Teams Are Changing: Time to "Think Networks"

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Evolution is well underway in the area of teams. As Tannenbaum, Mathieu, Salas, and Cohen (2012) aptly convey, today's teams are increasingly complex! Teams are no longer relatively straightforward extensions of individually-based jobs; rather, teams are increasingly capitalizing on technological advances joining together larger, more diverse, more highly specialized, and often distributed sets of individuals to tackle progressively more complex work. This evolution in the team phenomena requires corresponding advances in both how team phenomena are conceptualized and the sensitivity of our methodologies to represent those core features. This commentary calls for two advances in teams research: (a) greater sophistication in conceptualizing the nature of multilevel phenomena and (b) increased application of network-analytic methodology to better capture the multilevel dynamics of modern teams.

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Conceptualizing Multilevel Phenomena

Teams are multilevel, but most research is overly simplistic in the representation of multilevel constructs and relationships.

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The traditional team perspective recognizes the role of emergence in team-level phenomena but rarely attends to the nature of how emergence comes about. Most conceptualizations of team-level processes and emergent states have been guided by multilevel compositional models (Chan, 1998; Kozlowski & Klein, 2000). Compositional models describe higher level phenomena that emerge through uniform inputs of individual-level elemental content. This type of emergence may have been well suited to understanding teams whose members were largely colocated and membership in the team was relatively stable over time. In these highly bounded, stable teams, frequent interactions enable all members to perceive team processes and states similarly, rendering their perceptions of team process and states largely interchangeable. Accordingly, the typical approach of averaging individual member responses to represent the ''team's'' standing on that construct is appropriate.

However, complex teams exhibit processes and states more likely to emerge through compilation. Compilational models describe higher level phenomena that do not resemble the elemental content visible at the lower level (Kozlowski & Klein, 2000). The very nature of modern teams—their reliance on technology, dispersion, and diverse composition—all render the likelihood that the emergent states and processes that determine their success or failure will be compilational in nature, as opposed to compositional. The contributions of team member inputs to processes, states, and performance are less substitutable, their perceptions of the team are less redundant, and so the higher level team constructs cannot be understood through simple linear aggregations.

Fundamental changes in team sociotechnological infrastructure challenge researchers' assumptions about the type of measurement and representation techniques to use. Blindly accepting assumptions of team configurations that no longer hold, compromises our capacity to understand complex team dynamics. Instead, teams researchers must carefully conceptualize the configural patterns of emergence through which team-level constructs manifest and then represent them appropriately (Roberts, Hulin, & Rousseau, 1978).

Network Analytic Methodology

As we move toward understanding the nature of compilational emergence characteristics of complex teams, network analytics based on a multitheoretical multilevel perspective (Contractor, Wasserman, & Faust, 2006; Monge & Contractor, 2003) become an invaluable tool for uncovering the inner workings of teams. Although the utility of network analysis has been widely recognized in the more mainstream management and organizational sciences (Borgatti & Foster, 2003), its application in industrial–organizational psychology has been quite limited. Compilational models of emergence are about structural patterning—they are inherent in the original formulation of synergy, the kernel idea that the whole is greater than the sum of the parts (Steiner, 1972). Network analysis is ideally suited to understand the patterning of team composition, processes, states, and performance and to model the impact of these patterns on teams, both across levels and over time (Poole & Contractor, 2011).

Imagine that a researcher is interested in the impact of virtual communication on performance. Rather than representing teams as ''high'' or ''low'' on some continuum of virtuality, we may better capture the nature of virtual communication by representing the patterns of interaction of particular pairs of members, exchanging particular types of information, at particular times. In seven-person teams, there are 42 directed communication channels! Representing the degree to which these seven members are using virtual tools using an aggregate measure that collapses virtuality dimensions and dyads is a coarse-grained approach to understand the focal team construct and likely won't predict performance very well.

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Network analysis is particularly powerful in its ability to analyze the structure of team phenomena. Measures of team interactional patterns include density (Reagans & Zuckerman, 2001); structural holes, the extent to which an aggregate amount of members' ties is nonredundant (Burt, 1992); reciprocity, the extent to which there is social exchange between pairs of individuals (Sparrowe, Liden, Wayne, & Kraimer, 2001); transitivity, the extent to which there is balance between triads in the network (Hummon & Doreian, 2003); centrality, the importance of a node to the network structure (Freeman, 1979; Mizruchi & Potts, 1998); and core-periphery structure, defined as a cohesive subset to which team members are connected (Borgatti & Everett, 1999). Importantly, these network measures offer a multilevel characterization of the system: centrality and structural holes are at the actor level, reciprocity at the dyadic level, transitivity at the triadic level, core-periphery at the subgroup level, and density at the global level.

The network framework is inherently multilevel, capturing information about actors and their dyadic, triadic, subgroup-, and team-level properties. Applying a network perspective to teams begins by representing individuals and their characteristics as nodes and attributes, and then considers the nature of team interactions, that is, their cognitive, affective, motivational, and behavioral ties. Different aspects of patterns, connectivity, clustering, and centrality can be examined. These patterns of ties (i.e., structural representations) representing different aspects of team functioning (i.e., content of ties) can be used to predict performance at the individual and team levels of analysis. In this way, the network approach affords a more sophisticated way to examine two fundamental questions in teams research:

1. How does member composition give rise to team states and interaction processes? Network methods allow a rich understanding of the factors at work in shaping both how teams come together as well as how they should come together (Guimera, Uzzi, Spiro, & Amaral, 2005). At the individual level, network analysis can examine whether members with certain personal attributes are unique in how they form relationships in teams.
2. In what ways do the patterned arrangements of team states and interaction processes affect individual and team performance? Network analysis provides unique representation techniques useful for uncovering the structural properties of constructs at multiple levels. Consider the network metrics degree centrality and centralization. Degree centrality is an individual-level descriptor, capturing each team member's number of ties. Ties could be the provision of backup behavior, the sharing of information, or the management of conflict. Centrality of team process and state data provide a rich look into who is critical to, and perhaps in some cases even detrimental to, the functioning of a team. A parallel concept, centralization, could be used to describe the team. Applied to team processes and states, centralization captures the degree to which relationships within the team are heterogeneous. Teams with higher centralization of backup behavior, for example, are those where a relative few members are doing the helping within the team. Teams with decentralized conflict networks are those where members are about equally involved in debating ideas.

Team Dynamics

In addition to providing descriptive metrics, recent development in network analysis offers the ability to statistically model network structures and processes. These approaches enable us to test for the emergence, dynamics, and outcomes of specific network structural signatures within teams. The need for additional consideration of

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temporal dynamics appears in most recent publications on teams. However, actual analysis of time-dependent relationships in teams remains rare. In addition to network indices as representations of a static structure, network methods enable the researcher to explore the ways in which teams develop over time. Two particularly valuable approaches for statistical modeling of network structures and dynamics are p^* or Exponential Random Graph Models (Robins, Pattison, Kalish, & Lusher, 2007) and stochastic actor-oriented models (Snijders, Steglich, Schweinberger, & Huisman, 2007).

Answering important questions about teams will require some basic shifts in how teams research is done. These shifts begin with multilevel theory and carry through data capture and analysis. Network analysis further stands to enable a huge leap forward in teams research by way of the sheer volume of data amenable to analysis with these techniques. In short, teams have left their neatly bounded forms of the 1990s behind. Teams are communicating across time and space through digitally enabled mobile technology. The bad news is that it is challenging to contemporary teams that are increasingly distributed, complex collectives. The good news is that evolving methods such as network analysis are particularly well suited to leverage the large volume of digital traces these teams generate.

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