often found it hard to gain a shared understanding regarding the team's task (e.g., Armstrong & Cole, 2002) or maintain high levels of member trust (Jarvenpaa, Rao, & Huber, 1988). However, as technological tools have improved and VTs have become more common, two patterns have emerged. First, rich forms (e.g., Daft & Lengel, 1984) of technology such as videoconferencing and virtual meeting software are now more readily available. Second, teams have become more adept at incorporating technology into their functioning while also adapting technology to fit member preferences (e.g., DeSanctis & Poole, 1994; Majchrzak, Rice, Malhotra, King, & Ba, 2000). In part, this is increasingly the result of teams being staffed with individuals who grew up using various forms of collaborative tools. As a result, these individuals have come to view technology as the norm in both their personal and professional lives (e.g., Chafkin, 2010). Accordingly, research is finding that increased technology use can facilitate team processes and outcomes (e.g., O'Leary & Cummings, 2007).

Previous research in this area has often concluded that it takes longer for teams to function via virtual means than it does face to face (Baltes, Dickson, Sherman, Bauer, & LaGanke, 2002; Straus, 1997). Much of this research comes from comparisons of ad hoc groups doing fairly simple tasks face to face or through computer-mediated means. Alternatively, leveraging virtual tools enables organizations to comprise teams that span geographic time zones and organizations (Lipnack & Stamps, 1997). Although it may well be true that interactions take more time and are less rich when done via chat versus face to face (Walther, 2002), the simple fact is that, in many instances, these team members would never have the opportunity to meet face to face. Perhaps a more interesting comparison would be to contrast how easily some set of people can coordinate their efforts electronically versus how involved, costly, and time demanding it would be to have them meet face to face. Adaptive structuration theory argues that to the extent members view advanced technologies as helping facilitate coordination efforts they will more readily adopt them (DeSanctis, Poole, & Dickson, 2000). In fact, it is quite likely that teams will evolve different patterns of technology use as a function of the tasks that they perform (Zigurs & Khazanchi, 2008). Thus, rather than considering working virtually as a challenge to be overcome, perhaps research should consider how teams can best leverage technology for optimal performance.

As noted earlier, some future teams will incorporate technology as surrogate team members, including the use of robots and avatars. Although communication between humans and robots has seen advances over the past few years, this understanding is still nascent in form and lacking in completeness. For communication between humans and robots to successfully mimic that of human–human communication, progress is needed in three component areas, including communication channels, communication cues from the channels, and the affordances of the technology that affect the transmission of these cues (Green, Billinghurst, Chen, & Chase, 2008). A robot or avatar team member would have to be capable of recognizing and expressing communication and cues through several channels (Green et al., 2008)—including the intricacies of tone, pitch, gaze, posture, and spatial relationships (Tversky, Lee, & Mainwaring, 1999).

Presently, robots are capable of understanding limited communication from only a few channels. Green et al. (2008) identified a number of areas where the technology inherent to robots requires further development for robots to be able

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to complete their transformation and realize a role as a team member. For instance, for the most accurate interaction with a robot or avatar, humans typically use text or graphical user interface (GUI) based communication. Voice communication (both recognition and expression) lacks the realism and naturalism of voice communications with other human actors.

Another issue that affects human–robot teams is that of team processes and emergent states critical to successful teamwork. Although well researched in human–human teams, the examination of these processes and emergent states in human–robot teams is an emerging area of study and is limited in focus. Included in this is the area of trust in human–robot teams. In human–human teams, critical components to the definition of trust include confident expectations and a willingness to be vulnerable (Rousseau, Sitkin, Burt, & Camerer, 1998). These critical components are also applicable to the domain of trust in human–robot teams (Fong, Thorpe, & Baur, 2003). In addition, recent work has focused on understanding how humans interpret and incorporate cues from a robot into their coordination of action planning (Shah & Breazeal, 2010).

In summary, technology is changing who is a member of a team, how teams interact, what teams actually do, and how they are linked over space and time. Clearly there are performance improvements that can be realized by leveraging technology, but equally clear there are risks and process losses associated with employing such technologies. Accordingly, we have listed some of what we believe are the most pressing research needs along these lines in Table 2.

Technology and Distance: Implications for Practice

Given current and emerging technology changes, we identify a few implications and challenges for team-based practice below. In general, increased awareness and better guidelines are needed to enable teams to successfully work at a distance and ensure technology is an enabler for, rather than a barrier to, team processes, states, and performance.

- *Time zones*. Technology can enable team members to be located thousands

Table 2. *Suggestions for New Directions in Teams Research: Technology and Distance*

• To what extent, and how, do team members choose to employ virtual tools rather than meet face to face?
• To what extent can telepresence or other high-fidelity technologies realize the benefits of direct face-to-face interactions in team settings, and what are their limitations?
• To what extent can virtual communication media create confusion or complications due to cultural differences or misinterpretations of behaviors or words?
• To what extent, and how, do technological enhancements such as remote monitoring and 24/7 connectivity, impact (a) team processes and (b) members' ability to manage work–family interfaces?
• To what extent do individuals have different perspectives about technology, and how do these differences affect team communication, development, and coordination patterns? How do these differences manifest themselves in cross-generational teams?
• How are critical team states, such as trust, identity, and shared cognition, influenced by the use of technological tools? To what extent do these concepts apply when one or more ''team members'' is an artificial agent, avatar, or robot?
• Under what circumstances do team members hide behind the virtual technology to avoid difficult conversations, confrontations, or decisions?
• What is the potential for social media to enhance team communications, identity, and cohesion?

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of miles apart. As a result, organizations need to provide tools for scheduling and, equally important, need to offer policy and practice guidelines that are fair and reasonable to staff in various time locations. For example, when team members are geographically dispersed, it is not uncommon for meetings to be held at a time that is convenient for the team members at the location where the team leader resides but cumbersome for remote team members. Sometimes there is a compelling business reason for doing this, but when possible, it is useful to rotate meeting times so that the same group or office isn't always being asked to accommodate by participating in meetings well before or after normal working hours.

- *24/7 connectivity*. Advancements in technology make it possible to remain connected to team members 24 hours a day. However, the potential for dissonance when some team members choose not to communicate outside of work hours, whereas others prefer to stay connected, is a real possibility and should be dealt with in an effective and consistent manner within a team. Organizations need to establish guidelines to make technology a positive force for teamwork and not a source of burnout and resentment. Otherwise, frustration could influence productivity negatively or cause additional stress that is unhealthy for individuals. Team members need clarity about when they are expected to be ''connected'' with the rest of the team. When the team leader tells the team they don't need to be available off hours, but then applauds and rewards a team member who is connected and working all weekend and during vacations, that leader is sending a mixed and confusing message about team role expectations.
- *Cross-generational preferences*. There appear to be some strong differences in how younger and older team members like to communicate and learn. Organizations need to manage communications and learning more carefully in cross-generational teams. For example, more mature workers may prefer to receive training in a face-to-face environment before going virtual, whereas younger team members may not need or expect such face-to-face interaction. All team members may not resonate with the same training due to generational preferences, so trainers and team leaders need to consciously consider the trade offs, determine when more than one training option should be made available, and establish how best to frame training opportunities and requirements.
- *Evaluation at a distance*. In VTs, the team leader often cannot see members of their team at work. This presents a myriad of performance management challenges. The need and opportunities for observing performance, providing feedback and advice, and evaluating performance are different when a leader and team member are not colocated. Team leaders of such teams need training that specifically targets the best ways to give feedback and provide coaching at a distance, as the dynamics can be quite different than those seen in colocated work arrangements. In addition, it can be useful to examine organizational survey results from those employees who work at a distance, to learn, for example, how well the performance management process is working for them.
- *Global applicant pools*. With collaboration software and other forms of technology readily available, the pool of potential members for a project team increases. Companies will need to compose teams in ways that tap into and capitalize on a global labor pool. This means that detailed skills information will need to be readily available about potential team members as well as a way to determine their availability and competence for various team

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assignments. Such databases would be most valuable if they also contained employees' teamwork competencies and current team assignments, as that information can help decision makers form better teams and avoid overloading employees with too many team assignments.

- *Monitoring and trust*. When technology allows for greater, more consistent, or more detailed monitoring, team members can feel threatened. However, in some cases, monitoring may be needed to allow sufficient oversight in geographically dispersed teams. As a result, team leaders will need to be taught how to use monitoring as a constructive tool and not a source of distrust, including how best to describe monitoring to their team. This will not be easy and new ways of showing the value to both individuals and organizations will need to be developed. In addition, system designers need to carefully evaluate the advantages and risks associated with monitoring and not simply assume that more monitoring is needed whenever team members are working ''out of sight.''
- *Technology as teammate*. As technology continues to advance, there will be more circumstances in which a person needs to interact with technology in lieu of a teammate. Technology will need to be designed in a way that encourages team members to use it and to do so in the manner in which it was intended. This will mean developing new patterns of behavior and potentially minimizing former patterns of behavior. For example, although a team member might have previously interacted directly with colleagues to solve a problem, going forward that person might be encouraged to first interact with a database that has some artificial intelligence properties built into it. Even if the capabilities of the database exceed that of the team members, there will be some change management challenges associated with elevating technology to the status of a trusted ''teammate.''

Theme 3: Empowerment and Delayering

Who makes decisions for a team? Who is responsible for its ''care and feeding''? The idea that teams should be able to make some of their own decisions and assume responsibility for how they work dates back over 50 years. Organizations have experimented with giving teams more autonomy for a long time. A general trend that has continued to influence the way teams operate is the pushing of authority and governance down the organizational hierarchy, from central control outside the team to team leader control of the team to team self-control. More recently, there have been attempts to employ forms of shared or member-led leadership, where different team members assume various leadership responsibilities.

In addition, as teams take on more self-management, they assume greater responsibility for their own development. It appears that a significant portion of an employee's development is increasingly reliant on getting the ''right'' mix of experiences and, hopefully, learning from those experiences. As a result, teams need to find ways to self-develop, and team leaders need to create good learning opportunities for their team members. At the same time, teams also need to self-regulate and self-discipline. If learning has not taken hold or has not sufficiently addressed a performance issue, then teams and team leaders need to take steps to rectify the problem—be it a single team member or multiple team members. For example, temporal planning, reminders, or reflexivity may be used as a means of self-regulation.

What are the drivers behind this trend toward team self-management? One is the general belief that self-management is motivational, engaging, and empowering. It is difficult to say whether that assumption is more or less prevalent than in the past. Although recent meta-analyses

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have supported the positive impact of empowerment on individual and team-level outcomes, there is a second, more recent driver that is also stimulating a move toward these types of designs. Economic pressures have resulted in organizational downsizing and delayering. Middle managers are often early casualties of cost reduction efforts, resulting in fewer team leaders. When this occurs, team-leader span of control increases. As team size grows, it can almost become a necessity to distribute certain leadership tasks that were traditionally handled by the official leader. The team leader cannot handle all leadership responsibilities, so some are delegated to other members of the team. In other words, shared leadership can sometimes be driven by economic factors and the ''need to be lean'' as much as by any idealistic empowerment principles.

Delayering can also mean that a leader who has several team leaders reporting to her may have a greater span of control and be unable to closely direct all the teams below her. In essence, there is often some de facto team empowerment that occurs, whether intentional or not. When organizations reduce the size of middle management, it often results in heightened autonomy for teams. However, when greater autonomy or self-management is forced on a team simply because of workload demands, it can produce resentment and stress rather than motivation and energy and generate push-back rather than buy-in. For example, if a broadened span of control means that a cross-functional team leader is unable to be adequately involved with the team, then members may be less likely to be committed to the team effort.

So team empowerment efforts appear to have been stimulated by one of two divergent drivers. The first is the fundamental belief that teamwork and empowerment are engaging and productive. The second is that downsizing or economically driven leanness can force de facto team empowerment. A basic challenge in the second case is that teamwork relies on trust and a sense of cohesion, whereas downsizing often creates a period of distrust and fear. Yet economic realities dictate that organizational efficiency efforts will never go away. The issue is, regardless of the driver, how to optimize team empowerment and self-management.

Research on Empowerment and Delayering

Team empowerment has been heralded as a means to positively influence both objective team performance and members' affective reactions (e.g., Kirkman & Rosen, 1999). The idea that teams should be structured such that they are able to make their own decisions and be responsible for their functioning is not new (e.g., Trist, Higgin, Murray, & Pollack, 1963). Likewise, the importance of having teams believe that they can perform their work on their own and are thus responsible for their actions and outcomes is a foundational management concept dating back at least to the days of Kurt Lewin and the Harwood Studies of the 1930–1940s (cf., Burnes, 2007). Consequently, research interest in what facilitates teams functioning independently, acting autonomously, being responsible, self-managing, and having members believe they are empowered has, not surprisingly, resulted in a great number of empirical investigations.

The empowerment literature has progressed in two different yet related tracks. *Structural empowerment* builds upon work centered on job design and job characteristics (Campion et al., 1993; Hackman & Oldman, 1980) and, at its core, focuses on the transition of authority and responsibility from managers to subordinates. Accordingly, structural empowerment is concerned with the actual transference of decision making and how this can best be done so that benefits from shifting authority and responsibility for certain tasks to employees are realized. In comparison, *psychological empowerment*, which has ties to Bandura's (1997) work on self-efficacy, is less concerned about the actual transition of authority and responsibility but is instead focused

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on employees' perceptions or cognitive states regarding empowerment. The general impression from this research is that organizational efforts to introduce structural (empowerment) changes can yield benefits in terms of enhanced psychological empowerment and thereby generate positive outcomes such as enhanced team effectiveness, member commitment, and development (Wallace, Johnson, Mathe, & Paul, 2011). Yet the bulk of this work has been framed in terms of the positives—where empowerment was introduced as a motivational benefit. But there is also the dark side of empowerment—instances where organizations are delayered, management ranks are thinned, and employees are ''empowered.'' Many of these instances are viewed as anything but motivational, and employees can perceive that they are being asked to do more, take on added responsibility, and so forth—but reap no benefits (Marks & De Meuse, 2003; Silver, Randolph, & Seibert, 2006). One of the authors encountered a situation where employees noted that ''team is a four letter word around here'' and employees were highly cynical of efforts to ''empower them.''

When teams are given greater autonomy, they often must assume greater responsibility for their own ongoing learning and development. As a result, such teams must become proficient at learning from experience. They need to take advantage of informal learning opportunities, which involves a conscious intent to learn, gather feedback, and reflect upon their experiences (Tannenbaum, Beard, McNall, & Salas, 2010). Techniques such as after-action reviews, debriefing, and team self-correction have been shown to be effective at promoting team learning (Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008). Future research needs to further explicate how semi-autonomous teams can learn and self-correct through informal learning mechanisms—a challenge in any circumstance but particularly when coupled with the dynamic team composition factors discussed earlier.

Research has demonstrated that team empowerment is facilitated by a supportive organizational structure and climate (e.g., Hempel, Zhang, & Han, in press); team-based human resources systems such as training, development, and rewards (e.g., Subramony, 2009); team-based and reinforcing external leaders (e.g., Kirkman & Rosen, 1999); and teams composed of members who welcome working together and embrace the added responsibility and accountability. At issue, however, is that research has yet to examine elements that undermine team-based structures. Moreover, although there are abundant correlational studies (cf., Seibert, Wang, & Courtright, 2011), very few quasi-experimental designs and change-oriented research investigations have been done. In Table 3, we offer several suggestions for future research along these lines. Research also needs to be conducted that examines how teams self-regulate or self-discipline and whether such actions benefit from formal organizational policies or are better left to informal self-regulation and discipline (Gevers, van Eerde, & Rutte, 2009).

Empowerment and Delayering: Implications for Practice

Below we identify a few challenges and offer a series of suggestions for organizations to help ensure their teams can be successful when increasing degrees of team self-management are expected. In general, empowerment and delayering increase the need to establish clear roles, expectations, and guidelines.

- *Role clarity*. When there is a single leader, the leadership role is clear. But when leadership responsibilities are distributed, a key question is how to ensure role clarity within the team. Traditional role clarification exercises that identify who is responsible for specific task assignments and who needs to be consulted with or informed about key decisions are particularly important in teams with distributed

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Table 3. *Suggestions for New Directions in Teams Research: Empowerment and Delayering*

- What are the circumstances that derail team empowerment efforts?
- What foundational work or preparation needs to be done to transform from a traditional design to a team-based empowered arrangement?
- What are the roles of change agents when introducing empowerment-based designs?
- What are the relative advantages and disadvantages of introducing team-based design interventions gradually versus abruptly?
- How do organizations best handle threats to higher level leaders when team-based designs are adopted?
- What are the most effective practices that teams can employ when they are responsible for their own ongoing learning and development?
- How do organizations best transition to increased team autonomy when the transition is forced by economic necessities?
- Does the impact of empowerment interventions increase or wane over time? If the latter, what techniques can be employed to sustain or reenergize the effort, and when should they be introduced?
- Under what conditions does team empowerment restrict individual empowerment?
- What mechanisms help coordinate the efforts of multiple empowered teams?
- What are the risks and rewards of team self-regulation and discipline?

leadership. These exercises can be modified to ensure there is a strong focus on leadership-related requirements. Teams that distribute, share, and rotate leadership responsibilities need to conduct role clarification exercises with some regularity to avoid the problems associated with role ambiguity and conflict and to periodically reestablish team expectations.

- *Leader rotations*. As organizations experiment with self-guided teams, various team members may assume leadership roles. In such cases, organizations must choose, prepare, and rotate leaders in a way that yields a sense of fairness and fosters development while ensuring leader roles are fulfilled capably. Organizations need to examine whether their standard ways of choosing leaders will work in self-guided teams. A person who may not be ready to assume a full-time leader role as part of a management career path may still be a viable candidate for a leader rotation as part of a self-guided team, provided that person is given ample guidance and there is sufficient role clarity.
- *Self-directed learning*. Decision makers need to clarify the expectations associated with team learning. For example, if a team is waiting for organizationally sponsored team training programs when none are forthcoming, they run the risk of stagnating. When a team is responsible for much of their own learning, it is essential that they learn from their experiences. One of the most powerful yet simple ways for a team to learn from its experiences is through debriefs or after-action reviews. Organizations that expect some self-directed learning from their teams should teach them how to conduct effective team debriefs. In addition, in self-guided teams, team leaders need to encourage existing team members to suggest other individual or team learning needs.
- *Downsizing and teamwork*. Paradoxically, downsizing often creates a demand for greater team empowerment while simultaneously producing barriers to teamwork. Organizations must equip and enable teams to handle increased autonomy and workload as the result of a reduction in force or

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a focus on cost efficiencies; often they must do this in a context of resource scarcity, placing additional stress on the team itself. A key indicator of success for teams after a downsizing is whether they can sustain their productivity while also maintaining a reasonable degree of cohesion, a difficult challenge. Organizations should assess the impact of downsizing and cost efficiencies on teamwork and be prepared to take remedial actions if necessary.

- *Evaluation*. In a traditional, hierarchical team, the leader evaluates team member performance. When leadership is distributed or rotated among team members, organizations need to establish a clear process and guidelines for assessing performance that may be somewhat different than the traditional approach. Evaluation in a team with shared leadership may necessitate establishing a process of gathering input from fellow team members, including those who served in some form of leadership role during the period of performance. In addition, in some cases, the team may report in to a formal supervisor who does not actively lead the team on a day-to-day basis, so a clear evaluation process is critical for ensuring fairness and accuracy in performance ratings.
- *Governance and team structure*. Organizations have been experimenting with various team structures. From a practical perspective, team designers could benefit from receiving clear information about the various team structure and governance alternatives, including their strengths, risks, and keys to success. Ideally, these guidelines would be research based, although, as noted earlier, this is an area where additional research could be beneficial.
- *Self-regulation*. As organizations empower teams to grow, develop, evaluate, and self-direct, they must also empower teams to self-regulate and discipline when necessary. And organizations must ensure that self-regulation is done fairly, consistently where possible, and in a nondiscriminatory way. Teams will develop their own culture and the possibility for inappropriate self-regulatory behavior exists. Just as in the broader organization, steps must be taken to ensure that individuals and groups are not inappropriately treated while at the same time ensuring effectiveness in a self-managed environment.

The Road Forward

We chose to highlight the themes of dynamic composition, technology and distance, and empowerment and delayering as simply three of the many facets that are salient for the new breed of teams. These changes can greatly affect numerous team states or processes that have historically been shown to drive team effectiveness. The picture that we have outlined for team members is a chaotic one, with factors such as the rapid formation of flash teams, fluid team memberships, simultaneously being members of multiple teams, interacting through various forms of technology in different times and places, and perhaps even future dealings with avatars and robots as ''teammates.'' Add to that the fact the basic design of organizations has been changing, sometimes employing empowered teams as a choice design and sometimes simply defaulting to the use of de facto teams. In the face of all this, how do teams manage to establish and maintain key characteristics such as trust, shared cognitions, role clarity, and identity?

As merely a few examples, trust, shared cognitions, role clarity, and team identity are traditionally understood as vital ingredients for team effectiveness (cf., Mathieu et al., 2008). Work in the area of VTs suggests that it is difficult—yet critical—for team members to quickly establish trust with one another if the team is to be successful (Cascio, 2000; Jarvenpaa, Knoll, & Leidner, 1998; Robert, Dennis,

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& Hung, 2009). Trust is hard to establish in any team, and it becomes even more challenging in situations with geographically dispersed teammates, changing team members, multiple affiliations, or empowerment style redesigns—especially if such redesigns are due to economic drivers. Similarly, team cognitions such as shared mental models (Mohammed, Ferzandi, & Hamilton, 2010), transactive memory systems (Lewis, 2004), and the like, take time to develop and are rooted in members' understandings of both task and team dynamics. Building shared cognitions is exceedingly difficult when membership is fluid. Role clarity has long been considered a requirement for team effectiveness (Klein et al., 2009), but virtually all the team dynamics we discussed can stimulate role ambiguity or conflict. Moreover, cultivating a sense of team identity is particularly challenging when team members do not meet face to face, when they belong to multiple teams (or organizations) that have different priorities, or when the team membership is transient.

Clearly, a unifying theme of the changes noted above is that the boundaries of teams are becoming more permeable and difficult to identify (Marrone, 2010). Individuals are simultaneously members of multiple teams; move freely in and out of different teams, some of which within functional areas, some are cross-functional; and still others may span organizational boundaries (Drach-Zahavy, 2011). These new arrangements offer many potential advantages such as the ability to redeploy human resources quickly across tasks, cross-pollination of knowledge and expertise, and enhanced employee motivation and organizational adaptability. But they may often come at a price, including coordination breakdowns, role stresses, suboptimal team assignments, and general chaos. The relative balance of these benefits versus costs, as well as factors that may tip the scales one way or the other, is little understood. Thus, the point is that not only do the new team dynamics create new challenges for the study and application of teamwork, but the new dynamics strain many of the long-established keys to team effectiveness.

We should also note that the new challenges provide some unique opportunities. Given that many teams have fluid memberships, deal with different technologies, transform to new empowered designs, and so forth—modern-day organizations are becoming unique incubators for study. In other words, these changes create many instances of naturally occurring field experiments, which may afford prime opportunities to study the dynamics that we have described above. In some instances, researchers and practitioners alike may be able to conduct true- or quasi-experimental field studies, whereas in other instances, naturally evolving changes might be investigated using action research methodologies to learn more about the drivers of team effectiveness. With the advent of new technologies, new and potentially valuable sources of information about team states and processes may be available for study. In short, studying the *new team dynamics* may necessitate *new theories*, *research methods*, and *analyses*.

What might some of these new approaches entail? First, much can be learned from detailed qualitative longitudinal investigations (Yin, 1993). In particular, studying teams ''in the wild'' under extreme conditions may be particularly revealing by placing heightened pressures on their strengths and vulnerabilities (cf., Burke, Salas, Estep, & Pierce, 2007; Salas, Burke, & Fowlkes, 2006). Space shuttle crews, emergency disaster response teams, medical trauma teams, forensic accounting teams, and the like all come in relatively low numbers yet present vivid examples of how teams can excel, or fail, under duress—and why. Investigations of this variety are likely to require more of an anthropological approach where researchers embed themselves in the lives of the teams. Essentially, we are advocating for rich case studies where teams are examined ''in their natural environments.'' Although often advocated, I–O psychology has not been that welcoming to in-depth qualitative case study work.

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Yet—we believe—these types of investigations may actually be the most revealing in terms of illuminating nonlinear and simultaneous types of team dynamics.

Second, there has been a recent push toward viewing team dynamics in terms of dyadic networks of relations and exchanges between members (Balkundi, Kilduff, Barsness, & Michael, 2007; Borgatti & Foster, 2003). Although such approaches have typically focused on a single factor or two (e.g., friendships and interdependencies), recent advances in network theory and analyses permit the simultaneous analysis of multiple substantive dimensions of teamwork (cf., Contractor, 2009; Xi & Tang, 2004). Further still, team networks can be examined as dynamic entities that evolve over time (e.g., Carley, 2003; Contractor, Wasserman, & Faust, 2006). The network paradigm offers a powerful lens through which to consider the diversity of intrateam composition, processes, and states (Harrison & Humphrey, 2010). Moreover, recent efforts have sought to not only model human team networks but also apply network methodologies and computational modeling techniques to the study of blended teams comprising both humans and agents (i.e., computer-controlled entities; see Gaston & DesJardins, 2008).

Third, in the area of teams and technologies, some (e.g., Kirkman & Mathieu, 2005) have argued for a profile approach for achieving task–technology fits, whereby different technologies (e.g., instant messaging vs. threaded discussion lists) are adopted for different purposes. Others, however, have suggested more complex patterning approaches, whereby VT attributes coevolve with technologies to enhance dynamic change processes and adaptability (e.g., Zigurs & Khazanchi, 2008). And finally, team researchers might also benefit from the adoption of some very nontraditional methods. For example, Harmati and Skrzypczyk (2009) developed a fuzzy logic adaptation of game theory to optimize the coordination of robot teams in a complex tracking task. Clearly, this is well beyond the domain of traditional social science and I–O psychology. Yet, the common theme underlying these new approaches is that teams, technologies, contexts, and associated variables all coevolve over time. This promotes a shift in thinking from typical cause–effect models toward more of a coevolutionary systems approach, where there are simultaneous reciprocal influences between variables. Such a shift will necessitate both new theories and new methods of inquiry.

The term team has also come to be used to refer to many different forms of collectives—some of which are arguably not teams in the traditional sense. For example, Kirkman, Mathieu, Cordery, Rosen, and Kukenberger (2011) have recently described organizational communities of practices as entities that are a blend between traditional VTs and communities of practice. Cummings and Pletcher (2011) researched the effectiveness of project networks that include a core project team and noncore contributors who provide information and help solve problems. Noncore contributors are identified from core members' personal networks. Elsewhere, Mathieu, Marks, and Zaccaro (2001) advanced the notion of multiteam systems (MTSs), which they defined in terms of a tightly coupled set of teams that may traverse organizational boundaries. They used the degree of interdependence among teams and the existence of a common superordinate goal as the key rules for inclusion or exclusion in MTS. Yet, it is often the case that different teams are tightly coupled at different periods, such as during large-scale responses to natural disasters (cf., Zaccaro, Marks, & DeChurch, 2011). So team membership in an MTS often faces some of the same challenges that we described above in terms of dynamic composition.

The time is right to study teams that fall outside the implicit and perhaps even the formal definition of a traditional team, for example, to study teams with dynamic composition or flexible boundaries, who operate at a distance through technology or who are attempting to operate with greater empowerment or autonomy. Rather than

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thinking about traditional team types, it may be best to understand teams by studying the challenges, pressures, demands, triggers, and potential enablers they confront, perhaps by capitalizing on naturally occurring experiments with real teams in dynamic conditions. Researchers studying such teams may want to pay careful attention to issues such as swift trust, team identity, and shared cognitions, which can be particularly salient in nontraditional teams.

Of course, team-based practices must morph as well. We need to prepare and encourage leaders to employ effective practices when membership is fluctuating, when team members belong to multiple teams, or when the team is expected to self-govern and self-develop. Where gaps exist, we must design and introduce evidence-driven practices that support the formation, development, and management of teams in the new environment. In the future, we may even need to offer advice for teams that employ technology as surrogate team members.

A rich and valuable history of team research and experience exists as a launching point. However, times have changed, and the science and practice of team effectiveness must continue to evolve to remain relevant and meaningful. Teams are increasingly being called upon to serve organizational and societal needs, so there is a critical need to form, build, and use teams far more effectively in all types and sizes of organizations.

References

Ancona, D. G., & Caldwell, D. F. (1998). Rethinking team composition from the outside in. In M. A. Neale, E. A. Mannix, & D. H. Gruenfeld (Eds.), *Research on managing groups and teams* (Vol. 1, pp. 21–38). Greenwich, CT: JAI Press.

Armstrong, D., & Cole, P. (2002). Managing distances and differences in geographically distributed work groups. In P. Hinds & S. Kiesler (Eds.), *New ways of working across distance using technology* (pp. 167–189). Cambridge, MA: MIT Press.

Arrow, H. (1997). Stability, bistability, and instability in small group influence patterns. *Journal of Personality and Social Psychology, 72*, 75–85.

Arrow, H., & Crosson, S. (2003). Musical chairs—Membership dynamics in self-organized group formation. *Small Group Research, 34*, 523–556.

Arrow, H., & McGrath, J. E. (1995). Membership dynamics in groups at work—A theoretical framework. *Research in Organizational Behavior: An Annual Series of Analytical Essays and Critical Reviews, 17*, 373–411.

Balkundi, P., Kilduff, M., Barsness, Z. I., & Michael, J. H. (2007). Demographic antecedents and performance consequences of structural holes in work teams. *Journal of Organizational Behavior, 28*, 241–260.

Baltes, B. B., Dickson, M. W., Sherman, M. P., Bauer, C. C., & LaGanke, J. S. (2002). Computer-mediated communication and group decision making: A meta-analysis. *Organizational Behavior and Human Decision Processes, 87*, 156–179.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: Freeman.

Borgatti, S. P., & Foster, P. (2003). The network paradigm in organizational research: A review and typology. *Journal of Management, 29*, 991–1013.

Burke, C. S., Salas, E., Estep, S., & Pierce, L. (2007). Facilitating team adaptation ''in the wild'': A theoretical framework, instructional strategies, and research agenda. In R. Hoffman (Ed.), *Expertise out of context* (pp. 507–524). New York, NY: Taylor & Francis Group.

Burnes, B. (2007). Kurt Lewin and the Harwood studies: The foundations of OD. *Journal of Applied Behavioral Science, 43*, 213–231.

Campion, M. A., Medsker, G. J., & Higgs, A. C. (1993). Relations between work group characteristics and effectiveness: Implications for designing effective work groups. *Personnel Psychology, 46*, 823–850.

Cannon-Bowers, J. A., Tannenbaum, S. I., Salas, E., & Volpe, C. E. (1995). Defining team competencies and establishing team training requirements. In R. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations.* San Francisco, CA: Jossey-Bass.

Carley, K. M. (2003). Dynamic network analysis. In R. Breiger, K. Carley, & P. Pattison (Eds.), *Dynamic social network modeling and analysis* (pp. 133–145). Washington, D.C.: National Research Council.

Cascio, W. F. (2000). Managing a virtual workplace. *Academy of Management Executive, 14*, 81–90.

Chafkin, M. (2010, April 1). The case, and the plan, for the virtual company. *INC.*, 62–73.

Contractor, N. (2009). The emergence of multidimensional networks. *Journal of Computer-Mediated Communication, 14*, 743–747.

Contractor, N., Wasserman, S., & Faust, K. (2006). Testing multi-theoretical multilevel hypotheses about organizational networks: An analytic framework and empirical example. *Academy of Management Review, 31*, 681–703.

Cummings, J., & Pletcher, C. (2011). Why project networks beat project teams. *MIT Sloan Management Review, 52*, 75–80.

Cummings, J. N. (2007, July). *Membership intensity and the performance of geographically dispersed teams.* Paper presented at the 2nd annual ING Conference, Lansing, Michigan.

Daft, R. L., & Lengel, R. H. (1984). Information richness: A new approach to managerial behavior and organization design. *Research in Organizational Behavior, 6*, 191–233.

https://doi.org/10.1111/j.1754-9434.2011.01396.x Published online by Cambridge University Press

DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use—Adaptive structuration theory. *Organization Science, 5*, 121–147.

DeSanctis, G., Poole, M. S., & Dickson, G. W. (2000). Teams and technology: Interactions over time. In M. A. Neale, E. A. Mannix, & T. L. Griffith (Eds.), *Research on managing groups and teams* (pp. 1–27). Stamford, CT: JAI Press.

Drach-Zahavy, A. (2011). Interorganizational teams as boundary spanners: The role of team diversity, boundedness, and extrateam links. *European Journal of Work and Organizational Psychology, 20*, 89–118.

Ellis, A. P. J., Hollenbeck, J. R., Ilgen, D. R., Porter, C., West, B. J., & Moon, H. (2003). Team learning: Collectively connecting the dots. *Journal of Applied Psychology, 88*, 821–835.

Espinosa, J. A., Cummings, J. N., Wilson, J. M., & Pearce, B. M. (2003). Team boundary issues across multiple global firms. *Journal of Management Information Systems, 19*, 157–190.

Fong, T., Thorpe, C., & Baur, C. (2003). Collaboration, dialog, and human-robot interaction. *Robotics Research, 6*, 255–266.

Gaston, M., & DesJardins, M. (2008). The effect of network structure on dynamic team formation in multi-agent systems. *Computational Intelligence, 24*, 122–157.

Gevers, J. M. P., van Eerde, W., & Rutte, C. G. (2009). Team self-regulation and meeting deadlines in project teams: Antecedents and effects of temporal consensus. *European Journal of Work and Organizational Psychology, 18*, 295–321.

Gonzalez, V., & Mark, G. (2004, April). *Constant, constant, multi-tasking craziness: Managing multiple working spheres*. Paper presented at the SIGCHI Conference on Human Factors in Computing Systems, New York.

Green, S. A., Billinghurst, M., Chen, X., & Chase, J. G. (2008). Human-robot collaboration: A literature review and augmented reality approach in design. *International Journal of Advanced Robotic Systems, 5*, 1–18.

Hackman, J. R., & Oldman, G. R. (1980). *Work redesign*. Reading, MA: Addison-Wesley.

Harmati, I., & Skrzypczyk, K. (2009). Robot team coordination for target tracking using fuzzy logic controller in game theoretic framework. *Robotics and Autonomous Systems, 57*, 75–86.

Harrison, D. A., & Humphrey, S. E. (2010). Designing for diversity or diversity for design? Tasks, interdependence, and within-unit differences at work. *Journal of Organizational Behavior, 31*, 328–337.

Harrison, D. A., Mohammed, S., McGrath, J. E., Florey, A. T., & Vanderstoep, S. W. (2003). Time matters in team performance: Effects of member familiarity, entrainment, and task discontinuity on speed and quality. *Personnel Psychology, 56*, 633–669.

Hempel, P. S., Zhang, Z. X., & Han, Y. E. (in press). Team empowerment and the organizational context: Decentralization and the contrasting effects of formalization. *Journal of Management*.

Hill, W. F., & Gruner, L. (1973). A study of development in open and closed groups. *Small Group Research, 4*, 355–381.

Hirst, G. (2009). Effects of membership change on open discussion and team performance: The moderating role of team tenure. *European Journal of Work and Organizational Psychology, 18*, 231–249.

Jarvenpaa, S. L., Knoll, K., & Leidner, D. E. (1998). Is anybody out there? Antecedents of trust in global virtual teams. *Journal of Management Information Systems, 14*, 29–64.

Jarvenpaa, S. L., Rao, V. S., & Huber, G. P. (1988). Computer support for meetings of groups working on unstructured problems: A field experiment. *MIS Quarterly, 12*, 645–666.

Kim, P. H. (1997). When what you know can hurt you: A study of experiential effects on group discussion and performance. *Organizational Behavior and Human Decision Processes, 69*, 165–177.

Kirkman, B. L., & Mathieu, J. E. (2005). The dimensions and antecedents of team virtuality. *Journal of Management, 31*, 700–718.

Kirkman, B. L., Mathieu, J. E., Cordery, J. L., Kukenberger, M. R., & Rosen, B. (2011). Managing a new collaborative entity in business organizations: Understanding organizational communities of practice effectiveness. *Journal of Applied Psychology, 96*, 1234–1245.

Kirkman, B. L., & Rosen, B. (1999). Beyond self-management: Antecedents and consequences of team empowerment. *Academy of Management Journal, 42*, 58–74.

Klein, C., DiazGranados, D., Salas, E., Le, H., Burke, C. S., Lyons, R., Goodwin, G. F. (2009). Does team building work? *Small Group Research, 40*, 181–222.

Kozlowski, S. W. J., & Bell, B. S. (2003). Work groups and teams in organizations. In W. Borman, D. Ilgen & R. Klimoski (Eds.), *Comprehensive handbook of psychology, Vol. 12: Industrial and organizational psychology* (pp. 333–375). New York, NY: Wiley.

Lewis, K. (2004). Knowledge and performance in knowledge-worker teams: A longitudinal study of transactive memory systems. *Management Science, 50*, 1519–1533.

Lewis, K., Belliveau, M., Herndon, B., & Keller, J. (2007). Group cognition, membership change, and performance: Investigating the benefits and detriments of collective knowledge. *Organizational Behavior and Human Decision Processes, 103*, 159–178.

Lipnack, J., & Stamps, J. (1997). *Virtual teams: Reaching across space, time and organizations with technology*. New York, NY: Wiley.

Littlepage, G., Robison, W., & Reddington, K. (1997). Effects of task experience and group experience on group performance, member ability, and recognition of expertise. *Organizational Behavior and Human Decision Processes, 69*, 133–147.

Majchrzak, A., Rice, R. E., Malhotra, A., King, N., & Ba, S. L. (2000). Technology adaptation: The case of a computer-supported inter-organizational virtual team. *MIS Quarterly, 24*, 569–600.

Marks, M. L., & De Meuse, K. P. (2003). The realities of resizing. In M. L. Marks & K. P. D. Meuse (Eds.), *Resizing the organization: Managing layoffs, divestitures, and closings* (pp. 1–38). San Franciso, CA: Jossey-Bass.

https://doi.org/10.1111/j.1754-9434.2011.01396.x Published online by Cambridge University Press

Marrone, J. A. (2010). Team boundary spanning: A multilevel review of past research and proposals for the future. *Journal of Management, 36*, 911–940.

Martins, L. L., Gilson, L. L., & Maynard, M. T. (2004). Virtual teams: What do we know and where do we go from here? *Journal of Management, 30*, 805–835.

Mathieu, J. E., Marks, M. A., & Zaccaro, S. J. (2001). Multi-team systems. In N. Anderson, D. Ones, H. K. Sinangil, & C. Viswesvaran (Eds.), *International handbook of work and organizational psychology* (pp. 289–313). London, UK: Sage Publications.

Mathieu, J. E., Maynard, M. T., Rapp, T. L., & Gilson, L. L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management, 34*, 410–476.

Maynard, T., Mathieu, J. E., Gilson, L., & Rapp, T. (in press). Something(s) old and something(s) new: Modeling drivers of global virtual team effectiveness. *Journal of Organizational Behavior*.

Mohammed, S., Ferzandi, L., & Hamilton, K. (2010). Metaphor no more: A 15-year review of the team mental model. *Journal of Management, 36*, 876–910.

Mohrman, S. A., Cohen, S. G., & Mohrman, A. M., Jr. (1995). *Designing team-based organizations: New forms of knowledge work*. San Francisco, CA: Jossey-Bass.

Mortensen, M., Woolley, A. W., & O'Leary, M. B. (2007). Conditions enabling effective multiple team membership. In K. Crowston, S. Sieber, & E. Wynn (Eds.), *Virtuality and virtualization* (Vol. 236, pp. 215–228). Portland, OR: Springer.

O'Leary, M. B., & Cummings, J. N. (2007). The spatial, temporal, and configurational characteristics of geographic dispersion in teams. *Management Information Science Quarterly, 31*, 433–452.

O'Leary, M., Mortensen, M., & Woolley, A. (2011). Multiple team membership: A theoretical model of its effects on productivity and learning for individuals and teams. *Academy of Management Review, 36*, 461–478.

Robert, L. P., Dennis, A. R., & Hung, Y. T. C. (2009). Individual swift trust and knowledge-based trust in face-to-face and virtual team members. *Journal of Management Information Systems, 26*, 241–279.

Rousseau, D. M., Sitkin, S. B., Burt, R. S., & Camerer, C. (1998). Not so different after all: A cross-discipline view of trust. *Academy of Management Review, 23*, 393–404.

Salas, E., Burke, C. S., & Fowlkes, J. E. (2006). Measuring team performance "in the wild": Challenges and tips. In W. Bennett, C. Lance, & D. Woehr (Eds.), *Performance measurement: Current perspectives and future challenges* (pp. 245–272). Mahwah, NJ: Lawrence Erlbaum.

Salas, E., Dickinson, T. L., Converse, S. A., & Tannenbaum, S. I. (1992). Toward an understanding of team performance and training. In R. W. Swezey & E. Salas (Ed.), *Teams: Their training and performance* (Vols. 3–29). Norwood, NJ: Ablex.

Seibert, S., Wang, G., & Courtright, S. H. (2011). Antecedents and consequences of psychological and team empowerment in organizations: A meta-analysis review. *Journal of Applied Psychology, 96*, 981–1003.

Shah, J., & Breazeal, C. (2010). An empirical analysis of team coordination behaviors and action planning with application to human-robot teaming. *Human Factors, 52*, 234–245.

Silver, S., Randolph, W. A., & Seibert, S. (2006). Implementing and sustaining empowerment: Lessons learned from comparison of a for-profit and a non-profit organization. *Journal of Management Inquiry, 15*, 47–58.

Smith-Jentsch, K. A., Cannon-Bowers, J. A., Tannenbaum, S. I., & Salas, E. (2008). Guided team self-correction: Impacts on team mental models, processes, and effectiveness. *Journal of Small Group Research, 39*, 303–327.

Straus, S. (1997). Technology, group process, and group outcomes: Testing the connections in computer-mediated and face-to-face groups. *Human-Computer Interaction, 12*, 227–266.

Subramony, M. (2009). A meta-analytic investigation of the relationship between HRM bundles and firm performance. *Human Resource Management, 48*, 745–768.

Sundstrom, E. (1999). The challenges of supporting work team effectiveness. In E. Sundstrom (Ed.), *Supporting work team effectiveness* (pp. 3–23). San Francisco, CA: Jossey-Bass.

Tannenbaum, S. I., Beard, R. L., McNall, L. A., & Salas, E. (2010). Informal learning and development in organizations. In S. W. J. Kozlowski & E. Salas (Eds.), *Learning, training, and development in organizations* (pp. 303–332). New York, NY: Routledge.

Trist, E. L., Higgin, G. W., Murray, H., & Pollack, A. B. (1963). *Organizational choice*. London, UK: Tavistock.

Tversky, B., Lee, P., & Mainwaring, S. (1999). Why do speakers mix perspectives? *Spatial Cognition Computing, 1*, 399–412.

Wallace, J. C., Johnson, P. D., Mathe, K., & Paul, J. (2011). Structural and psychological empowerment climates, performance, and the moderating role of shared felt accountability: A managerial perspective. *Journal of Applied Psychology, 96*, 840–850.

Walther, J. B. (2002). Time effects in computer-mediated groups: Past, present, and future. In P. J. Hinds & S. Kiesler (Eds.), *Distributed work* (pp. 235–257). Cambridge, MA: MIT Press.

Webber, S. S., & Klimoski, R. J. (2004). Crews: A distinct type of work team. *Journal of Business and Psychology, 18*, 261–279.

Wildman, J., Thayer, A., Rosen, M., Salas, E., Mathieu, J. E., & Rayne, S. (in press). Task types and team-level attributes: Synthesis of team classification literature. *Human Resource Development Review*.

Xi, Y., & Tang, F. (2004). Multiplex multi-core pattern of network organizations: An exploratory study. *Computational & Mathematical Organization Theory, 10*, 179–195.

Yin, R. (1993). *Applications of case study research*. Beverly Hills, CA: Sage.

Zaccaro, S., Marks, M., & DeChurch, L. (2011). *Multiteam systems: An organizational form for dynamic and complex environments*. New York, NY: Routledge Academic

Zigurs, I., & Khazanchi, D. (2008). From profiles to patterns: A new view of task-technology fit. *Information Systems Management, 25*, 8–13.

https://doi.org/10.1111/j.1754-9434.2011.01396.x Published online by Cambridge University Press