

INTEGRATIVE CONCEPTUAL REVIEW

Social Network Approaches to Leadership: An Integrative Conceptual Review

Dorothy R. Carter
University of Georgia

Leslie A. DeChurch
Georgia Institute of Technology

Michael T. Braun
Virginia Polytechnic Institute and State University

Noshir S. Contractor
Northwestern University

Contemporary definitions of leadership advance a view of the phenomenon as relational, situated in specific social contexts, involving patterned emergent processes, and encompassing both formal and informal influence. Paralleling these views is a growing interest in leveraging *social network approaches* to study leadership. Social network approaches provide a set of theories and methods with which to articulate and investigate, with greater precision and rigor, the wide variety of relational perspectives implied by contemporary leadership theories. Our goal is to advance this domain through an integrative conceptual review. We begin by answering the question of why—Why adopt a network approach to study leadership? Then, we offer a framework for organizing prior research. Our review reveals 3 areas of research, which we term: (a) *leadership in networks*, (b) *leadership as networks*, and (c) *leadership in and as networks*. By clarifying the conceptual underpinnings, key findings, and themes within each area, this review serves as a foundation for future inquiry that capitalizes on, and programmatically builds upon, the insights of prior work. Our final contribution is to advance an agenda for future research that harnesses the confluent ideas at the intersection of leadership in and as networks. Leadership in and as networks represents a paradigm shift in leadership research—from an emphasis on the static traits and behaviors of formal leaders whose actions are contingent upon situational constraints, toward an emphasis on the complex and patterned relational processes that interact with the embedding social context to jointly constitute leadership emergence and effectiveness.

Keywords: organizational leadership, relational perspectives, social network approaches

Leadership is a foundational topic of organizational science. There is widespread consensus that leadership enables organizations to function effectively, directing, inspiring, and coordinating the efforts of individuals, teams, and organizations toward the realization of collective goals. Since its inception, scholarly interest in leadership has considered two overarching aspects of the phenomenon: *leadership emergence* (e.g., why and how does leadership arise?) and *leadership effectiveness* (e.g., how does leadership enable leader, follower, team, and

organizational outcomes?; Hiller, DeChurch, Murase, & Doty, 2011). Although these core questions have changed little over the past century, a noticeable trend in recent research is the growing appreciation of the *relational* nature of leadership. Leadership is conceptualized as a “dyadic, shared, relational, strategic, global, and a complex social dynamic” (Avolio, Walumbwa, & Weber, 2009, p. 423).

Accompanying these relational conceptions of leadership is a growing interest in using *social network approaches* to understand

This article was published Online First March 23, 2015.

Dorothy R. Carter, Department of Psychology, University of Georgia; Leslie A. DeChurch, School of Psychology, Georgia Institute of Technology; Michael T. Braun, Department of Psychology, Virginia Polytechnic Institute and State University; Noshir S. Contractor, Departments of Industrial Engineering and Management Sciences, Communication Studies, and Management and Organizations, Northwestern University.

This material is based upon work supported by the National Science Foundation under Grant Nos. SES-1219469, SES-1063901, and SBE-1262474. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not neces-

sarily reflect the views of the National Science Foundation. This research was supported in part by the Army Research Laboratory under contract W911NF-09-2-0053 and by the Army Research Institute for the Social and Behavioral Sciences under contract W5J9CQ12C0017. The views, opinions, and/or findings contained in this report are those of the authors, and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documents.

Correspondence concerning this article should be addressed to Dorothy R. Carter, Department of Psychology, University of Georgia, 125 Baldwin Street, Athens, GA 30602. E-mail: dorothyrpc@gmail.com

leadership emergence and effectiveness. Social networks are the patterns of interpersonal relationships (i.e., ties) among a set of people (i.e., actors, nodes; Wasserman & Faust, 1994). Social network approaches offer theoretic rationale for understanding the development and utility of relationships, as well as a set of analytic tools designed to identify, describe, and explain relationships (e.g., Borgatti, Mehra, Brass, & Labianca, 2009; Contractor, Wasserman, & Faust, 2006). Thus, network approaches are well suited for investigating leadership as a relational phenomenon. The goal of our review is to advance this domain through an integrative conceptual review of social network approaches to leadership. We organize this prior research to facilitate understanding and integration across subdomains of this work, opening up fruitful new avenues for leadership inquiry.

We begin by answering the question of *why?*—Why adopt network approaches to study leadership? Then, we offer three contributions to the science of leadership. First, we develop a framework and a lexicon for discussing prior research on leadership that used a network approach. Our review reveals three distinct areas of research in this realm. The first area, which we term *leadership in networks*, situates people in *social* networks and investigates how social networks relate to individuals' emergence and effectiveness as leaders. The second area, termed *leadership as networks*, situates people in *leadership* networks and investigates the emergence and effectiveness of these networks. The third area, *leadership in and as networks*, combines aspects of both Areas 1 and 2. Our second contribution is to use this framework to synthesize prior networks research on leadership. By clarifying the conceptual underpinnings, key findings, and themes within each area, this review serves as a foundation for future research that capitalizes on, and programmatically builds upon, the insights of prior work. In closing, our third contribution is to advance an agenda for future research that leverages the confluent ideas at the intersection of *leadership in and as networks*.

Why Network Approaches to Leadership?

Leadership, as a phenomenon, is *relational*. Table 1 presents a sample of definitions from the past century of leadership theorizing that emphasize the relational nature of leadership as a unifying theme. Contemporary definitions have also advanced a view of leadership as *situated* in specific contexts, as a *patterned* phenomenon, and as a process that can be *formal and/or informal*. We review foundational work that clarifies these key aspects of leadership and then discuss why network approaches are particularly well suited for studying leadership given the ability of network approaches to characterize relational, situated, patterned, and formal/informal structures and processes.

Characteristic 1: Leadership Is Relational

At a minimum, leadership involves a relationship between two people with one leading the other, or both mutually leading one another. As Katz and Kahn (1978) put it, “without followers there can be no leader” (p. 527). Relational views expand the focus of leadership research to include both leaders and followers, and often, their mutual engagement in leadership (e.g., Tee, Ashkanasy, & Paulsen, 2013; Uhl-Bien, Riggio, Lowe, & Carsten, 2014). Contemporary relational conceptualizations of leadership depict

the phenomenon as a relational process of influence connecting two or more people (e.g., DeRue & Ashford, 2010; Uhl-Bien, 2006; Uhl-Bien & Ospina, 2012). These views stand in contrast to views of leadership as *personological* (i.e., residing in the characteristics individuals). Personological views are perhaps best exemplified by the great man theory (e.g., Carlyle, 1907; Cowley, 1928; Terman, 1904), which posits that certain sets of personal characteristics predispose particular individuals to rise to positions of power. Although personological views can be studied using a relational approach, they are not *inherently* relational conceptions of leadership.

Characteristic 2: Leadership Is Situated in Context

The second key aspect of leadership is the phenomenon is *situated* in specific contexts. Contingency theories have long held that leadership interacts with situational needs and constraints (Fiedler, 1966; House, 1971). Recent work suggests leadership is largely *inseparable* from the social and historical situations within which leadership occurs (DeRue & Ashford, 2010; Hollenbeck, DeRue, & Nahrgang, 2014; Hogg, 2001; Osborn, Hunt, & Jauch, 2002). For example, depending on the set of social norms operating within different groups, behaviors interpreted as “charismatic” in one social context may not be recognized as such in another (Hogg, 2001).

Characteristic 3: Leadership Is Patterned

A third key aspect is that leadership relationships among different sets of people are unique such that *patterns* of leadership relations emerge. The patterned nature of leadership is premised on research suggesting that unique experiences and processes characterize the leadership relationships among different dyads (Graen & Uhl-Bien, 1995; Lord, Brown, Harvey, & Hall, 2001). For example, research on leader-member exchange (LMX) establishes that supervisors experience differential (i.e., patterned) leadership relationships with their subordinates, and there are times when supervisor-subordinate relationships are *not* characterized by leadership (e.g., Dansereau, Graen, & Haga, 1975; Graen, Liden, & Hoel, 1982; Graen & Uhl-Bien, 1995). Like other emergent organizational phenomena (Kozlowski & Klein, 2000), patterns of leadership relations develop over time and are shaped by top-down contextual factors as well as bottom-up through individuals' traits, cognitions, affect, motivations, and behavioral interactions (DeRue, 2011; Hernandez, Eberly, Avolio, & Johnson, 2011).

Characteristic 4: Leadership Can Be Formal and Informal

A final key aspect is that leadership can involve both *formal* and/or *informal influence*. Certainly, leadership can originate from individuals with formalized authority or control (e.g., supervisors, managers). Leadership can also originate from some or all members of a collective (Follet, 1925; Gibb, 1954). For example, influence can arise based on personal, rather than positional, sources of power (e.g., expertise; French & Raven, 1959). In recent years, as organizations have trended toward flatter, team-based work designs, research questions surrounding informal leadership have gained significant traction. These trends challenge dominant

Table 1
Exemplar Definitions of Leadership That Emphasize Its Relational, Situated, Patterned, and Formal/Informal Nature

Author (year)	Leadership definition
Follet (1925)	"It is possible to develop the conception of power-with , a jointly developed power, a coactive, not a coercive power . . . power is capacity . . . power-with is jointly developing power " (pp. 101, 109, 115).
Pigors (1935)	"Leadership is a process of mutual stimulation which, by the successful interplay of individual differences, controls human energy in the pursuit of a common cause" (p. 378).
Gibb (1954)	"Leadership is probably best conceived as a group quality " (p. 884).
French & Raven (1959)	"Our theory of social influence and power is limited to influence on the person, P, produced by a social agent, O, where O can be either another person, a role, a norm, a group or a part of a group . . . The "influence" of O must be clearly distinguished from O's "control" of P " (p. 151).
Hollander & Julian (1969)	There is a "need to attend to leadership as a property of the system of a group ; recognize the two-way influence characterizing leader-follower relations" (p. 387).
Dansereau et al. (1975)	"The vertical dyad is the appropriate unit of analysis for examining leadership processes " (p. 47).
Burns (1978)	"Surely it is time that . . . the roles of leader and follower be united " (p. vi).
Fernandez (1991)	"We argue that leadership, particularly that aspect of leadership which is reflected in respect, is inherent in the relations among individuals, not in the individuals themselves " (p. 37).
Hollander (1993)	" Without followers there are plainly no leaders or leadership " (p. 29).
Graen & Uhl-Bien (1995)	"LMX . . . is a relationship-based approach to leadership" (p. 219). "LMX should be viewed as systems of interdependent dyadic relationships, or network assemblies" (p. 233).
Klein & House (1995)	"Charisma resides not in a leader, nor in a follower, but in the relationship between a leader who has charismatic qualities and a follower who is open to charisma, within a charisma-conducive environment" (p.183).
Meindl (1995)	"The romance of leadership notion emphasizes followers and their contexts for defining leadership itself and for understanding its significance" (p. 330).
Osborn et al. (2002)	"Leadership is socially constructed in and from a context where patterns over time must be considered and where history matters" (p. 798).
Hogg (2001)	"Leaders may emerge, maintain their position, be effective, and so forth, as a result of basic social cognitive processes " (p. 186).
Pearce & Conger (2003)	"Leadership is broadly distributed among a set of individuals instead of centralized in hands of a single individual who acts in the role of superior" (p. 1).
Howell & Shamir (2005)	"Followers' self-concepts play a crucial role in determining the type of relationship they develop with the leader " (p. 97).
Balkundi & Kilduff (2006)	"Our network approach locates leadership not in the attributes of individuals but in the relationships connecting individuals " (p. 942).
Uhl-Bien (2006)	"I identify relational leadership as a social influence process through which emergent coordination . . . and change . . . are constructed and produced" (p. 655).
Hackman & Wageman (2007)	"One does not have to be in a leadership position to be in a position to provide leadership" (p. 46)
Drath et al. (2008)	"Leadership has been enacted and exists wherever and whenever one finds a collective exhibiting direction, alignment, and commitment " (p. 642).
Friedrich et al. (2009)	" Multiple individuals within the team may serve as leaders in both formal and informal capacities " (p. 933).
DeRue & Ashford, (2010)	"We propose that a leadership identity is coconstructed in organizations when individuals claim and grant leader and follower identities in their social interactions " (p. 627).
DeRue (2011)	"[Leadership is] a social interaction process where individuals engage in repeated leading-following interactions, and through these interactions, co-construct identities and relationships as leaders and followers " (p. 126).
Morgeson et al. (2010)	"Leadership is the vehicle through which [team needs] are satisfied, regardless of the specific leadership source " (p. 5).
Yukl (2010)	"Leadership is the process of influencing others to understand and agree about what needs to be done and how to do it, and the process of facilitating individual and collective efforts to accomplish shared objectives" (p. 8).
Eberly et al. (2013)	"We posit that what gives rise to the phenomenon of leadership is a series of often simultaneous event cycles between multiple loci of leadership " (p. 4).
Yammarino (2013)	"Leadership is a multi-level . . . leader-follower interaction process that occurs in a particular situation (context) where a leader . . . and followers . . . share a purpose . . . and jointly accomplish things . . . willingly " (p. 20).
Lord & Dinh (2014)	"Leadership is a social process that involves iterative exchange processes among two (or more) individuals " (p. 161).

paradigms for studying leadership founded on motivating, controlling, and asserting power *over* individuals as they accomplish independent tasks (Pearce, Manz, & Sims, 2009). As an example, shared, collective, or distributed theories of leadership suggest that leadership constitutes informal processes existing in parallel to, or in place of, formal hierarchical structures (Contractor, DeChurch, Carson, Carter, & Keegan, 2012; Denis, Langley, & Sergi, 2012; D'Innocenzo, Mathieu, & Kukenberger, 2014; Nicolaidis et al., 2014; Pearce & Conger, 2003; Yammarino, Salas, Serban, Shirreffs, & Shuffler, 2012; Wang, Waldman, & Zhang, 2014).

The Case for Social Network Approaches to Leadership

Social network approaches are highly suitable for studying leadership as relational, situated in specific contexts, involving patterned processes, and both formal and/or informal influence. First, organizational research from a social network perspective seeks to understand two overarching research questions, both of which are relational: (a) What are the *causes* of social networks (e.g., why do relationships come about?) and (b) What are the

consequences of social networks (e.g., what outcomes stem from the pattern of relationships?; Borgatti & Foster, 2003; Carpenter, Li, & Jiang, 2012; Monge & Eisenberg, 1987)? Second, social network approaches rely on the core assumption that not only do actors participate in relationships but also that networks define the embedding social context within which actors are *situated* (Borgatti & Foster, 2003). Through this lens, the relationships actors are embedded within have a certain social utility for individuals and groups (Balkundi & Kilduff, 2006; Kilduff & Brass, 2010; Kilduff & Tsai, 2003). Third, at a minimum, social network approaches involve an emphasis on the *patterning* of social relations (Kilduff & Tsai, 2003; Wasserman & Faust, 1994). Finally, network approaches can be used to reveal both *formal* as well as *informal* relationships (Cross & Prusak, 2002).

Given the ability of social network approaches to study relational, situated, patterned, and informal structures and processes, scholars have suggested that future research on leadership should “pay more attention to social network perspectives” (Denis et al., 2012, p. 2). At present, however, there remains a gap between conceptualizing leadership as relational, situated, patterned, and informal and *modeling* it as such. For example, although the majority of recent theoretical articles on leadership emphasize its patterned nature, only approximately 27% of quantitative research on leadership in the past decade has considered patterned phenomena, and the rest relies on global approaches to study leadership, which assume static, top-down leadership processes (Dinh et al., 2014).

Applying a network approach to study leadership might involve using *network methods* to operationalize variables from theories of leadership featuring relational and patterned constructs. We suggest that *any* leadership theory subscribing to a view of leadership as involving patterned relational processes might benefit from investigation using network methods.

However, networks are more than a method. *Native theories* of social networks—theories developed in the realm of social networks that explain the development and utility of relationships—add additional insight into the emergence and effectiveness of leadership (e.g., Borgatti & Lopez-Kidwell, 2011; Katz & Lazer, 2014). Indeed, there is a growing interest in developing leadership theories that incorporate principles from native network theories. Brass (2001) and Brass and Krackhardt (1999) described the role of leaders as one of a human resource broker—leveraging social connections to identify and organize human competencies. Balkundi and Kilduff’s (2006) *Network Leadership Theory* explores how leaders’ cognitions with regard to organizational and interorganizational network structures, as well as their relative positions in these social structures, augments or constrains their effectiveness as leaders. Sparrowe (2014) developed network-based extensions of prominent leadership theories, such as LMX (Graen & Uhl-Bien, 1995), cognitive/connectionist approaches to leadership (e.g., Lord et al., 2001), and identity approaches to leadership (e.g., the social identity theory of leadership; van Knippenberg & Hogg, 2003; Hogg, 2001). In these examples, social network approaches enhance both leadership theory and methods.

In summary, social network approaches provide a theoretical apparatus with which to articulate and investigate, with greater precision and rigor, the wide variety of relational perspectives implied by contemporary theories of leadership. In the remainder

of this article we advance this domain by developing an organizing framework for extant network approaches to leadership, synthesizing prior work, and offering a roadmap for future research.

The State of the Science of Social Network Approaches to Leadership

Leadership researchers are increasingly leveraging social network approaches, which emphasize the patterning of social relations, to understand leadership emergence and effectiveness. However, there is considerable diversity in how network theories and methods are applied and which network relations are examined. In this section we provide an in-depth critical review of contemporary scholarship that has used a network approach to study leadership. We begin by describing the strategies we used to include studies in our review, and then develop a framework for organizing prior research.

Scope of Literature Reviewed

We began our review by identifying all studies published within the past 15 years (1999–2014) in top-tier journals specializing in topics related to leadership, human resource management, organizational psychology, organizational behavior, sociology, social networks, and communication that included the terms *leadership* and *networks* as keywords and/or used network analytic techniques to study leadership. Next, we identified publications not explicitly using these search terms that fell within the scope of our review. These include leadership studies within management and applied psychology that may not mention networks but whose conceptual assumptions relied heavily on patterns of social processes (e.g., Aime, Humphrey, DeRue, & Paul, 2014). These include studies that used sociometric (“round-robin”) data collection and/or network analytic approaches to consider constructs associated with leadership, such as social status attainment in groups (e.g., Anderson, Ames, & Gosling, 2008). We included journal articles, book chapters, and conference proceedings. In all, 142 articles using network approaches to study leadership were reviewed. Table 2 displays the wide range of outlets where this research appears. Of these, a sample of recent (i.e., within the past 15 years) exemplars of quantitative, qualitative and case-based studies, are summarized in greater depth ($N = 45$ exemplar studies).

We focus on *organizational leadership*, defined as a process whereby individuals and/or groups are influenced to exert effort “over and above mechanical compliance with the routine directives of the organization” (Katz & Kahn, 1978, p. 528). Thus, we do not cover research on public opinion leadership found in marketing or consumer research that seeks to identify individuals in social networks who have a disproportionate influence on others’ attitudes toward and/or adoption of products (e.g., Iyengar, Van den Bulte, & Valente, 2011; Rogers & Cartano, 1962; Van den Bulte, & Joshi, 2007; Watts & Dodds, 2007). Although public opinion leadership involves influence, the construct is not typically examined in contexts where opinion leaders and followers share common organizing goals. By bounding our review in this manner, we align with how the phenomenon of leadership is typically viewed in organizational psychology and management research (e.g., Yammarino, 2013).

Table 2
 Alphabetical List of Publication Outlets for Reviewed Research on Leadership Using a Social Network Approach

Journal	
Academy of Management Annals	Journal of Leadership Education
Academy of Management Executive	Journal of Management ^a
Academy of Management Journal ^a	Journal of Managerial Psychology
Academy of Management Proceedings	Journal of Organizational Behavior
Academy of Management Review	Journal of Personality and Social Psychology ^a
Administrative Science Quarterly ^a	Journal of Personnel Psychology ^a
American Journal of Preventative Medicine	Journal of Strategy and Management
American Journal of Sociology	The Leadership Quarterly ^a MIT Sloan Management Review
American Sociological Review ^a	Organization Dynamics
Annals of the American Academy of Political and Social Science	Organization Science ^a
California Management Review	Personality Processes and Individual Differences
Chapter in Edited Volume ^a	Personality and Social Psychology Bulletin ^a
Conference Proceedings ^a	Personnel Psychology ^a
Current Directions in Psychological Science ^a	Public Administration
Educational Administration Quarterly ^a	Public Performance and Management Review
European Association of Social Psychology	Research in Organizational Behavior
Group and Organization Management	Rural Sociology
Harvard Business Review ^a	School Leadership and Management
Human Resource Management Review	Small Group Research ^a
I/O Psychology Perspectives on Science and Practice	Social Networks ^a
International Journal of Public Administration	Social Psychology Quarterly
Journal of Abnormal and Social Psychology	Sociometry
Journal of Applied Psychology ^a	Strategic Management Journal ^a
Journal of the Acoustical Society of America	
Journal of Business Ethics	
Journal of Educational Administration	
I/O Psychology Perspectives on Science and Practice	
Journal of Leadership and Organizational Studies	

Note. *N* = 142 total reviewed articles/chapters/conference proceedings using a network approach to study leadership.
^a Denotes publication outlet for exemplar quantitative, qualitative, and case-study research from the past 15 years featured in this review (*N* = 45 exemplar studies).

A Framework for Organizing Network Approaches to Leadership

Our review of network approaches to leadership revealed a distinction between research that positions social network ties in the foreground, using them to explain individuals' emergence and effectiveness as *leaders*, and research that positions *leadership* network ties (distinct from other social network ties) in the foreground to understand leadership network emergence and effectiveness. We refer to these domains as Area 1, *leadership in networks*, and Area 2, *leadership as networks*, respectively. Figure 1 depicts the basic dyadic relational building blocks of the types of networks examined in these three areas. Figure 2 summarizes the ways in which these distinct areas have investigated the questions of leadership emergence and effectiveness.

In the first set of studies, Area 1, *leadership in networks*, there is a focus on understanding leaders in the context of embedding *social* networks (see Figure 1). Examples of social networks that feature prominently in Area 1 include communication networks (e.g., who shares information with whom?), advice networks (e.g., who seeks advice from whom?), and friendship networks (e.g., who is friends with whom?). These studies have examined three research questions about leadership: (a) What social network factors explain leader emergence? (Relationship 1 in Figure 2); (b) How do social networks impact outcomes of leadership? (Relationship 2 in Figure 2); and (c) In what ways do leaders affect the development of social networks, and in turn, outcomes of leadership? (Relationship 3 in Figure 2).

A defining feature of Area 1 is that these studies use a relational approach to model the embedding social context of leadership but apply a nonrelational, *personological* approach to measure and model leadership. Personological approaches address questions of leadership emergence and effectiveness by measuring leadership as an attribute of individuals (e.g., the extent to which someone is charismatic, articulates a compelling vision, or provides initiating

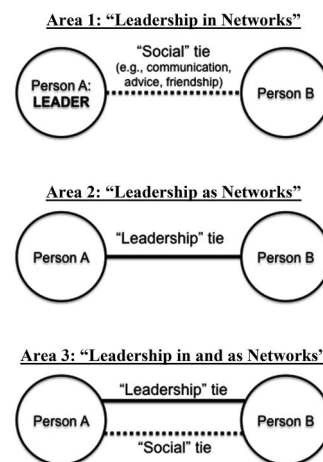


Figure 1. Dyadic building blocks of networks examined in extant social network approaches to leadership.

This document is copyrighted by the American Psychological Association or one of its allied publishers. This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.

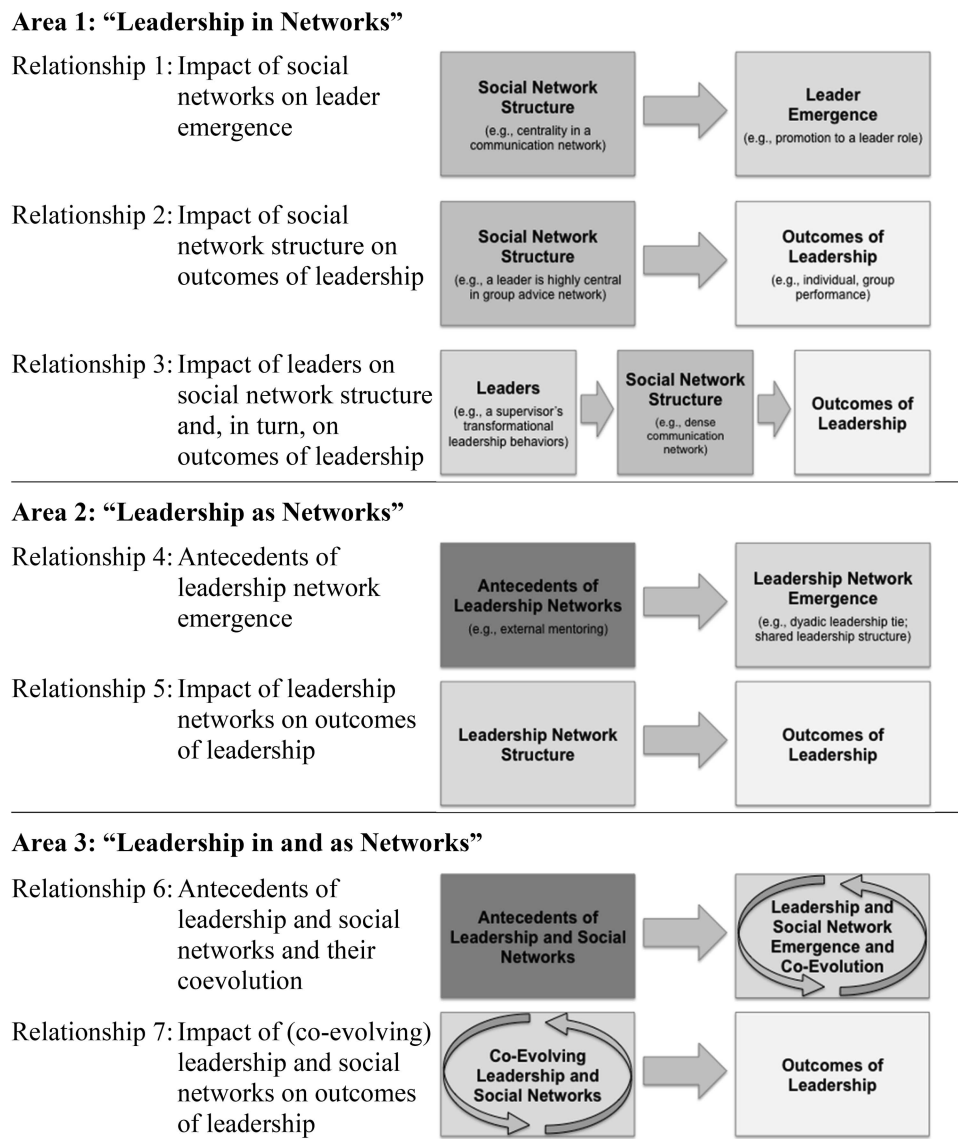


Figure 2. Organizing framework for research on leadership using a social network approach.

structure). Indeed, in Area 1, leadership is conceptualized as an attribute or property, albeit in many cases a perceived attribute, of a focal person—typically a formal manager or team leader.

In contrast, studies in Area 2, *leadership as networks*, hone in on the patterning of leadership relationships. As depicted in Figure 1, the ties connecting individuals are *leadership ties*, defined as a relationship wherein one person gives or attempts to provide leadership and another person grants or accepts leadership (DeRue & Ashford, 2010). The giving side of a leadership network might be assessed with a question such as, To whom do you provide leadership? The granting side of leadership networks might be assessed with a question such as, Who do you rely on for leadership? Area 2 studies have examined two questions about leadership: (a) What factors explain the emergence of leadership networks? (Figure 2, Relationship 4); and (b) How do networks of

leadership relationships impact outcomes of leadership? (Figure 2, Relationship 5). Studies in Area 2 model leadership as relational, but when considering social context variables, model them as intensity variables (e.g., what is the group’s level of social support or external coaching? e.g., Carson, Tesluk, & Marrone, 2007).

It is useful to distinguish these two areas of research—scholarship that explores social network relations other than leadership (e.g., communication, friendship, advice) from research exploring leadership itself as relational. Although leadership networks are a type of social network, the focus of Area 1 studies is on other types of social networks, with the goal of examining how these other types of social ties are associated with personological measures of leadership. Some research in Area 1 examines advice networks, which although akin to leadership networks, are conceptually distinct from them. Individuals may seek out advice from others

who they would not consider leaders, and may perceive as leaders those whom they would not necessarily consider going to for advice.

Another distinction between Areas 1 and 2 is their general orientation toward social behavior, based to some degree, on disciplinary differences. The conceptual orientations in Area 1 tend to be more sociological, stemming from theories like social capital (Burt, 1997, 2000; Coleman, 1988), structural holes (Burt, 2005), and embeddedness (Granovetter, 1985; Uzzi, 1997). The conceptual orientations in Area 2 tend to be more psychologically oriented, drawing heavily on micro-organizational behavior theories, such as those examining leader traits (Judge, Bono, Ilies, & Gerhardt, 2002; Terman, 1904), behaviors (Judge, Piccolo, & Ilies, 2004; Stogdill, 1950), transformational and charismatic leadership (Bass, 1985; House, 1971), LMX (Graen & Uhl-Bien, 1995), and shared leadership (Pearce & Conger, 2003).

Combining these approaches has the potential to add further insight into leadership emergence and effectiveness. Thus, we conclude our review by reporting on a small line of studies at the intersection of Areas 1 and 2. Area 3, *leadership in and as networks*, includes studies that use network approaches to model the embedding social context and model the phenomenon of leadership as a relational network (see Figure 1). These studies identify antecedents of the emergence of leadership and other social relational structures and the coevolution of, or relationships among, these different types of networks (Figure 2, Relationship 6). These studies also identify the outcomes of leadership and social networks (Figure 2, Relationship 7).

We turn now to the findings. Within each area, we present a brief synopsis of the dominant theoretical ideas. Then, we synthesize recent exemplar quantitative, qualitative, and case-based studies with regard to (a) network relations and metrics utilized, (b) conceptual orientations, (c) key findings, and (d) research design and sample type. Tables 3, 4, and 5 summarize this information for each area.

Area 1: Leadership in Networks

Studies in Area 1 (see Tables 3,) use social networks to explain leadership, with the general idea that the embedding social structures individuals operate within facilitate and constrain their emergence as leaders (Figure 2, Relationship 1), as well as the outcomes of leadership (Figure 2, Relationships 2 and 3). Although some theoretical work in Area 1 clarifies that leadership can be both formal and/or informal (e.g., Balkundi & Kilduff, 2006), most empirical studies in this area have focused on formal leaders.

Area 1 theoretical foundations. Area 1 research considers embedding social structures as determinants of leadership. In this way, research on *leadership in networks* broadens the focus of leadership research from a consideration of human capital (i.e., attributes of leaders, e.g., individuals' traits or behaviors), to consider *social* capital. Whereas human capital emphasizes people's individual characteristics (e.g., cognitive ability, expertise) as predictors of their performance, *social* capital explanations are a "metaphor about advantage" (Burt, 2002, p. 346).

The core message conveyed by this metaphor is that certain structural positions in social networks benefit those individuals or groups who occupy them through both contagion (e.g., transmission of beliefs and practices through networks) and prominence

(i.e., advantage based on network position; e.g., Bourdieu & Wacquant, 1992; Burt, 1992, 2000; Coleman, 1988; Lin & Dumin, 1986). For example, Brass (2001) and Brass and Krackhardt (1999) argue that individuals not only obtain leadership positions based on their own social connections, but also that effective leaders gain knowledge about social network structures, connect to central others, forge connections between unconnected actors, and, in so doing, establish necessary synergy between organizational human and social capital. Balkundi and Kilduff (2006) also view the role of leadership as one of managing social capital. They posit that leaders are effective when they possess accurate perceptions of the informal networks within and across the organization (Krackhardt, 1990). This is because socially aware leaders can leverage their accuracy of who knows whom to marshal human and social capital resources within the organizational and interorganizational networks. In other words, socially aware leaders are better able to allocate their own resources toward necessary social endeavors and capitalize on others' networks to work for their own and their organization's benefit.

Network relations, metrics, and key findings. Table 3 reports the wide variety of social relationships and associated network metrics utilized by research in Area 1. Some studies examine behavioral interaction networks where ties reflect communication, collaboration, workflow, and direct interaction. Other studies consider more enduring social network relationships that can be either cognitive (e.g., advice or other instrumental ties) or affective (e.g., friendship or other expressive ties).

In general, research in Area 1 has relied on two sets of network metrics. Some studies have used individual-focused (i.e., node-level) metrics, such as centrality (e.g., degree, betweenness, eigenvector centrality; Wasserman & Faust, 1994), which characterize the power inherent in a person's position in a social network. Each type of centrality proffers a different type of advantage (e.g., McElroy & Shrader, 1986). For example, Lau and Liden (2008) showed that the extent to which formal leaders trusted employees predicted the extent to which they were trusted by their coworkers (their trust in-degree centrality). Other studies have used metrics that describe the overall network structure (e.g., density, centralization, closure). For instance, Oh, Chung, and Labianca (2004) show that a moderate degree of within-group closure provides a source of advantage for groups, positively impacting group performance.

Conceptual orientations. Table 3 includes a summary of the conceptual orientation of each Area 1 exemplar study. Unsurprisingly, this table reveals, that social capital-based explanations for leadership emergence and effectiveness dominate this area. The structure of social networks is offered as an explanation for leader emergence/perceptions, and leader, team, and organizational effectiveness. In addition to social capital, these studies have incorporated prominent mainstream leadership theories, such as transformational and charismatic leadership.

Key findings: Relationship 1. The first set of studies depicted in Figure 2 and detailed in Table 3 explain leadership emergence as a consequence of social network structure. These studies provide compelling evidence that individuals' social networks are associated with the attainment of leader roles. For example, research has linked social networks to variables including promotion to a formal leadership position (Collier & Kraut, 2012; Parker & Welch, 2013). This research also demonstrates that individuals'

Table 3
Exemplar Findings From Area 1, "Leadership in Networks"

Authors (year)	Social network relations (metrics)	Conceptual orientation(s)	Key findings	Design, sample
Relationship 1: Impact of social networks on leader emergence				
Collier & Kraut (2012)	Communication ties (strong, weak, Simmelian ties)	Social capital	Initial and weak communication ties with periphery members, later communication ties with current leaders, and Simmelian ties to leaders all significantly predict promotion to a formal leadership role in Wikipedia. E.g., the size and density of scientists' collaboration networks predicts their occupation of a leadership position in science centers.	Quantitative, informal virtual organization
Parker & Welch (2013)	Collaborative and advice ties (density, network size)	Social capital		Quantitative, field sample of scientists
Pastor et al. (2002)	Instrumental and expressive ties (proximity, i.e., reciprocated ties)	Charismatic, romance of leadership	Subordinates' proximity in instrumental and expressive networks positively predicts their similarity and convergence with regard to charisma attributions of the formal leader.	Quantitative, formal organizational and student teams
Relationship 2: Impact of social network structure on outcomes of leadership				
Balkundi & Harrison (2006)	Instrumental and expressive ties (density, centrality)	Team leadership, social capital	Leaders' centrality in team interpersonal network, density in team interpersonal network, and centrality in intergroup networks predicts team performance.	Meta-analytic, mixed samples
Balkundi et al. (2009)	Advice ties (centrality, brokerage)	Team leadership, social capital	Team leaders' centrality in team advice network negatively predicts conflict, positively predicts team viability. Leaders' brokerage in team advice network positively predicts conflict, negatively predicts viability.	Quantitative, formal organizational teams
Cummings & Cross (2003)	Communication ties (structural holes, core-periphery, centralization)	Team leadership, structural capital	Leaders' structural holes in team communication networks, and core-periphery and centralized structures in team communication networks negatively predict team performance.	Quantitative, formal organizational teams
Lam & Schaubroeck (2000)	Advice/source of opinions (manager nomination)	Opinion leaders	Providing service-quality leadership training to individuals who are central in advice networks, as opposed to randomly selected individuals, predicts unit-level service effectiveness.	Quantitative, formal organizations
Lau & Liden (2008)	Trust ties (centrality)	Trust in leaders	Ties to formal leaders in organizational trust networks predict other coworkers' trust in focal employee; relationship stronger in poorer performing groups.	Quantitative, formal organizations
Mehra, Dixon, et al. (2006)	Friendship ties (centrality, density)	Social capital	Leaders' centrality in external and internal group friendship networks positively related to group performance and leader reputation.	Quantitative, formal organization
Oh et al. (2004)	Socializing ties (intragroup closure, bridging)	Group social capital	Moderate closure in group informal socializing network and bridging ties to diverse groups and other groups' leaders positively predicts group effectiveness.	Quantitative, formal organizational groups
Rodan & Galunic (2004)	Advice, buy-in social support etc. ties (sparseness, heterogeneity)	Social capital	Network sparseness and heterogeneity positively predict managerial performance. Network heterogeneity positively predicts managerial innovation performance.	Quantitative, formal organization
Relationships 1 and 2: Impact of social networks on leader emergence and outcomes of leadership				
Balkundi et al. (2011)	Advice ties (centrality)	Charismatic and team leadership, social capital	Team leaders' centrality in the team advice network positively predicts follower attributions of leader charisma and team performance.	Quantitative, organizational and student teams

Table 3 (continued)

Authors (year)	Social network relations (metrics)	Conceptual orientation(s)	Key findings	Design, sample
Daly et al. (2014)	Relationship 3: Impact of leaders on social network structure and, in turn, on outcomes of leadership Advice ties (in-ties, out-ties)	Educational leadership; trait theories	Formal leaders' job tenure, personality, and efficacy for management and for leading reform predict incoming and outgoing ties in intraorganizational advice networks.	Quantitative, formal organization
Cross et al. (2005); Cross & Prusak, (2002); Krackhardt & Hanson (1993)	Communication, advice, workflow, trust ties, etc. (centrality, brokerage, etc.)	Strategic management, social capital	Body of work suggesting: Senior-level leaders can use social network analysis to examine informal organizational and team social networks, identify key individuals, and change informal structures for more effective organizational performance.	Quantitative and qualitative case-study examples, formal organizational
Zhang & Peterson (2011)	Advice ties (density)	Transformational leadership	Formal leaders' transformational leadership predicts advice network density; relationship stronger for teams with high mean and low variability in core self-evaluations; density predicts team performance, centralization attenuates this relationship.	Quantitative, formal organizational teams
Zohar & Tenne-Gazit (2008)	Friendship and communication ties (density, centralization)	Transformational leadership	Transformational leadership predicts communication network density; communication network density partially mediates relationship between transformational leadership and team climate strength; Centralization of team friendship and communication networks incrementally affect climate strength.	Quantitative, military teams

impressions of formal leaders are affected by social network structures. For example, building on *the romance of leadership (ROL) theory* (Meindl, Ehrlich & Dukerich, 1985), which argues that followers' attributions of leaders are largely determined by their social interactions, Pastor, Meindl, and Mayo (2002) demonstrated that subordinates' perceptions of a formal leader's charisma are contagious in social networks.

Key findings: Relationship 2. Several studies in Area 1 have examined the consequences of structural patterns of social networks, such as communication, friendship, advice, socialization, instrumental, and expressive ties on outcomes of leadership (i.e., leadership effectiveness), such as individual or group performance. This research establishes the importance of leaders' positions in social networks for individual and collective outcomes. For example, the degree to which formal group leaders are central and bridge structural holes in internal group social networks positively predicts group and team performance (Balkundi, Barsness, & Michael, 2009; Balkundi & Harrison, 2006; Mehra, Dixon, Brass, & Robertson, 2006). Additionally, this research establishes relationships between the overall network structure (e.g., density, centralization, closure) of groups and outcomes of leadership. Meta-analytic evidence suggests that groups are most effective when their leaders occupy central positions in dense internal instrumental and expressive networks and when the group occupies a central position in the external intergroup networks (Balkundi & Harrison, 2006).

Key findings: Relationship 1 and Relationship 2. More complex theoretical models found in this area consider others' perceptions of individuals' leadership based on social network phenomena, and the subsequent outcomes of those social network phenomena through leadership perceptions. For example, Balkundi, Kilduff, and Harrison (2011) posed the chicken and the egg question of which comes first: centrality-to-charisma or charisma-to-centrality? Their findings showed strong evidence for the centrality-to-charisma hypothesis: Formal team leaders' centrality in team advice networks positively predicts follower perceptions of leader charisma. In turn, follower charisma attributions positively predict team performance.

Key findings: Relationship 3. The final set of studies in Area 1 examine leadership as a *cause* of social network development, and the leadership outcomes stemming from these social networks. For example, research in this area has considered the role of transformational leadership in shaping social networks. Evidence suggests that a formal team leader's transformational leadership behaviors predict team advice network density and subsequent team performance (Zhang & Peterson, 2011), and team communication network density, centralization, and subsequent team climate strength (Zohar & Tenne-Gazit, 2008).

Lastly, there is a sizable body of more practice-focused work documenting leaders' use of social network techniques to diagnose the informal social networks in their organizations and teams, identify key individuals (e.g., brokers, central connectors, bottlenecks) or clusters of individuals, and leverage or change these structures to better serve the needs of the organization (e.g., Cross, Liedtka, & Weiss, 2005; Cross & Prusak, 2002; Krackhardt & Hanson, 1993). Often, this work relies on case study analyses of organizations.

Research design and sample. Table 3 presents the research design and sample for each exemplar study from Area 1. This work is primarily quantitative, but does include noteworthy case study

and mixed-method research studies (e.g., Cross & Prusak, 2002). The majority of this research has relied on samples from the field, such as teams in formal organizations, military populations or entire organizations.

Summary of Area 1. On the basis of this research, we conclude that individuals' occupation of certain positions in organizational, and intraorganizational social networks, most notably their centrality in these networks, relates to others' perceptions of the person's leadership and to his or her ability to be a successful leader. Although the network metrics and relations used in these studies are diverse, this research offers compelling evidence that actors who occupy central positions in social networks that are structured such that they encourage diversity of information flow and access to resources (e.g., moderate closure, bridging connections to other groups) can reap the benefits of these networks for leadership. However, the scarcity of empirical studies examining the effects of leadership on social network development suggests that more research is needed to identify how leaders impact social network structures.

Area 2: Leadership as Networks

Area 2, *leadership as networks* research (see Table 4), utilizes network approaches to explain leadership by considering networks of leadership *relationships* (see Figure 2, Area 2 for a visual depiction). Research in Area 2 conceptualizes leadership as the emergence of a *leadership network* (Figure 2, Relationship 4), and equates leadership effectiveness with the outcomes of leadership networks (Figure 2, Relationship 5). Whereas many of the studies in Area 1 focused on formal leaders, the studies in Area 2 often investigate the patterns of leadership relationships among all members of a focal collective, whether it be a team, unit, or organization. However, some Area 2 studies examine the emergence and effectiveness of leadership relationships only within supervisor-subordinate dyads. Thus, a focus on informal leadership is not a defining feature of this realm.

Area 2 theoretical synopsis. Area 2 is rooted in the notion that leadership resides in the ties between individuals. This premise arises out of the many relationally oriented definitions of leadership offered over the past century. This premise is particularly apparent in recent conceptual work on leadership; key examples being DeRue and Ashford's (2010) notion of the giving and granting of leadership, and DeRue's (2011) use of "double interacts" (Hollander & Willis, 1967; Weick, 1979) to explain how leadership identities are coconstructed over time through interaction processes. Double interacts imply that the behaviors of each actor are contingent upon, as well as influence, the behaviors of each other actor. These theoretical arguments explain how interactions between individuals (i.e., relational processes) come to form bonds characterized as leadership and affording influence. Thus, a key difference between Areas 1 and 2 is that Area 1 assumes that the phenomenon of leadership resides within a person, whereas Area 2 considers it to reside in relationships between dyads.

Many relational approaches in leadership research, the most prominent of which is LMX, are based on the premise that leadership occurs when leaders and followers develop mature leadership relationships/partnerships (Graen & Uhl-Bien, 1995). Although not typically thought of as a network approach, LMX

theory, with its focus on understanding leaders, followers, and their relationships, provides an important conceptual foundation for the network approaches to leadership found in Area 2. LMX research establishes the dyad as the basic unit of analysis for leadership (Graen & Uhl-Bien, 1995), assumes leadership relationships are recognizable when certain relational processes exist among actors, emphasizes the patterned nature of leadership (e.g., Dansereau et al., 1975), and has recently evolved to consider networks of lateral member-to-member leadership relations as well as those connecting vertically from leader-to-member (Graen, 2012; Graen & Schiemann, 1978, 2013; Vidyarthi, Erdogan, Anand, Liden, & Chaudhry, 2014). Reviewing all of the findings from LMX research is clearly beyond the scope of our review (for reviews of this literature, see Erdogan & Bauer, 2014; Graen, 2005; Graen & Uhl-Bien, 1995). We discuss LMX in our review as it concerns the foundation for a relational view of leadership and elaborate on a few exemplar LMX studies that have extended this theory using social network approaches (e.g., Goodwin, Bowler, & Whittington, 2009; Sparrowe & Liden, 2005; Venkataramani, Green, & Schleicher, 2010; Zhang, Waldman, & Wang, 2012).

Theories of shared, distributed, and collective leadership emphasize the relational and informal nature of leadership as it emerges throughout entire collectives (e.g., Osborn et al., 2002; Pearce & Conger, 2003; Small & Rentsch, 2010). Recently, D'Innocenzo et al. (2014) distinguished two genres of shared leadership research: aggregate versus network structure conceptions. An *aggregate* conception of shared leadership implies the source of leadership is an undifferentiated whole of members. Based on this conception, shared leadership is often measured using the average of members' self-report ratings of their team's level of leadership with the team as the referent (e.g., Sivasubramaniam, Murry, Avolio, & Jung, 2002). In contrast, *network* conceptions consider the degree to which each individual group member engages in leadership processes. Based on this conception, leadership might be measured using a network approach, such as a sociometric survey (e.g., "Whom do you rely on for leadership?"), and shared leadership structures represented using network indices, such as centralization, that capture the pattern of leadership relationships within collectives. Clearly, our focus is on research that conceptualizes shared leadership as a network structure rather than as an aggregate.

Network concepts. Table 4 presents the types of leadership relationships examined in Area 2 and their associated network metrics. It is not surprising that Area 2 is dominated by studies that measure how individuals perceive the leadership relationships in their collectives. For example, this research has relied on self-report sociometric (i.e., "round robin") questionnaires that explicitly assess participants' views of others "influence," "leadership," or "status." This research also includes qualitative coding of behaviors that constitute "leadership" or "power" relations (e.g., Aime et al., 2014) and quantitative identification and analysis (e.g., machine learning) of leadership processes as they emerge in very large collectives (e.g., Zhu, Kraut, & Kittur, 2012).

In terms of network metrics, just as in Area 1, the majority of research in Area 2 has utilized individual-level network metrics (e.g., centrality) or aggregate (i.e., network-level) network metrics (e.g., density, centralization, qualitative coding of aggregate structures). Studies in this realm have also used the social relations model (SRM; Kenny, 1994), which decomposes the variance of

This document is copyrighted by the American Psychological Association or one of its allied publishers. This article is intended solely for the personal use of the individual user and is not to be disseminated broadly.

Table 4
Exemplar Findings From Area 2, "Leadership as Networks"

Authors (year)	Leadership network relations (metrics)	Conceptual orientations	Key findings	Design, sample
Anderson et al. (2001)	Status and influence ties (peer rating and objective score)	Relationship 4: Antecedents of leadership network emergence Status, trait theories	Extraversion is positively related to status. Neuroticism is negatively related to status for men. Status ordering is relatively stable, but women's status order takes longer to emerge.	Quantitative, fraternity and sorority samples
Anderson et al. (2008)	Influence ties (incoming ties)	Trait, contingency theories	Personality and person-organization fit predict incoming ties in organizational influence networks.	Quantitative, formal organization
Anderson & Kilduff (2009)	Influence, task competence, and social competence ties (SRM; Kenny, 1994)	Influence, trait theories	Controlling for actual abilities, trait dominance predicts higher ratings in task competence and social competence networks by fellow group members, peer observers, and researchers. Competence ratings mediated relationship between personality dominance and nominations in influence networks.	Quantitative, laboratory groups
Bendersky & Shah (2013)	Status/influence ties, group contribution ties (SRM)	Expectations states theory, trait theories	Over time, extraversion is positively predictive of status losses (via disappointing expectations for contributions to group tasks); neuroticism is positively predictive of status gains.	Quantitative, laboratory groups and MBA students
Kalish (2013)	Leadership ties (ERGM parameters)	Trait theories, emergent leadership patterns	Intelligence predicts incoming ties in leadership networks; reciprocity and hierarchy are probable in leadership networks.	Quantitative, ad hoc military teams
Livi et al. (2008)	Leadership ties (SRM)	Sources of variance for leadership perceptions	There is high agreement about who is a leader in leadership networks; agreement increases as group size increases; there is low between-group variance with regard to the average level of leadership; perceivers are prone to a self-enhancement bias.	Quantitative; mixed samples
White et al. (2014)	Leadership ties (ERGM parameters)	Emergence of plural leadership in specific contexts	In a routine situation, leadership networks are characterized by generalized exchange and hierarchy, but do not develop based on members' professional and managerial roles. In a nonroutine situation, leadership networks are characterized by restricted exchange (i.e., reciprocity), are more strongly hierarchical, and develop based on by members' professional and managerial roles.	Quantitative, interorganizational health and social care community
Wolff et al. (2002)	Leadership ties (centrality)	Trait theories; Informal team leadership	Emotional intelligence, and in particular, empathic skill, predicts centrality in team leadership networks.	Critical incident study/quantitative, MBA students
Zhu et al. (2011)	Task-oriented leadership ties, socially oriented leadership ties (core-periphery structure)	Emergence of informal leadership; core-periphery emergence	Core-periphery structures are probable in leadership networks on Wikipedia. Peripheral editors are more likely to send ties in task-oriented leadership networks; Core editors are more likely to send ties in socially oriented leadership networks.	Quantitative, informal virtual organization
Davis & Eisenhardt (2011)	Leadership process ties (qualitatively coded)	Relationship 5: Impact of leadership networks on outcomes of leadership Distributed leadership	<i>Dominating</i> and <i>consensus</i> patterns in leadership process networks are associated with less innovation; <i>rotating</i> patterns associated with more innovation.	Qualitative, formal organizations

(table continues)

Table 4 (continued)

Authors (year)	Leadership network relations (metrics)	Conceptual orientations	Key findings	Design, sample
Mehra, Smith, et al. (2006)	Team leadership ties (SME-coded network structures)	Distributed leadership	Distributed-coordinated leadership network structures are more effective than distributed-fragmented structures and distributed structures, but not more effective than vertical network structures.	Quantitative, formal organizational teams
Zhu et al. (2012)	Transactional ties, person-focused ties, aversive ties (out-ties in behavioral networks)	Transactional, person-focused, and aversive leadership	Outgoing ties in transactional and person-focused leadership networks positively predict targets' motivation to comply with desired behavior change. Outgoing ties in aversive networks negatively predict recipients' motivation to make desired change. Outgoing leadership ties from legitimate leaders are more influential than ties from non-legitimate leaders.	Quantitative, informal virtual organization
Relationships 4 AND 5: Impact of antecedents on leadership (network) emergence and outcomes of leadership.				
Aime et al. (2014)	Power expression ties (hierarchy, i.e., rotated power expressions)	Power hierarchies	Heterarchy is probable in team power expression networks. Heterarchy in power expression networks positively relates to team creativity.	Mixed-methods, formal organizational and lab teams
Carson et al. (2007)	Team leadership ties (density)	Shared leadership	Team environment and coaching predicts density in team leadership networks. Density in team leadership networks positively predicts team performance.	Quantitative, MBA student teams
Foti & Hauenstein (2007)	Influence ties (SRM)	Trait theories	High intelligence, dominance, self-efficacy, and self-monitoring predict incoming ties in influence networks. These traits also predict superior-rated leadership effectiveness scores.	Quantitative, military organization
Klein et al. (2006)	Leadership behavior ties (qualitatively coded)	Shared leadership Dynamic delegation	Dynamic delegation structures (formal leaders delegating leadership roles to followers over time) are probable in leadership behavioral networks. Dynamic delegation structures in leadership networks are positively related to team performance.	Qualitative, extreme action teams
Pescosolido (2001)	Leadership ties (centrality)	Informal leaders	The efficacy beliefs of group members who are central in leadership networks predict group-level measurements of efficacy. Relationship is stronger early-on in group lifecycle.	Quantitative, MBA students
Small & Rentsch (2010)	Team leadership ties (centralization)	Shared leadership	Team collectivism and intragroup trust predict de-centralization in team leadership networks. Decentralization in team leadership networks is positively related to team performance.	Quantitative, business student teams
Willer (2009)	Status ties (incoming ratings)	Status theory of collective action	Partners who were perceived to have contributed more to collective action had higher status and influence, were cooperated with more, and received greater financial reward. Participants who received status for their contributions contributed more and perceived the group more positively.	Quantitative, laboratory dyads
Zhang et al. (2012)	Team leadership ties (peer ratings of leadership i.e., centrality, average of peer ratings, i.e., density)	LMX, informal leadership	Self-rated LMX predicts member centrality in team leadership network. Centrality mediates relationship between LMX and individual job performance. The LMX-leader emergence relationship is moderated by team shared vision. Density in team leadership network positively predicts team performance.	Quantitative, formal organizational teams

Note. SRM = social relations model; MBA = master of business administration; SME = subject matter expert; ERGM = exponential random graph model; LMX = leader-member exchange.

sociometric peer ratings into multiple sources (i.e., group attributes, dyadic attributes, perceiver, target, error). In general, researchers' use of network metrics aligns with the theoretical aspect of leadership under study. For example, studies seeking to identify "emergent leaders" in leadership networks have used individual-level metrics, such as one or more centrality network indices, or used the SRM to identify the level of the network, that is, group, dyad, perceiver, or target, from which leadership effects are emanating (e.g., Anderson, Srivastava, Beer, Spataro, & Chatman, 2006; Bendersky & Shah, 2013; Zhu et al., 2012). On the other hand, studies of leadership as an emergent property of an entire group (e.g., shared, collective leadership) have used network-level metrics, such as density, centralization, or qualitative and/or quantitative coding of leadership network structures to identify *aggregate* emergent patterns of leadership (e.g., Carson et al., 2007; Mehra, Smith, Dixon, & Robertson, 2006; Small & Rentsch, 2010; Zhu, Kraut, Wang, & Kittur, 2011). Some studies have used both of these conceptual approaches, identifying emergent "leaders" and aggregate emergent group-level structures of leadership (e.g., Zhang et al., 2012).

Finally, some work in Area 2 (e.g., Kalish, 2013; Kalish, 2013; White, Currie, & Lockett, 2014) uses *predictive* models of network evolution to identify the rules or principles governing leadership network *self-organization*. These studies use advanced network analytic and modeling techniques to identify structural patterns in leadership networks that are *statistically likely*—typically by identifying significant parameter estimates in predictive models of network evolution (e.g., stochastic actor-oriented models [SAOMs]; Snijders, 2001, 2005; Snijders, van de Bunt, & Steglich, 2010). For example, Kalish (2013) showed that principles of reciprocity (mutual influence) and hierarchy (relying for leadership on a few individuals) governed the self-organization of leadership networks in a sample of ad hoc military teams. A distinctive feature of self-organizing approaches is their utilization of endogenous explanatory mechanisms (Contractor et al., 2006). For instance, the emergence of a leadership reliance tie from one individual A to another individual B can be explained by, say, the presence of a leadership reliance tie from C to both A and B—a phenomena referred to as *generalized exchange*. In this example, other leadership ties within the network explain leadership ties "endogenously."

Conceptual orientations. Table 4 summarizes the conceptual foundations of research in Area 2. In contrast to Area 1, Area 2 research stems from human capital theories of leadership found in management and applied psychology. For example, studies of emergent leaders in leadership networks often rely on trait, or behavioral perspectives. Studies of aggregate patterns of leadership often rely on collectivistic theories of leadership, such as shared, collective, distributed, or complexity theories.

Key findings: Relationship 4. Relationship 4 reflects the emergence of leadership networks based on a variety of antecedents. A subset of these studies considers individual difference variables, finding that personality, person–organization fit, and intelligence predict peer perceptions of influence, status, and leadership (e.g., Anderson et al., 2008; Anderson, John, Keltner, & Kring, 2001; Anderson & Kilduff, 2009; Bendersky & Shah, 2013; Kalish, 2013). Other studies have considered other, more situationally specific, individual difference factors. For example, Zhu et al. (2011) showed that editors on Wikipedia who either founded a project or were one of the top three contributors on a project (i.e.,

"core members") were more likely to engage in socially oriented leadership relationships compared with editors who are not core members (i.e., "peripheral members"); peripheral members were more likely to engage in task-oriented leadership.

Some work in Area 2, Relationship 4 (e.g., Kalish, 2013; White et al., 2014), has sought to uncover the rules or principles governing how collectives tend to *self-organize* their leadership relationships. White et al. (2014) compared the self-organization of the leadership network in an interorganizational health and social care community under routine versus nonroutine conditions. Under routine conditions, the community tended to structure their leadership based on a principle of *generalized* exchange—two members who were relied on for leadership by a third member also tended to rely on each other for leadership. It is interesting that under these routine conditions, members did *not* tend to base their judgments of others' leadership on the target's level of formal authority. However, in a nonroutine situation, members structured their leadership relationships more hierarchically, tending to attribute leadership only to those with formal authority.

Key findings: Relationship 5. Studies examining Relationship 5 identify the outcomes of emergent leadership networks. For example, in a sample of Wikipedia users, Zhu et al. (2012) showed that emergent leadership relationships characterized by "transactional" and "person-focused" interactions, and leadership stemming from legitimate rather than nonlegitimate leaders, positively predicted the likelihood that a target actor will engage in a desired behavior.

Research in this area has also examined the impact of aggregate patterns of leadership networks on individual and group effectiveness. Mehra, Smith, et al. (2006) qualitatively classified team leadership network structures in a sample of organizational teams into one of four categories—*vertical* (i.e., one single formal leader), *distributed* (i.e., all members relying on one another for leadership), *distributed-coordinated* (i.e., a formal leader and an emergent leader mutually reliant on one another for leadership), and *distributed-fragmented* (i.e., the formal leader and the emergent leader are not mutually reliant on one another for leadership). Findings showed that although teams with distributed leadership were not more effective than those with a vertical leadership pattern, distributed-coordinated structures were more effective than distributed-fragmented and distributed patterns (Mehra, Smith, et al., 2006).

Key findings: Relationship 4 and Relationship 5. More complex models consider both the antecedents of leadership networks (Relationship 4) as well as the outcomes of these networks (Relationship 5). For example, research on individuals shows a correspondence in who emerges in a leadership network, and who is effective as a leader. Traits and behaviors including intelligence, dominance, self-efficacy, self-monitoring, personality, and contribution to the group task predict incoming nominations of informal leadership, and also predict outcomes of leadership, such as superior-rated leadership effectiveness, financial rewards, and team performance (e.g., Foti & Hauenstein, 2007; Taggar, Hackew, & Saha, 1999; Willer, 2009).

Research on shared leadership in teams has begun to clarify the conditions supporting the emergence as well as the consequences of aggregate leadership network structures. Small and Rentsch (2010) showed that team collectivism and team trust predict leadership network decentralization. Carson et al. (2007) showed the

supportiveness of a team's internal environment and the quality of external coaching predict leadership network density. Both studies demonstrated a positive relationship between shared leadership—operationalized as decentralization or density, respectfully—and team performance.

In a recent extension of LMX research, Zhang et al. (2012) examined both the LMX leadership relationships between formal supervisors and their subordinates as well as the structures of informal leadership in teams (i.e., team leadership networks). Their findings revealed that self-rated LMX quality predicts member centrality in the team leadership network, and this centrality mediates the relationship between LMX and individual job performance. Consistent with Carson et al. (2007), at an aggregate level, density in the team leadership network positively predicted team performance.

Lastly, evidence in this area suggests that leadership network structures can change dynamically over time, and that certain shifts in patterning predict important outcomes. For example, Klein, Ziegert, Knight, and Xiao (2006) showed that, in extreme action teams, dynamically delegated patterns of leadership—with the supervisor delegating key leadership roles to subordinates when appropriate—were not only likely to occur, but were also positively related to team performance. Such patterns enabled “extreme action teams” to perform reliably while also building their novice team members' skills (p. 590). Likewise, Aime et al. (2014) found creativity-focused teams tend to exhibit *heterarchical* patterns of power expressions (i.e., rotating power expressions to match task demands). When matched with task demands and members' perceptions of one another, heterarchical leadership network patterns were also effective.

Research design, sample. The studies included in Table 4 represent both quantitative as well as qualitative and mixed-method approaches to understanding leadership networks. Although many exemplar studies in this realm examine the leadership networks of groups or teams in formal organizations, there are also substantially more laboratory and/or student sample studies compared with Area 1.

Summary of Area 2. Research on *leadership as networks* demonstrates that (a) individual attributes relate to the occupancy of certain positions in leadership networks (Relationships 4); (b) leadership networks are self-organizing, with particular patterns more likely to emerge than others (Relationship 4) and (c) certain patterns of leadership relationships are more effective than others (Relationships 5); and The promising empirical evidence in support of the two distinct network approaches to leadership emergence and effectiveness reported in Areas 1 and 2 above, suggests there is potential in combining these two approaches. The research reported next, in Area 3, makes this important connection.

Area 3: Leadership in and as Networks

The third area in our conceptual framework, Area 3, *leadership in and as networks*, utilizes network approaches to explain leadership emergence and effectiveness by considering the interplay between social and leadership networks (Figure 2, Relationship 6) as well as the outcomes of these often coevolving systems of relationships (Figure 2, Relationship 7). Table 5 provides an overview of exemplar studies in this area.

Area 3 theoretical synopsis. Research on *leadership in and as a network* views leadership as relational, situated in context, patterned, and both formal and informal. As in Area 2, research in this realm conceptualizes leadership itself as an emergent relationship between actors. In addition, as in Area 1, this work incorporates explanations for leadership derived from the embedding networks of other social relationships.

Network relations and metrics. Table 5 provides a summary of the types of networks prior work in Area 3 has investigated. Like Area 1, these studies utilize, “social” networks, such as communication, advice, friendship, respect, and trust. Like Area 2, they also utilize “leadership” networks measured explicitly as influence perceptions or processes.

As in Areas 1 and 2, studies in Area 3 utilize both individual-focused and aggregate network metrics. Several studies in Area 3 consider *dyadic* leadership network ties. For example, some LMX studies situate dyadic LMX relationships in networks of other social relationships (e.g., advice; Sparrowe & Liden, 2005). Table 5 indicates that the network metric associated with LMX development are “dyadic ties” (e.g., Goodwin et al., 2009). Further, several studies in this area have examined the interrelationship between leadership and social networks using the Quadratic Assignment Procedure (QAP) or other inferential models of network development and coevolution (i.e., interactive development over time).

Conceptual orientations. Table 5 provides a summary of the conceptual foundations used in Area 3. Given that this research combines Areas 1 and 2, many of these studies use both social and human capital explanations for leadership emergence and effectiveness. In other words, this research often connects leadership theories stemming from management or organizational psychology (e.g., LMX, transformational leadership, collectivistic leadership) with structuralist perspectives of social networks stemming from sociology.

Key findings: Relationship 6. Several studies in Area 3 have considered the social network antecedents of leadership networks. This work has its origins in a set of classic studies conducted well over 15 years ago (e.g., Bavelas, 1950) that sparked a substantial body of organizational social network research in the following decades (e.g., Brass, 1984, 1985; for reviews of this work see Shaw, 1964; Mullen, Johnson, & Salas, 1991). For example, Bavelas (1950) demonstrated that occupying a central position in a group's communication network positively predicted nominations in leadership networks. Brass (1984, 1985) found individuals' centrality in workflow and communication networks are associated with their perceived influence and subsequent leadership role occupation. More recently, Neubert and Taggar (2004) demonstrated that this effect is moderated by gender such that members' personality and centrality in team advice and social support networks more strongly predicted incoming leadership reliance ties (i.e., granting) for men than for women. On the other hand, general mental ability more strongly predicted incoming leadership reliance for women than for men.

Goodwin et al.'s (2009) study predicting LMX relationships between formal leaders and their subordinates also investigated the social network antecedents of leadership networks. Goodwin et al. showed that both leaders' and followers' ratings of their leadership relationships depended on the others' social network position. Leaders' centrality in the organizational advice network positively

Table 5
Exemplar Findings From Area 3, “Leadership in and as Networks”

Authors (year)	Social network relations (metrics)	Leadership network relations (metrics)	Conceptual orientations	Key findings	Design, sample
Bono & Anderson (2005)	Advice ties (centrality)	Relationship 6: Antecedents of leadership and social networks and their coevolution Influence ties (centrality)	Transformational leadership, social capital	Managers’ transformational leadership predicts managers’ centrality in organizational advice and influence networks. Transformational leadership positively predicts direct reports’ centrality in organizational advice and influence networks.	Quantitative, formal organizations
Emery (2012)	Friendship ties (parameters from SAOMs)	Relationship- and task-based leadership ties (SAOM parameters)	Trait theories, social capital	Ability to perceive and manage emotions predicts incoming ties in relationship-based leadership networks; Ability to use and understand emotions predicts incoming ties in in task-based leadership networks; Friendship networks (control variable) predict leadership networks.	Quantitative, undergraduate students
Goodwin et al. (2009)	Advice ties (centrality)	LMX tie (dyadic ties)	LMX, Social capital	Formal leader centrality in advice network predicts follower-rated LMX; Follower centrality in advice network predicts leader-rated LMX; Leader centrality moderates interaction frequency—follower-rated LMX relationship; Follower centrality moderates leader-rated similarity frequency—leader-rated LMX relationship.	Quantitative, formal organization
Neubert & Taggar (2004)	Advice ties, support ties (centrality)	Leadership ties (In-ties)	Leader emergence, social capital, trait theories	Centrality in team advice and support networks, and personality traits predict incoming ties in leadership networks more for men than for women. General mental ability predicts incoming ties in leadership networks more for women.	Quantitative, formal organizational teams
Sparrowe & Liden, (2005)	Trust ties, advice ties, (centrality, shared ties)	Influence ties (centrality) LMX ties (dyadic ties)	LMX, informal influence, social capital	When formal leaders are central in organizational advice network, the relationship between members’ advice network centrality and members’ influence is positive for members who share ties with their leaders in the organizational trust network (i.e., sponsorship). When formal leaders’ centrality in the advice network is low, the relationship between members’ advice network centrality and their influence is negative for sponsored members.	Quantitative, formal organizational teams

(table continues)

Table 5 (continued)

Authors (year)	Social network relations (metrics)	Leadership network relations (metrics)	Conceptual orientations	Key findings	Design, sample
Mehra et al. (2009)	Friendship ties (in-ties, density, transitivity, network coevolution)	Leadership ties (in-ties, density, transitivity, coevolution)	Leadership network structure emergence, social capital	Friendship networks develop based on gender similarity, density increases over time, ties tend to be transitive, and actors with many friends are less likely to acquire new friends. Leadership networks do not develop based on gender similarity, density decreases over time, and actors with many followers are more likely to acquire new followers. Friends of "leaders" more likely to be seen as leaders.	Quantitative, business student sample
Venkataramani et al. (2010)	Advice ties (centrality)	LMX ties, (dyadic tie),	LMX, social capital	Relationship 7: Impact of (coevolving) leadership and social networks on outcomes of leadership Formal leaders' centrality in advice networks and leaders' connections to other senior leaders predicts follower perceptions of leaders' status. Follower perceptions of leader status predict LMX and, in turn, member job satisfaction. Member centrality in peer advice networks moderates relationship between member perceptions of leader status and LMX.	Quantitative, formal organization

Note. SAOMs = stochastic actor-oriented models; LMX = leader-member exchange.

predicted follower-rated LMX; followers' centrality in the advice network positively predicted leader-rated LMX. More specifically, leaders' advice centrality moderated the positive relationship between interaction frequency and follower-rated LMX such that followers who have more interactions with a highly central leader were more likely to rate their LMX relationship as high. It is interesting that follower centrality also moderated the relationship between leader-rated similarity between the leader and follower and leader-rated LMX such that when leaders viewed themselves as highly similar to a follower who was not central in the advice network, the leaders tended to rate the LMX quality as low.

Other studies in this area consider formal leaders' role in shaping informal leadership and social networks. For example, Bono and Anderson (2005) showed that managers' level of transformational leadership positively predicted their centrality in organizational influence and advice networks and predicted the centrality of their direct reports in these different networks. Relatedly, Sparrowe and Liden's (2005) research considered the role of formal leaders and organizational social networks in the development of organizational influence networks, finding that when an organizational member's formal leader is central in the organizational advice network, there is a positive relationship between the member's advice network centrality and his or her organizational influence when sponsored (i.e., when they share ties with their leader in the organizational trust network). Conversely, when the formal leader is low in centrality in the organizational advice network, there is a negative relationship between members' advice network centrality and organizational influence for sponsored members.

Researchers have also used social network structures as control variables in studies that examine leadership network emergence. For example, Emery (2012) used SAOMs (Snijders, 2001, 2005; Snijders et al., 2010) to understand the role that emotional abilities play in leadership emergence. Her findings suggest that, *controlling* for friendship networks, the ability to perceive and manage emotions predicts incoming ties in relationship-based leadership networks and the ability to use and understand emotions predicts incoming ties in task-based leadership networks.

Finally, given the highly interrelated nature of social relationships and leadership constructs, some research has considered how social and leadership networks *coevolve* over time, mutually shaping one another. For example, Mehra, Marineau, Lopes and Dass (2009) examined the coevolution of friendship and leadership networks. Their findings suggest that friendship ties develop based on gender similarity, friendship network density increases over time, friendship networks tend to be transitive (i.e., individuals who share mutual friends are likely to become friends), and actors with many friends are less likely to acquire new friends. On the other hand, the development of a leadership tie is *not* predicted by gender similarity, leadership network density *decreases* over time, and actors with many followers are *more* likely to acquire new followers. In alignment with social capital perspectives of leadership emergence, friends of "leaders" are themselves more likely to be perceived as leaders eventually.

Key findings: Relationship 7. Last, some research has examined the subsequent outcomes of interrelated social and leadership networks. This area of research is notably sparse. For example, Venkataramani et al. (2010) demonstrated that the degree to which a formal leader is central in his or her peer advice network and has connections to other senior leaders predicts follower perceptions of

the leader's status. These status perceptions, in turn, predict LMX relationships (i.e., dyadic leadership relationships in a leadership network) and subsequent follower job satisfaction. Furthermore, Venkataramani et al. found that the effects of the leaders' perceived status on LMX is stronger when the follower was less central in his or her peer advice network. This study of leadership in and as networks illustrates the direct impact social ties have on the two relations that comprise leadership: giving/attempting influence and granting/accepting influence. Venkataramani et al. found the leadership relations that are most likely to solidify are those where the party providing leadership is well-connected, whereas the party accepting leadership is not. This study underscores the value of considering both social and leadership networks in tandem to understand how these networks *form*, and how they *perform*. If, as this finding suggests, the well-connected are disproportionately more likely to secure followership, this may undermine the breadth of leadership capacity within organizations.

Research design, sample. Research in Area 3 includes a mix of quantitative and qualitative research and a mix of experimental laboratory studies and field studies conducted in real-world organizations.

Summary of Area 3. Research in Area 3, although sparse, shows promising signs of the synergies to be realized by connecting the ideas and approaches from Areas 1 and 2. These findings demonstrate the important role social structures play in shaping leadership as a relational phenomenon. However, there is a relative paucity of research connecting leadership networks, social networks, and outcomes, such as individual or collective performance. Certainly, the exemplar Relationship 7 study described suggests the benefit of adopting this more comprehensive approach. Venkataramani et al. (2010) focused only on the patterns of leadership relationships that emerged among formal leaders and their followers, clearly there is an opportunity for future research to consider leadership in and as networks by conceptualizing and modeling leadership and social relations in entire networks and investigating both the emergence and evolution of these networks as well as their impact on organizational outcomes.

A Summary of the Three Areas: Where We Are Now

The two age-old interconnected questions of leadership emergence and effectiveness are still useful for characterizing research on leadership from a network approach. Our framework for organizing this literature provides a roadmap for understanding how prior network approaches to leadership, stemming from different theoretical perspectives, have tackled these two classic questions.

Area 1 findings shed light on how social context shapes leader emergence and how building and leveraging social capital can explain leadership effectiveness. However, although the social context in this body of literature is treated as a relational process, leadership is not. Area 1's contribution to understanding the social networks as the context of leadership would benefit from the relationally infused view of leadership considered in Area 2. Area 2 findings shed light on how leadership patterns emerge and how they foster individual and collective functioning. Yet, despite the advancement of using networks to model leadership, this research has not considered the impact of the embedding social patterning examined by studies in Area 1.

The limited amount of research in Area 3 begins to showcase the promise of viewing leadership through the dual network lenses offered by Areas 1 and 2. Going forward, we suggest that future research on leadership can benefit from the relational paradigm by considering two aspects of leadership as relational—the social context and leadership itself—and by using network approaches to investigate both aspects. Social network approaches can serve as a unifying theme for the theoretically rich, but arguably disjointed, leadership domain.

Our final contribution is to advance an agenda for future research on leadership that leverages the confluent ideas at the intersection of leadership in and as networks. Leadership in and as networks reflects a paradigm shift in leadership research—from an emphasis on the static traits and behaviors of single formal leaders whose actions are contingent upon situational constraints, toward a leadership networks paradigm that emphasizes *the complex and patterned relational processes that interact with the embedding social context to jointly constitute leadership emergence and effectiveness*.

Advancing an Agenda: Where to Next

Social network approaches to leadership are well positioned to model some of the most enduring foundational ideas in leadership research. Leadership is a relational phenomenon (e.g., Follet, 1925). Leadership is strongly affected by the embedding social context (e.g., Fiedler, 1964). Leadership relationships are patterned (Graen, 1976). Leadership involves formal and informal influence (French & Raven, 1959). For many years, perhaps because of considerable pragmatic and methodological challenges, the field of organizational leadership set aside its relational origins, steered clear of situational determinants, eschewed engaging with the idea of patterning, and neglected the significance of informal influence. It is time for leadership research to revisit these wise ideas from the past and instantiate them into future research within the field.

These ideas are even more relevant today, given the increasing prevalence of flatter, team-based, and interdependent organizational structures and self-managed, cross-functional teams (Kozlowski & Bell, 2003; Maynard, Gilson, & Mathieu, 2012; Morgeson, 2005; Morgeson, DeRue, & Karam, 2010; Pearce & Conger, 2003). Leadership by a single formal leader is often impractical and unsustainable for meso- and macro-organizational forms, such as multiteam systems or intergroup collaborations (Carter & DeChurch, 2014; Davison, Hollenbeck, Barnes, Slesman, & Ilgen, 2012; Hogg, van Knippenberg, & Rast, 2012; Mathieu, Marks, & Zaccaro, 2001). Traditional forms of organizing are being augmented via markets and hierarchies with novel "network" forms of organizing (Podolny & Page, 1998). Newly emerging types of collectives, such as virtually mediated communities (e.g., Wikipedia, open-source software), raise new questions about how leadership manifests in situations lacking traditional practices, such as sanctioning or terminating employees (Zhu et al., 2012). Clearly there is a pressing need to rethink leadership in this rapidly changing world by introducing new concepts, evaluating the adequacy of existing theories, and developing theoretical extensions or new theories. Social network approaches are exceptionally well suited to characterize and explain the emergence and effectiveness of leadership within the novel, fluid, flexible, and dynamic forms of organizing that are increasingly prevalent in society.

The ability to take on the challenge of studying leadership as relational, situated, patterned, and informal is bolstered by advances in data and methods that provide social scientists unprecedented opportunities to make major breakthroughs in understanding leadership emergence and effectiveness. In our review, we developed an organizing framework to situate past research on leadership from a social network approach with the aim of paving the way for future research. We conclude with five agenda items, each with associated research questions that point toward meaningful advances in leadership research brought to light by our review.

Agenda Item 1: What Are the Principles of Leadership Network Emergence?

The question of leadership emergence, *Who will lead?*, is one of the preeminent questions in leadership research. This question has been addressed by theorists and theories spanning many levels of analysis, including individual traits and characteristics (Zaccaro, 2007), dyadic exchange relationships (Graen & Uhl-Bien, 1995), group prototypicality (Hogg, 2001), and executive hubris (Hiller & Hambrick, 2005). Our review highlights the potential of using a self-organizing framework to integrate and encompass exogenous and endogenous factors at multiple levels of analysis (e.g., individual traits, dyadic characteristics, group properties) as explanations of leadership emergence (i.e., *who will lead, and who will follow*).

Prior research on leadership using a network approach has considered multiple exogenous explanations for leadership emergence: (a) characteristics of the task (e.g., routine vs. nonroutine collective task demands), (b) individual differences (e.g., intelligence, personality), and (c) social phenomena (e.g., trust, communication, group climate). In addition to these exogenous factors we need research that identifies the *endogenous rules or principles* governing leadership emergence. That is, to what extent does the extant leadership network, itself, endogenously enable or constrain its emergence. This type of thinking is starting to enter leadership research. Kalish (2013), Mehra et al. (2009), Emery (2012), and White et al. (2014) consider the extent to which principles of self-organization such as reciprocity, hierarchy, or generalized exchange, are revealed by the prevalence of distinct structural signatures in the leadership network. For example, White et al.'s (2014) findings suggest that a different set of principles (e.g., a tendency toward generalized exchange) underpin the emergence of leadership in routine versus nonroutine situations. Although there have been advances in confirmatory network analytic methods to test hypotheses about the presence of specific structural signatures (Lusher, Koskinen, & Robins, 2012), more research is needed that develops the theoretical rationale for *why* certain exogenous and endogenous factors influence leadership emergence. This will require turning to classic social psychological theories, such as theories of social exchange (e.g., Cook, 1982) and balance theories (e.g., Heider, 1958), or theories stemming from social network research, such as homophily or proximity (e.g., McPherson, Smith-Lovin, & Cook, 2001), social contagion (e.g., Burt, 1987), or coevolution (e.g., Baum, 1999).

Our call for greater attention toward underlying self-organizing processes parallels Kozlowski, Chao, Grand, Braun, and Kuljanin's (2013) exhortation for research using direct approaches to

study emergent organizational phenomena that "rely on prospective observations that capture the process and manifestation of emergence as it unfolds" (p. 3). Qualitative research has long sought to directly investigate patterns of emergence (e.g., through ethnographic approaches). For example, several notable qualitative and mixed-method studies in Area 2 directly assess emergent patterns of influence (e.g., Aime et al., 2014; Klein et al., 2006). However, as quantitative research methods are rapidly advancing, our understanding of the emergence of leadership should be informed by both qualitative and quantitative methodologies (e.g., Humphrey & Aime, 2014; Kozlowski et al., 2013).

To begin, however, we may need to develop a more precise theoretical depiction of what microdynamic relational processes *constitute* leadership relationships (Fairhurst & Antonakis, 2012). Whereas LMX theory suggests that trust and mutual respect characterize leadership, other leadership theories emphasize other relational processes. For example, other functional approaches to team leadership imply that leadership is present when one or multiple leadership participants engage in behaviors such as establishing expectations and goals, sense making, problem solving, or providing resources for one another (e.g., Morgeson et al., 2010). Transformational leadership theory suggests that leadership is present when participants have developed emotionally fulfilling, intellectually stimulating and inspiring relationships (Bass, 1985).

In summary, some of the most interesting and important research questions in the area of leadership emergence include (a) What microdynamic relational processes constitute leadership? (b) What exogenous factors and endogenous principles of self-organization are articulated in extant theory as explanations for leadership emergence? (c) What distinct structural signatures are likely to emerge in leadership networks if specific principles of self-organization underpin leadership emergence? (d) What new theoretical explanations can be adduced by empirically detecting the prevalence of certain structural signatures in the leadership network that do not map on to existing theories of leadership emergence? (e) How does the embedding context of leadership affect the principles of self-organization? and (f) Which exogenous and endogenous antecedents of leadership emergence are the most robust and universal?

Agenda Item 2: How Does the Structure of Leadership Affect Individual, Group, and Organizational Outcomes?

The question of leadership effectiveness is the second prominent question of leadership research. This question cuts across existing theories and levels of analysis, addressing the important issue of how leadership affects individual, team, system, and organizational outcomes (Hiller et al., 2011). Some research conceptualizing leadership *as a network* has begun to address this question. For example, Carson et al. (2007) and Small and Rentsch (2010) demonstrated that patterns of leadership relationships in teams, reflective of shared leadership, positively predict team performance. Yet, most prior studies of leadership networks have focused on the degree to which leadership is vertical versus shared (e.g., D'Innocenzo et al., 2014; Nicolaidis et al., 2014; Wang et al., 2014). We need greater attention toward other structural aspects of leadership (Contractor et al., 2012), and their unique affordances for relevant outcomes. Furthermore, research has thus far linked leadership structures to team level outcomes. We need

research that identifies how these structures affect leadership outcomes at individual and organizational levels of analysis.

Some of the most interesting and important research questions relating the structure of leadership networks to outcomes include (a) Which leadership structures best promote individual motivation and performance? (b) Which structures are best for creating the enabling conditions needed for team functioning? (c) Which leadership structures best enable systems of teams to function as a coherent whole? (d) Given the inevitable tradeoffs of leading across levels, which structures optimize leadership outcomes across levels? and (e) What are the boundary conditions that govern the relationships between leadership structures and valued outcomes? For example, how do network size, member turnover, and the degree of virtuality affect the relations between leadership network structures and outcomes of leadership?

Agenda Item 3: How Do Social and Leadership Networks Coevolve?

Our third agenda item integrates the leadership *in* and leadership *as* networks approaches to consider the processes through which leadership and the social context coevolve over time. Coevolution implies that there is a mutual interaction among and feedback loops between leadership networks and social networks, such as advice or friendship (Gross & Blasius, 2008). Existing research in Area 1 has examined how social networks shape leader emergence, leadership outcomes, and how leaders affect social networks. The types of explanations generated in this research are useful starting points for thinking about how leadership and social context mutually affect one another. However, this research examines leadership as a characteristic of individuals (e.g., the extent to which someone is charismatic, articulates a compelling vision, or provides initiating structure), rather than a relationship.

Exemplar studies reviewed in Area 3 investigate social as well as leadership network relations, finding centrality in social networks affects leadership nominations (Emery, 2012; Neubert & Taggar, 2004, & Mehra et al., 2009), and the quality of LMX (Goodwin et al., 2009). However, this work has only begun to uncover the nature of the interdependence in these networks and the feedback loops that connect social and leadership networks. For example, are the structures similar whereby leadership tends to mirror the social network, or are they complementary or even compensatory? Another future direction is to explore the role of leadership networks in shaping social networks.

In sum, there are many interesting and important research questions in the area of leadership and social network coevolution, including (a) To what extent do social networks and leadership networks exhibit the properties of adaptive coevolution? (b) What is the leading indicator or dominant pacer in the emergence of leadership and social networks? (c) Under what conditions are leadership and social networks more and less tightly coupled?

Having discussed three specific streams of future research with associated research questions, our final two agenda items are meant to afford a big-picture perspective on how leadership and networks research point the way forward for two important areas of leadership research: the need for greater theoretical integration, and the need to remain rigorous and relevant in the coming age of computational social science.

Agenda Item 4: Toward a Multitheoretical Multilevel Approach to Leadership

Our fourth agenda item is for future work to integrate across multiple theories of leadership to understand the emergence and effectiveness of leadership networks embedded within social networks. Social network approaches and associated analytics hold the promise of connecting ideas across what are currently parallel theories about leadership. A point of convergence across theories is that leadership is relational, situated, patterned, and involves both formal and informal influence across multiple levels of analysis.

Existing research demonstrates the multilevel nature of both networks and leadership. Network approaches provide multilevel explanations, where the emergence of a network tie between two actors can be explained by attributes of the actors, other dyadic ties among actors (i.e., other networks), and properties of the collective (characteristics of the group/organization) in which they are embedded (Borgatti & Foster, 2003). Organizational leadership is well aligned with this multilevel structure (e.g., Wang, Zhou, & Liu, 2014; Yammarino & Dansereau, 2008, 2011). Leadership research has considered the causes and consequences of (a) individuals' emergence and effectiveness as leaders, (b) the leadership relationships individuals participate in, and (c) patterns of leadership in collectives. An integrative approach would connect across theories to consider the attributes of individuals, social phenomena, and properties of groups that predict the emergence and effectiveness of leadership across levels of analysis—individuals as contributors to leadership, dyadic leadership relationships, and aggregate patterns of leadership. This intersection reflects a multitheoretic multilevel approach to leadership, similar to that developed in the area of organizational communication (Contractor et al., 2006; Monge & Contractor, 2003).

Given a common network framework for translating key notions from leadership theories into individual, team, system, and organizational attributes (i.e., nodes) and their relations (i.e., social and leadership network ties), we can layer multiple theories of leadership on top of each other to gain a more holistic view of how leadership emerges and the leadership structures that best promote organizational effectiveness.

Agenda Item 5: Toward a Computational Social Science of Leadership

Clearly, the nature of organizing is changing, driven in part by advances in digital technologies that allow people to work collaboratively across traditional organizational, geographical, and cultural boundaries. The same digital revolution that is spawning novel forms of organizing has also yielded significant advancements in network data collection, curation, and analytic techniques and has provided access to an unprecedented amount of digital trace data left as trails from all the behavioral and social interactions people engage in online (Borgatti et al., 2009). In short, "a computational social science is emerging that leverages the capacity to collect and analyze data with an unprecedented breadth and depth and scale." (Lazer et al., 2009, p. 722). Thanks to the digital revolution, researchers are in the midst of a perfect storm—in terms of theory, data, methods, and computational infrastructure—to create a coherent foundation

for a theoretical and empirical research program that significantly advances understanding of leadership as a relational phenomenon. Thus, our final agenda item is to leverage these recent advancements and establish a *computational social science of leadership*.

Until recently, a major hurdle for relational theories of leadership has been the inability to empirically collect and analyze relational data. Access to digital trace data has the potential to transform leadership studies from being based on cumbersome self-report data to highly scalable high-resolution digital data. For instance, Zhu et al. (2011) used machine-learning techniques to automatically identify leadership behaviors among four million Wikipedia page editors. Their findings suggest that although leadership is a shared process throughout Wikipedia, the pattern of enacted leadership processes differed between those who were core to the network versus those who were members of the periphery. This study also suggests the potential of broadening the computational social science research toolkit to include both theory-driven and data-driven approaches (Williams, Contractor, Poole, Srivastava, & Cai, 2011).

Notwithstanding access to large tracts of digital data, another major hurdle in network science has been the inability to analyze network data. Conventional statistical techniques in organizational psychology are, for the most part, based on the assumption that observations are independently and identically distributed (i.i.d). However, the relational observations that constitute network data are, by definition, nonindependent. For example, Person A's leadership relationship with B may well be enabled or constrained by their relationships with C. In recent years, network science has witnessed the development of new methodologies, which do not make assumptions of i.i.d. to inferentially test hypotheses about the emergence and effectiveness of leadership relations. These new methods detect the prevalence of distinct structural signatures that are uniquely associated with certain theoretical mechanisms of leadership emergence and enable simultaneous tests of multiple relational theories, including theories that involve longitudinal and multilevel dynamics (e.g., Contractor et al., 2006; Monge & Contractor, 2003; Snijders & Bosker, 1999; Snijders, Pattison, Robins, & Handcock, 2006). For instance, a class of statistical models called p^* , or exponential random graph models (Anderson, Wasserman, & Crouch, 1999; Frank & Strauss, 1986; Pattison & Wasserman, 1999; Robins, Pattison, Kalish, & Lusher, 2007; Robins, Pattison, & Wasserman, 1999; Wasserman & Robins, 2005), along with SAOMs (Snijders, 2005), were designed to better account for the dependencies inherent in network data and enable inferential tests of the causes and consequences of network development over time (Contractor et al., 2012). Some networks research on leadership has fruitfully applied these new approaches (e.g., Emery, 2012; Kalish, 2013; Mehra et al., 2009; White et al., 2014).

Further, as Dinh et al. (2014) suggested "event-level methodologies and network analysis can offer additional technologies for understanding dynamic individual and group processes" (p. 54). Indeed, the availability of time-stamped data chronicling each "relational event" has prompted network scholars to develop new methodologies to model the likelihood of relational events (Brandes, Lerner, & Snijders, 2009; Butts, 2008). Relational event network models are especially well

sued to identify the principles of self-organization over time (called sequential structural signatures) that exist among microlevel interaction attempts, such as a person giving or attempting to provide leadership or another person granting or accepting leadership (DeRue & Ashford, 2010).

In addition to advances in inferential models of networks, the past decade has seen a dramatic maturation of computational modeling techniques (Kozlowski & Chao, 2012; Kozlowski et al., 2013). Agent-based computational modeling environments are particularly well suited to model network dynamics. They offer the opportunity to develop theoretically guided models with parameter sizes estimated using empirical data. These models can then be used to conduct "virtual experiments" that consider "what-if" scenarios under conditions that might not have been observed empirically (e.g., Kennedy & McComb, 2014; Sullivan, Lungeanu, DeChurch, & Contractor, in press). The results of virtual experiments generate new testable hypotheses that help confirm, extend, or amend existing theories of leadership emergence and effectiveness. The rationale behind computer assisted theory building is not new (Hanneman, 1988), but the confluence of the availability of high-resolution time-stamped digital trace data along with developments in computational infrastructure and methodological developments augurs well for advancing the study of leadership as an emergent process.

In summary, spurred by the availability of digital trace data and methodological developments, network science is well poised to theoretically and empirically advance the complex conceptualizations of leadership and group dynamics that have been discussed, albeit only conceptually, for many decades (e.g., Fiedler, 1964; French & Raven, 1959; Katz & Kahn, 1978; Lewin, 1943; Uhl-Bien & Marion, 2008). Critically, a computational social science of leadership that integrates social network thinking alongside computational modeling and agent-based simulation approaches can help leadership research better align with the "third scientific discipline" of organizational research, (Hunt & Ropo, 2003; Ilgen & Hulin, 2000), which emphasizes chaos, complexity, dynamic adaptive systems, and processual longitudinal approaches.

Conclusion

Relational conceptualizations of leadership are not only the past but are also very much the future of leadership research. We draw upon classic theories about the relational nature of leadership in organizations to advocate for an integrative social network approach to understanding the fundamental questions surrounding the emergence and effectiveness of leadership. Advances in technology as well as statistical and computational network models make the present an exceptionally opportune time to exploit the synergy between relational theories of leadership on the one hand, and relational data and methods on the other. As novel organizational forms increase in prevalence, social network approaches that cast leadership as *relational, situated in context, patterned*, and *both formal and informal* are increasingly critical for advancing the theory and practice of 21st century organizational leadership.

References

- *Denotes exemplar studies using social network approaches to leadership (Tables 3–5). **Denotes exemplar definitions of leadership (see Table 1).
- *Aime, F., Humphrey, S. E., DeRue, D. S., & Paul, J. B. (2014). The riddle of heterarchy: Power transitions in cross-functional teams. *Academy of Management Journal*, *57*, 327–352. <http://dx.doi.org/10.5465/amj.2011.0756>
- *Anderson, C., Ames, D. R., & Gosling, S. D. (2008). Punishing hubris: The perils of overestimating one's status in a group. *Personality and Social Psychology Bulletin*, *34*, 90–101. <http://dx.doi.org/10.1177/0146167207307489>
- *Anderson, C., John, O. P., Keltner, D., & Krings, A. M. (2001). Who attains social status? Effects of personality and physical attractiveness in social groups. *Journal of Personality and Social Psychology*, *81*, 116–132. <http://dx.doi.org/10.1037/0022-3514.81.1.116>
- *Anderson, C., & Kilduff, G. J. (2009). The pursuit of status in social groups. *Current Directions in Psychological Science*, *18*, 295–298. <http://dx.doi.org/10.1111/j.1467-8721.2009.01655.x>
- Anderson, C., Srivastava, S., Beer, J. S., Spataro, S. E., & Chatman, J. A. (2006). Knowing your place: Self-perceptions of status in face-to-face groups. *Journal of Personality and Social Psychology*, *91*, 1094–1110. <http://dx.doi.org/10.1037/0022-3514.91.6.1094>
- Anderson, C. J., Wasserman, S., & Crouch, B. (1999). A *p** primer: Logit models for social networks. *Social Networks*, *21*, 37–66. [http://dx.doi.org/10.1016/S0378-8733\(98\)00012-4](http://dx.doi.org/10.1016/S0378-8733(98)00012-4)
- Avolio, B. J., Walumbwa, F. O., & Weber, T. J. (2009). Leadership: Current theories, research, and future directions. *Annual Review of Psychology*, *60*, 421–449. <http://dx.doi.org/10.1146/annurev.psych.60.110707.163621>
- *Balkundi, P., Barsness, Z., & Michael, J. H. (2009). Unlocking the influence of leadership network structures on team conflict and viability. *Small Group Research*, *40*, 301–322. <http://dx.doi.org/10.1177/1046496409333404>
- *Balkundi, P., & Harrison, D. A. (2006). Ties, leaders, and time in teams: Strong inference about network structure's effects on team viability and performance. *Academy of Management Journal*, *49*, 49–68. <http://dx.doi.org/10.5465/AMJ.2006.20785500>
- **Balkundi, P., & Kilduff, M. (2006). The ties that lead: A social network approach to leadership. *The Leadership Quarterly*, *17*, 419–439. <http://dx.doi.org/10.1016/j.leaqua.2006.01.001>
- *Balkundi, P., Kilduff, M., & Harrison, D. A. (2011). Centrality and charisma: Comparing how leader networks and attributions affect team performance. *Journal of Applied Psychology*, *96*, 1209–1222. <http://dx.doi.org/10.1037/a0024890>
- Bass, B. M. (1985). *Leadership and performance beyond expectation*. New York, NY: Free Press.
- Baum, J. A. C. (1999). Whole-part coevolutionary competition in organizations. In J. A. C. Baum & B. McKelvey (Eds.), *Variations in organization science: In honor of Donald T. Campbell* (pp. 113–135). Thousand Oaks, CA: Sage. <http://dx.doi.org/10.4135/9781452204703.n7>
- Bavelas, A. (1950). Communication patterns in task-oriented groups. *Journal of the Acoustical Society of America*, *22*, 725–730. <http://dx.doi.org/10.1121/1.1906679>
- *Bendersky, C., & Shah, N. (2013). The downfall of extraverts and rise of neurotics: The dynamic process of status allocation in task groups. *Academy of Management Journal*, *56*, 387–406. <http://dx.doi.org/10.5465/amj.2011.0316>
- *Bono, J. E., & Anderson, M. H. (2005). The advice and influence networks of transformational leaders. *Journal of Applied Psychology*, *90*, 1306–1314. <http://dx.doi.org/10.1037/0021-9010.90.6.1306>
- Borgatti, S. P., & Foster, P. C. (2003). The network paradigm in organizational research: A review and typology. *Journal of Management*, *29*, 991–1013. [http://dx.doi.org/10.1016/S0149-2063\(03\)00087-4](http://dx.doi.org/10.1016/S0149-2063(03)00087-4)
- Borgatti, S. P., & Lopez-Kidwell, V. (2011). Network theory. In J. Scott & P. J. Carrington (Eds.), *The SAGE handbook of social network analysis* (pp. 40–54). Thousand Oaks, CA: Sage.
- Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009, February 13). Network analysis in the social sciences. *Science*, *323*, 892–895. <http://dx.doi.org/10.1126/science.1165821>
- Bourdieu, P., & Wacquant, L. J. (1992). *An invitation to reflexive sociology*. Chicago, IL: University of Chicago Press.
- Brandes, U., Lerner, J., & Snijders, T. A. (2009). Networks evolving step by step: Statistical analysis of dyadic event data. In N. Memon & R. Alhajj (Eds.), *International Conference on Advances in Social Network Analysis and Mining* (pp. 200–205). Piscataway, NJ: The Institute of Electrical and Electronics Engineers.
- Brass, D. J. (1984). Being in the right place: A structural analysis of individual influence in an organization. *Administrative Science Quarterly*, *29*, 518–539. <http://dx.doi.org/10.2307/2392937>
- Brass, D. J. (1985). Men's and women's networks: A study of interaction patterns and influence in an organization. *Academy of Management Journal*, *28*, 327–343. <http://dx.doi.org/10.2307/256204>
- Brass, D. J. (2001). Social capital and organizational leadership. In S. J. Zaccaro & R. J. Klimoski (Eds.), *The nature of organizational leadership: Understanding the performance imperatives confronting today's leaders* (pp. 132–152). San Francisco, CA: Jossey-Bass.
- Brass, D., & Krackhardt, D. (1999). Social capital for twenty-first century leaders. In J. G. Hunt, G. E. Dodge, & L. Wong (Eds.), *Out-of-the-box leadership transforming the Twenty-First Century Army and other top performing organizations* (pp. 179–194). Bingley, UK: Emerald Group Publishing.
- Burns, J. M. (1978). *Leadership*. New York, NY: Harper & Row.
- Burt, R. S. (1987). Social contagion and innovation: Cohesion versus structural equivalence. *American Journal of Sociology*, *92*, 1287–1335. <http://dx.doi.org/10.1086/228667>
- Burt, R. S. (1992). *Structural holes: The social structure of competition*. Cambridge, MA: Harvard Business School Press.
- Burt, R. S. (1997). The contingent value of social capital. *Administrative Science Quarterly*, *42*, 339–365. <http://dx.doi.org/10.2307/2393923>
- Burt, R. S. (2000). The network structure of social capital. *Research in Organizational Behavior*, *22*, 345–423. [http://dx.doi.org/10.1016/S0191-3085\(00\)22009-1](http://dx.doi.org/10.1016/S0191-3085(00)22009-1)
- Burt, R. S. (2002). The social capital of structural holes. In M. F. Guillen, R. Collins, P. England, & M. Meyer (Eds.), *The new economic sociology: Developments in an emerging field* (pp. 148–189). New York, NY: Russell Sage Foundation.
- Burt, R. S. (2005). *Brokerage and closure: An introduction to social capital*. New York, NY: Oxford University Press.
- Butts, C. T. (2008). Social network analysis: A methodological introduction. *Asian Journal of Social Psychology*, *11*, 13–41. <http://dx.doi.org/10.1111/j.1467-839X.2007.00241.x>
- Carlyle, T. (1907). *On heroes, hero-worship, and the heroic in history*. Boston, MA: Houghton Mifflin.
- Carpenter, M. A., Li, M., & Jiang, H. (2012). Social network research in organizational contexts: A systematic review of methodological issues and choices. *Journal of Management*, *38*, 1328–1361. <http://dx.doi.org/10.1177/0149206312440119>
- *Carson, J. B., Tesluk, P. E., & Marrone, J. A. (2007). Shared leadership in teams: An investigation of antecedent conditions and performance. *Academy of Management Journal*, *50*, 1217–1234. <http://dx.doi.org/10.2307/20159921>
- Carter, D. R., & DeChurch, L. A. (2014). Leadership in multiteam systems:

- A network perspective. In D. Day (Ed.), *The Oxford handbook of leadership and organizations* (pp. 482–503). New York, NY: Oxford University Press.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, *94*, 95–120. <http://dx.doi.org/10.1086/228943>
- *Collier, B., & Kraut, R. (2012). Leading the collective: Social capital and the development of leaders in core-periphery organizations. In T. W. Malone & L. von Ahn (Eds.), *Collective intelligence 2012: Proceedings*. Retrieved from <http://arxiv.org/abs/1204.3682>
- Contractor, N. S., DeChurch, L. A., Carson, J., Carter, D. R., & Keegan, B. (2012). The topology of collective leadership. *The Leadership Quarterly*, *23*, 994–1011.
- Contractor, N. S., Wasserman, S., & Faust, K. (2006). Testing multitheoretical, multilevel hypotheses about organizational networks: An analytic framework and empirical example. *Academy of Management Review*, *31*, 681–703. <http://dx.doi.org/10.5465/AMR.2006.21318925>
- Cook, K. S. (1982). Network structures from an exchange perspective. In P. V. Marsden & N. Lin (Eds.), *Social structure and network analysis* (pp. 177–218). Beverly Hills, CA: Sage.
- Cowley, W. H. (1928). Three distinctions in the study of leaders. *Journal of Abnormal and Social Psychology*, *23*(2), 144–157. <http://dx.doi.org/10.1037/h0073661>
- *Cross, R., Liedtka, J., & Weiss, L. (2005). A practical guide to social networks. *Harvard Business Review*, *83*, 124–132, 150.
- *Cross, R., & Prusak, L. (2002). The people who make organizations go—Or stop. *Harvard Business Review*, *80*, 104–112, 106.
- *Cummings, J. N., & Cross, R. (2003). Structural properties of work groups and their consequences for performance. *Social Networks*, *25*, 197–210. [http://dx.doi.org/10.1016/S0378-8733\(02\)00049-7](http://dx.doi.org/10.1016/S0378-8733(02)00049-7)
- *Daly, A. J., Liou, Y., Tran, N. A., Cornelissen, F., & Park, V. (2014). The rise of neurotics: Social networks, leadership, and efficacy in district reform. *Educational Administration Quarterly*, *50*, 233–278. <http://dx.doi.org/10.1177/0013161X13492795>
- **Dansereau, F., Jr., Graen, G., & Haga, W. J. (1975). A vertical dyad linkage approach to leadership within formal organizations: A longitudinal investigation of the role making process. *Organizational Behavior and Human Performance*, *13*, 46–78. [http://dx.doi.org/10.1016/0030-5073\(75\)90005-7](http://dx.doi.org/10.1016/0030-5073(75)90005-7)
- *Davis, J. P., & Eisenhardt, K. M. (2011). Rotating leadership and collaborative innovation recombination processes in symbiotic relationships. *Administrative Science Quarterly*, *56*, 159–201. <http://dx.doi.org/10.1177/0001839211428131>
- Davison, R. B., Hollenbeck, J. R., Barnes, C. M., Slesman, D. J., & Ilgen, D. R. (2012). Coordinated action in multi-team systems. *Journal of Applied Psychology*, *97*, 808–824. <http://dx.doi.org/10.1037/a0026682>
- Denis, J. L., Langley, A., & Sergi, V. (2012). Leadership in the plural. *The Academy of Management Annals*, *6*, 211–283. <http://dx.doi.org/10.1080/19416520.2012.667612>
- DeRue, D. S. (2011). Adaptive leadership theory: Leading and following as a complex adaptive process. *Research in Organizational Behavior*, *31*, 125–150. <http://dx.doi.org/10.1016/j.riob.2011.09.007>
- *DeRue, D. S., & Ashford, S. J. (2010). Who will lead and who will follow? A social process of leadership identity construction in organizations. *Academy of Management Review*, *35*, 627–647. <http://dx.doi.org/10.5465/AMR.2010.53503267>
- Dinh, J. E., Lord, R. G., Gardner, W. L., Meuser, J. D., Liden, R. C., & Hu, J. (2014). Leadership theory and research in the new millennium: Current theoretical trends and changing perspectives. *The Leadership Quarterly*, *25*, 36–62. <http://dx.doi.org/10.1016/j.leaf.2013.11.005>
- D’Innocenzo, L., Mathieu, J. E., & Kukenberger, M. R. (2014). A meta-analysis of different forms of shared leadership–team performance relations. *Journal of Management*. Advance online publication. <http://dx.doi.org/10.1177/0149206314525205>
- **Drath, W. H., McCauley, C. D., Palus, C. J., Van Velsor, E., O’Connor, P. M., & McGuire, J. B. (2008). Direction, alignment, commitment: Toward a more integrative ontology of leadership. *The Leadership Quarterly*, *19*, 635–653. <http://dx.doi.org/10.1016/j.leaf.2008.09.003>
- **Eberly, M. B., Johnson, M. D., Hernandez, M., & Avolio, B. J. (2013). An integrative process model of leadership: Examining loci, mechanisms, and event cycles. *American Psychologist*, *68*, 427–443. <http://dx.doi.org/10.1037/a0032244>
- *Emery, C. (2012). Uncovering the role of emotional abilities in leadership emergence. A longitudinal analysis of leadership networks. *Social Networks*, *34*, 429–437. <http://dx.doi.org/10.1016/j.socnet.2012.02.001>
- Erdogan, B., & Bauer, T. N. (2014). Leader–member exchange (LMX) theory: The relational approach to leadership. In D. Day (Ed.), *The Oxford handbook of leadership* (pp. 407–433). New York, NY: Oxford University Press.
- Fairhurst, G. T., & Antonakis, J. (2012). A research agenda for relational leadership. In M. Uhl-Bien & S. Ospina (Eds.), *Advancing relational leadership theory: A dialogue among perspectives* (pp. 433–459). Greenwich, CT: Information Age Publishing.
- **Fernandez, R. M. (1991). Structural bases of leadership in intraorganizational networks. *Social Psychology Quarterly*, *54*, 36–53. <http://dx.doi.org/10.2307/2786787>
- Fiedler, F. E. (1964). A contingency model of leadership effectiveness. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (pp. 149–190). New York, NY: Academic Press.
- Fiedler, F. E. (1966). The effect of leadership and cultural heterogeneity on group performance: A test of the contingency model. *Journal of Experimental Social Psychology*, *2*, 237–264. [http://dx.doi.org/10.1016/0022-1031\(66\)90082-5](http://dx.doi.org/10.1016/0022-1031(66)90082-5)
- Follet, M. P. (1925). Power. In H. C. Metcalf & L. Urwick (Eds.), *Dynamic administration: The collected papers of Mary Parker Follet* (pp. 95–116). New York, NY: Harper.
- *Foti, R. J., & Hauenstein, N. M. A. (2007). Pattern and variable approaches in leadership emergence and effectiveness. *Journal of Applied Psychology*, *92*, 347–355. <http://dx.doi.org/10.1037/0021-9010.92.2.347>
- Frank, O., & Strauss, D. (1986). Markov graphs. *Journal of the American Statistical Association*, *81*, 832–842. <http://dx.doi.org/10.1080/01621459.1986.10478342>
- French, J. R. P., & Raven, B. (1959). The bases of social power. In D. Cartwright (Ed.), *Studies in social power* (pp. 150–167). Ann Arbor: University of Michigan.
- **Friedrich, T. L., Vessey, W. B., Schuelke, M. J., Ruark, G. A., & Mumford, M. D. (2009). A framework for understanding collective leadership: The selective utilization of leader and team expertise within networks. *The Leadership Quarterly*, *20*, 933–958. <http://dx.doi.org/10.1016/j.leaf.2009.09.008>
- Gibb, C. A. (1954). Leadership. In G. Lindzey (Ed.), *Handbook of social psychology* (pp. 877–917). Reading, MA: Addison Wesley.
- *Goodwin, V. L., Bowler, W. M., & Whittington, J. L. (2009). A social network perspective on LMX relationships: Accounting for the instrumental value of leader and follower networks. *Journal of Management*, *35*, 954–980. <http://dx.doi.org/10.1177/0149206308321555>
- Graen, G. B. (1976). Role-making processes within complex organizations. In M. D. Dunnette (Ed.), *Handbook of industrial and organizational psychology* (pp. 1202–1245). Chicago, IL: Rand McNally.
- Graen, G. B. (2012). The missing link in network dynamics. In M. Rumsey (Ed.), *The many sides of leadership: A handbook* (pp. 359–375). New York, NY: Oxford University Press.
- Graen, G. B. (Ed.), (2005). *LMX leadership: Vol. 3. Global organizing designs*. Greenwich, CT: Information Age Publishing.
- Graen, G. B., Liden, R., & Hoel, W. (1982). Role of leadership in the employee withdrawal process. *Journal of Applied Psychology*, *67*, 868–872. <http://dx.doi.org/10.1037/0021-9010.67.6.868>

- Graen, G. B., & Schiemann, W. (1978). Leader-member agreement: A vertical dyad linkage approach. *Journal of Applied Psychology, 63*, 206–212. <http://dx.doi.org/10.1037/0021-9010.63.2.206>
- Graen, G. B., & Schiemann, W. A. (2013). Leadership-motivated excellence theory: An extension of LMX. *Journal of Managerial Psychology, 28*, 452–469. <http://dx.doi.org/10.1108/JMP-11-2012-0351>
- **Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. *The Leadership Quarterly, 6*, 219–247. [http://dx.doi.org/10.1016/1048-9843\(95\)90036-5](http://dx.doi.org/10.1016/1048-9843(95)90036-5)
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology, 91*, 481–510. <http://dx.doi.org/10.1086/228311>
- Gross, T., & Blasius, B. (2008). Adaptive coevolutionary networks: A review. *Journal of the Royal Society, Interface, 5*, 259–271.
- *Hackman, J. R., & Wageman, R. (2007). Asking the right questions about leadership: Discussion and conclusions. *American Psychologist, 62*, 43–47. <http://dx.doi.org/10.1037/0003-066X.62.1.43>
- Hanneman, R. A. (1988). *Computer-assisted theory building: Modeling dynamic social systems*. Thousand Oaks, CA: Sage.
- Heider, F. (1958). *The psychology of interpersonal relations*. New York, NY: Wiley. <http://dx.doi.org/10.1037/10628-000>
- Hernandez, M., Eberly, M. B., Avolio, B. J., & Johnson, M. D. (2011). The loci and mechanisms of leadership: Exploring a more comprehensive view of leadership theory. *The Leadership Quarterly, 22*, 1165–1185. <http://dx.doi.org/10.1016/j.leaqua.2011.09.009>
- Hiller, N. J., DeChurch, L. A., Murase, T., & Doty, D. (2011). Searching for outcomes of leadership: A 25-year review. *Journal of Management, 37*, 1137–1177. <http://dx.doi.org/10.1177/0149206310393520>
- Hiller, N. J., & Hambrick, D. C. (2005). Conceptualizing executive hubris: The role of (hyper-) core self-evaluations in strategic decision-making. *Strategic Management Journal, 26*, 297–319. <http://dx.doi.org/10.1002/smj.455>
- **Hogg, M. A. (2001). A social identity theory of leadership. *Personality and Social Psychology Review, 5*, 184–200. http://dx.doi.org/10.1207/S15327957PSPR0503_1
- Hogg, M. A., van Knippenberg, D., & Rast, D. E. (2012). Intergroup leadership in organizations: Leading across group and organizational boundaries. *Academy of Management Review, 37*, 232–255. <http://dx.doi.org/10.5465/amr.2010.0221>
- Hollander, E. P. (1993). Legitimacy, power, and influence: A perspective on relational features of leadership. In M. M. Chemers & R. Ayman (Eds.), *Leadership theory and research: Perspectives and directions* (pp. 29–47). San Diego, CA: Academic Press.
- **Hollander, E. P., & Julian, J. W. (1969). Contemporary trends in the analysis of leadership processes. *Psychological Bulletin, 71*, 387–397. <http://dx.doi.org/10.1037/h0027347>
- Hollander, E. P., & Willis, R. H. (1967). Some current issues in psychology of conformity and nonconformity. *Psychological Bulletin, 68*, 62–76. <http://dx.doi.org/10.1037/h0024731>
- Hollenbeck, J. R., DeRue, D. S., & Nahrgang, J. D. (2014). The opponent process theory of leadership succession. *Organizational Psychology Review*. Advance publication. <http://dx.doi.org/10.1177/2041386614530606>
- House, R. J. (1971). A path goal theory of leader effectiveness. *Administrative Science Quarterly, 16*, 321–338. <http://dx.doi.org/10.2307/2391905>
- **Howell, J. M., & Shamir, B. (2005). The role of followers in the charismatic leadership process: Relationships and their consequences. *Academy of Management Review, 30*, 96–112. <http://dx.doi.org/10.5465/AMR.2005.15281435>
- Humphrey, S. E., & Aime, F. (2014). Team microdynamics: Toward an organizing approach to teamwork. *The Academy of Management Annals, 8*, 443–503. <http://dx.doi.org/10.1080/19416520.2014.904140>
- Hunt, J. G. J., & Ropo, A. (2003). Longitudinal organizational research and the third scientific discipline. *Group & Organization Management, 28*, 315–340. <http://dx.doi.org/10.1177/1059601102250803>
- Ilggen, D. R., & Hulin, C. L. (Eds.). (2000). *Computational modeling of behavior in organizations: The third scientific discipline*. Washington: American Psychological Association. <http://dx.doi.org/10.1037/10375-000>
- Judge, T. A., Bono, J. E., Ilies, R., & Gerhardt, M. W. (2002). Personality and leadership: A qualitative and quantitative review. *Journal of Applied Psychology, 87*, 765–780.
- Judge, T. A., Piccolo, R. F., & Ilies, R. (2004). The forgotten ones? The validity of consideration and initiating structure in leadership research. *Journal of Applied Psychology, 89*, 36–51. <http://dx.doi.org/10.1037/0021-9010.89.1.36>
- Kalish, Y. (2013). Harnessing the power of social network analysis to explain organizational phenomena. In J. M. Cortina & R. S. Landis (Eds.), *Modern research methods for the study of behavior in organizations* (pp. 99–135). New York, NY: Routledge.
- Katz, D., & Kahn, R. (1978). *The social psychology of organizations*. New York, NY: Wiley.
- Katz, N., & Lazer, D. (2014). *Building effective intra-organizational networks: The role of teams (Working paper)*. Cambridge, MA: Center for Public Leadership.
- Kennedy, D. M., & McComb, S. A. (2014). When teams shift among processes: Insights from simulation and optimization. *Journal of Applied Psychology, 99*, 784–815. <http://dx.doi.org/10.1037/a0037339>
- Kenny, D. A. (1994). *Interpersonal perception: A social relations analysis*. New York, NY: Guilford Press.
- Kilduff, M., & Brass, D. J. (2010). Organizational social network research: Core ideas and key debates. *The Academy of Management Annals, 4*, 317–357. <http://dx.doi.org/10.1080/19416520.2010.494827>
- Kilduff, M., & Tsai, W. (2003). *Social networks and organizations*. Atlanta, GA: Sage.
- **Klein, K. J., & House, R. J. (1995). On fire: Charismatic leadership and levels of analysis. *The Leadership Quarterly, 6*, 183–198. [http://dx.doi.org/10.1016/1048-9843\(95\)90034-9](http://dx.doi.org/10.1016/1048-9843(95)90034-9)
- *Klein, K., Ziegert, J. C., Knight, A. P., & Xiao, Y. (2006). Dynamic delegation: Shared, hierarchical, and deindividualized leadership in extreme action teams. *Administrative Science Quarterly, 51*, 590–621.
- Kozlowski, S. W. J., & Bell, B. S. (2003). Work groups and teams in organizations. In W. C. Borman, D. R. Ilgen, & R. Klimoski (Eds.), *Handbook of psychology: Vol. 12. Industrial and organizational psychology* (pp. 333–375). New York, NY: Wiley.
- Kozlowski, S. W., & Chao, G. T. (2012). The dynamics of emergence: Cognition and cohesion in work teams. *Managerial and Decision Economics, 33*, 335–354. <http://dx.doi.org/10.1002/mde.2552>
- Kozlowski, S. W., Chao, G. T., Grand, J. A., Braun, M. T., & Kuljanin, G. (2013). Advancing multilevel research design capturing the dynamics of emergence. *Organizational research methods, 16*, 581–615. <http://dx.doi.org/10.1177/1094428113493119>
- Kozlowski, S. W. J., & Klein, K. J. (2000). A multilevel approach to theory and research in organizations: Contextual, temporal, and emergent processes. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 3–90). San Francisco, CA: Jossey-Bass.
- Krackhardt, D. (1990). Assessing the political landscape: Structure, cognition, and power in organizations. *Administrative Science Quarterly, 35*, 342–369. <http://dx.doi.org/10.2307/2393394>
- *Krackhardt, D., & Hanson, J. R. (1993). Informal networks: The company behind the chart. *Harvard Business Review, 71*, 104–111.

- *Lam, S. S., & Schaubroeck, J. (2000). A field experiment testing frontline opinion leaders as change agents. *Journal of Applied Psychology, 85*, 987–995. <http://dx.doi.org/10.1037/0021-9010.85.6.987>
- *Lau, D. C., & Liden, R. C. (2008). Antecedents of coworker trust: Leaders' blessings. *Journal of Applied Psychology, 93*, 1130–1138. <http://dx.doi.org/10.1037/0021-9010.93.5.1130>
- Lazer, D., Pentland, A., Adamic, L., Aral, S., Barabasi, A.-L., Brewer, D., . . . Van Alstyne, M. (2009, February 6). Life in the network: The coming age of computational social science. *Science, 323*, 721–723. <http://dx.doi.org/10.1126/science.1167742>
- Lewin, K. (1943). Defining the "field at a given time." *Psychological Review, 50*, 292–310. <http://dx.doi.org/10.1037/h0062738>
- Lin, N., & Dumin, M. (1986). Access to occupations through social ties. *Social Networks, 8*, 365–385. [http://dx.doi.org/10.1016/0378-8733\(86\)90003-1](http://dx.doi.org/10.1016/0378-8733(86)90003-1)
- *Livi, S., Kenny, D. A., Albright, L., & Pierro, A. (2008). A social relations analysis of leadership. *The Leadership Quarterly, 19*, 235–248. <http://dx.doi.org/10.1016/j.leaqua.2008.01.003>
- Lord, R. G., Brown, D. J., Harvey, J. L., & Hall, R. J. (2001). Contextual constraints on prototype generation and their multilevel consequences for leadership perceptions. *The Leadership Quarterly, 12*, 311–338. [http://dx.doi.org/10.1016/S1048-9843\(01\)00081-9](http://dx.doi.org/10.1016/S1048-9843(01)00081-9)
- **Lord, R. G., & Dinh, J. E. (2014). What have we learned that is critical in understanding leadership perceptions and leader-performance relations? *Industrial and Organizational Psychology: Perspectives on Science and Practice, 7*, 158–177. <http://dx.doi.org/10.1111/iops.12127>
- Lusher, D., Koskinen, J., & Robins, G. (Eds.). (2012). *Exponential random graph models for social networks: Theory, methods, and applications*. New York, NY: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511894701>
- Mathieu, J. E., Marks, M. A., & Zaccaro, S. J. (2001). Multi-team systems. In N. Anderson, D. S. Ones, H. K. Sinangil, & C. Viswesvaran (Eds.), *Handbook of industrial, work, and organizational psychology* (Vol. 2, pp. 289–313). London, England: Sage.
- Maynard, M. T., Gilson, L. L., & Mathieu, J. E. (2012). Empowerment—Fad or fab? A multilevel review of the past two decades of research. *Journal of Management, 38*, 1231–1281. <http://dx.doi.org/10.1177/0149206312438773>
- McElroy, J. C., & Shrader, C. B. (1986). Attribution theories of leadership and network analysis. *Journal of Management, 12*, 351–362. <http://dx.doi.org/10.1177/014920638601200304>
- McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology, 27*, 415–444. <http://dx.doi.org/10.1146/annurev.soc.27.1.415>
- *Mehra, A., Dixon, A. L., Brass, D. J., & Robertson, B. (2006). The social network ties of group leaders: Implications for group performance and leader reputation. *Organization Science, 17*, 64–79. <http://dx.doi.org/10.1287/orsc.1050.0158>
- Mehra, A., Marineau, J., Lopes, A. B., & Dass, T. K. (2009). The coevolution of friendship and leadership networks in small groups. In G. B. Graen & J. A. Graen (Eds.), *Predator's game-changing designs: Research-based tools* (pp. 145–162). Charlotte, NC: Information Age Publishing.
- *Mehra, A., Smith, B. R., Dixon, A. L., & Robertson, D. (2006). Distributed leadership in teams: The network of leadership perceptions and team performance. *The Leadership Quarterly, 17*, 232–245. <http://dx.doi.org/10.1016/j.leaqua.2006.02.003>
- **Meindl, J. R. (1995). The romance of leadership as a follower-centric theory: A social constructionist approach. *The Leadership Quarterly, 6*, 329–341. [http://dx.doi.org/10.1016/1048-9843\(95\)90012-8](http://dx.doi.org/10.1016/1048-9843(95)90012-8)
- Meindl, J. R., Ehrlich, S. B., & Dukerich, J. M. (1985). The romance of leadership. *Administrative Science Quarterly, 30*, 78–102. <http://dx.doi.org/10.2307/2392813>
- Monge, P. R., & Contractor, N. S. (2003). *Theories of communication networks*. New York, NY: Oxford University Press.
- Monge, P. R., & Eisenberg, E. M. (1987). Emergent communication networks. In F. M. Jablin, L. L. Putnam, K. H. Roberts, & L. W. Porter (Eds.), *Handbook of organizational communication* (pp. 304–342). Newbury Park, CA: Sage.
- Morgeson, F. P. (2005). The external leadership of self-managing teams: Intervening in the context of novel and disruptive events. *Journal of Applied Psychology, 90*, 497–508.
- Morgeson, F. P., DeRue, D. S., & Karam, E. P. (2010). Leadership in teams: A functional approach to understanding leadership structures and processes. *Journal of Management, 36*, 5–39. <http://dx.doi.org/10.1177/0149206309347376>
- Mullen, B., Johnson, C., & Salas, E. (1991). Productivity loss in brainstorming groups: A meta-analytic integration. *Basic and Applied Social Psychology, 12*, 3–23. http://dx.doi.org/10.1207/s15324834baso1201_1
- *Neubert, M. J., & Taggar, S. (2004). Pathways to informal leadership: The moderating role of gender on the relationship of individual differences and team member network centrality to informal leadership emergence. *The Leadership Quarterly, 15*, 175–194. <http://dx.doi.org/10.1016/j.leaqua.2004.02.006>
- Nicolaidis, V. C., LaPort, K. A., Chen, T. R., Tomassetti, A. J., Weis, E. J., Zaccaro, S. J., & Cortina, J. M. (2014). The shared leadership of teams: A meta-analysis of proximal, distal, and moderating relationships. *The Leadership Quarterly*. Advance online publication.
- *Oh, H., Chung, M., & Labianca, G. (2004). Group social capital can group effectiveness: The role of informal socializing ties. *Academy of Management Journal, 47*, 860–875. <http://dx.doi.org/10.2307/20159627>
- **Osborn, R. N., Hunt, J. G., & Jauch, L. R. (2002). Toward a contextual theory of leadership. *The Leadership Quarterly, 13*, 797–837. [http://dx.doi.org/10.1016/S1048-9843\(02\)00154-6](http://dx.doi.org/10.1016/S1048-9843(02)00154-6)
- *Parker, M., & Welch, E. W. (2013). Professional networks, science ability, and gender determinants of three types of leadership in academic science and engineering. *The Leadership Quarterly, 24*, 332–348. <http://dx.doi.org/10.1016/j.leaqua.2013.01.001>
- *Pastor, J. C., Meindl, J. R., & Mayo, M. C. (2002). A network effects model of charisma attributions. *Academy of Management Journal, 45*, 410–420. <http://dx.doi.org/10.2307/3069355>
- Pattison, P., & Wasserman, S. (1999). Logit models and logistic regressions for social networks: II. Multivariate relations. *British Journal of Mathematical and Statistical Psychology, 52*, 169–193. <http://dx.doi.org/10.1348/000711099159053>
- Pearce, C. L., & Conger, J. A. (2003). *Shared leadership: Reframing the hows and whys of leadership*. Thousand Oaks, CA: Sage.
- Pearce, C. L., Manz, C. C., & Sims, H. P., Jr. (2009). Where do we go from here? Is shared leadership the key to team success? *Organizational Dynamics, 38*, 234–238. <http://dx.doi.org/10.1016/j.orgdyn.2009.04.008>
- Pescosolido, A. T. (2001). Informal leaders and the development of group efficacy. *Small Group Research, 32*, 74–93.
- Pigors, P. J. W. (1935). *Leadership or domination*. Boston, MA: Houghton Mifflin.
- Podolny, J. M., & Page, K. L. (1998). Network forms of organization. *Annual Review of Sociology, 24*, 57–76. <http://dx.doi.org/10.1146/annurev.soc.24.1.57>
- Robins, G., Pattison, P., Kalish, Y., & Lusher, D. (2007). An introduction to exponential random graph (p^*) models for social networks. *Social Networks, 29*, 173–191. <http://dx.doi.org/10.1016/j.socnet.2006.08.002>
- Robins, G. L., Pattison, P. E., & Wasserman, S. (1999). Logit models and logistic regressions for social networks: III. Valued relations. *Psychometrika, 64*, 371–394. <http://dx.doi.org/10.1007/BF02294302>
- *Rodan, S., & Galunic, C. (2004). More than network structure: How knowledge heterogeneity influences managerial performance and innovativeness. *Strategic Management Journal, 25*, 541–562. <http://dx.doi.org/10.1002/smj.398>

- Rogers, E. M., & Cartano, D. G. (1962). Living research methods of measuring opinion leadership. *Public Opinion Quarterly*, 26, 435–441. <http://dx.doi.org/10.1086/267118>
- Shaw, M. E. (1964). Communication networks. *Advances in Experimental Social Psychology*, 1, 111–147. [http://dx.doi.org/10.1016/S0065-2601\(08\)60050-7](http://dx.doi.org/10.1016/S0065-2601(08)60050-7)
- Sivasubramaniam, N., Murry, W. D., Avolio, B. J., & Jung, D. I. (2002). A longitudinal model of the effects of team leadership and group potency on group performance. *Group & Organization Management*, 27, 66–96. <http://dx.doi.org/10.1177/1059601102027001005>
- *Small, E. E., & Rentsch, J. R. (2010). Shared leadership in teams: A matter of distribution. *Journal of Personnel Psychology*, 9, 203–211. <http://dx.doi.org/10.1027/1866-5888/a000017>
- Snijders, T. A. B. (2001). The statistical evaluation of social network dynamics. *Sociological Methodology*, 31, 361–395. <http://dx.doi.org/10.1111/0081-1750.00099>
- Snijders, T. A. B. (2005). Models for longitudinal network data. In P. J. Carrington, J. Scott, & S. Wasserman (Eds.), *Models and methods in social network analysis* (pp. 215–247). New York, NY: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511811395.011>
- Snijders, T., & Bosker, R. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. London, England: Sage.
- Snijders, T. A. B., Pattison, P. E., Robins, G. L., & Handcock, M. S. (2006). New specifications for exponential random graph models. *Sociological Methodology*, 36, 99–153. <http://dx.doi.org/10.1111/j.1467-9531.2006.00176.x>
- Snijders, T. A. B., van de Bunt, G. G., & Steglich, C. E. G. (2010). Introduction to actor-based models for network dynamics. *Social Networks*, 32, 44–60. <http://dx.doi.org/10.1016/j.socnet.2009.02.004>
- Sparrowe, R. T. (2014). Leadership and social networks: Initiating a different dialog. In D. Day (Ed.), *The Oxford handbook of leadership and organizations* (pp. 434–454). New York, NY: Oxford University Press.
- *Sparrowe, R. T., & Liden, R. C. (2005). Two routes to influence: Integrating leader–member exchange and social network perspectives. *Administrative Science Quarterly*, 50, 505–535.
- Stogdill, R. M. (1950). Leadership, membership and organization. *Psychological Bulletin*, 47, 1–14. <http://dx.doi.org/10.1037/h0053857>
- Sullivan, S., Lungeanu, A., DeChurch, L. A., & Contractor, N. S. (in press). Space, time, and the development of shared leadership networks in multiteam systems. *Network Science*.
- Taggar, S., Hackew, R., & Saha, S. (1999). Leadership emergence in autonomous teams: Antecedents and outcomes. *Personnel Psychology*, 52, 899–926. <http://dx.doi.org/10.1111/j.1744-6570.1999.tb00184.x>
- Tee, E. Y. J., Ashkanasy, N. M., & Paulsen, N. (2013). The influence of follower mood on leader mood and task performance: An affective, follower-centric perspective of leadership. *The Leadership Quarterly*, 24, 496–515. <http://dx.doi.org/10.1016/j.leaqua.2013.03.005>
- Terman, L. M. (1904). A preliminary study in the psychology and pedagogy of leadership. *The Journal of Genetic Psychology*, 11, 413–451.
- **Uhl-Bien, M. (2006). Relational leadership theory: Exploring the social processes of leadership and organizing. *The Leadership Quarterly*, 17, 654–676. <http://dx.doi.org/10.1016/j.leaqua.2006.10.007>
- Uhl-Bien, M., & Ospina, S. (Eds.). (2012). *Advancing relational leadership research: A dialogue among perspectives*. Charlotte, NC: Information Age Publishing.
- Uhl-Bien, M., Riggio, R. E., Lowe, K. B., & Carsten, M. K. (2014). Followership theory: A review and research agenda. *The Leadership Quarterly*, 25, 83–104. <http://dx.doi.org/10.1016/j.leaqua.2013.11.007>
- Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly*, 42, 35–67. <http://dx.doi.org/10.2307/2393808>
- Van den Bulte, C., & Joshi, Y. V. (2007). New product diffusion with influentials and imitators. *Marketing Science*, 26, 400–421. <http://dx.doi.org/10.1287/mksc.1060.0224>
- van Knippenberg, D., & Hogg, M. A. (2003). A social identity model of leadership effectiveness in organizations. *Research in Organizational Behavior*, 25, 243–295. [http://dx.doi.org/10.1016/S0191-3085\(03\)25006-1](http://dx.doi.org/10.1016/S0191-3085(03)25006-1)
- *Venkataramani, V., Green, S. G., & Schleicher, D. J. (2010). Well-connected leaders: The impact of leaders' social network ties on LMX and members' work attitudes. *Journal of Applied Psychology*, 95, 1071–1084. <http://dx.doi.org/10.1037/a0020214>
- Vidvarthi, P. R., Erdogan, B., Anand, S., Liden, R. C., & Chaudhry, A. (2014). One member, two leaders: Extending leader–member exchange theory to a dual leadership context. *Journal of Applied Psychology*, 99, 468–483. <http://dx.doi.org/10.1037/a0035466>
- Wang, D., Waldman, D. A., & Zhang, Z. (2014). A meta-analysis of shared leadership and team effectiveness. *Journal of Applied Psychology*, 99, 181–198. <http://dx.doi.org/10.1037/a0034531>
- Wang, M., Zhou, L., & Liu, S. (2014). Multilevel issues in leadership research. In D. Day (Ed.), *The oxford handbook of leadership and organizations* (pp. 146–166). New York, NY: Oxford University Press.
- Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications*. New York, NY: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511815478>
- Wasserman, S., & Robins, G. L. (2005). An introduction to random graphs, dependence graphs, and p. In P. Carrington, J. Scott, & S. Wasserman (Eds.), *Models and methods in social network analysis* (pp. 148–161). New York, NY: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511811395.008>
- Watts, D. J., & Dodds, P. S. (2007). Influentials, networks, and public opinion formation. *Journal of Consumer Research*, 34, 441–458. <http://dx.doi.org/10.1086/518527>
- Weick, K. (1979). *The social psychology of organizing*. New York, NY: McGraw-Hill.
- *White, L., Currie, G., & Lockett, A. (2014). The enactment of plural leadership in a health and social care network: The influence of institutional context. *The Leadership Quarterly*, 25, 730–745. <http://dx.doi.org/10.1016/j.leaqua.2014.04.003>
- *Willer, R. (2009). Groups reward individual sacrifice: The status solution to the collective action problem. *American Sociological Review*, 74, 23–43. <http://dx.doi.org/10.1177/000312240907400102>
- Williams, D., Contractor, N., Poole, M. S., Srivastava, J., & Cai, D. (2011). The virtual worlds exploratorium: Using large-scale data and computational techniques for communication research. *Communication Methods and Measures*, 5, 163–180. <http://dx.doi.org/10.1080/19312458.2011.568373>
- *Wolff, S. B., Pescosolido, A. T., & Druskat, V. U. (2002). Emotional intelligence as the basis of leadership emergence in self-managing teams. *The Leadership Quarterly*, 13, 505–522. [http://dx.doi.org/10.1016/S1048-9843\(02\)00141-8](http://dx.doi.org/10.1016/S1048-9843(02)00141-8)
- **Yammarino, F. (2013). Leadership past, present, and future. *Journal of Leadership & Organizational Studies*, 20, 149–155. <http://dx.doi.org/10.1177/1548051812471559>
- Yammarino, F. J., & Dansereau, F. (2008). Multi-level nature of and multi-level approaches to leadership. *The Leadership Quarterly*, 19, 135–141. <http://dx.doi.org/10.1016/j.leaqua.2008.01.001>
- Yammarino, F. J., & Dansereau, F. (2011). Multi-level issues in evolutionary theory, organization science, and leadership. *The Leadership Quarterly*, 22, 1042–1057. <http://dx.doi.org/10.1016/j.leaqua.2011.09.002>
- Yammarino, F. J., Salas, E., Serban, A., Shirreffs, K., & Shuffler, M. L. (2012). Collectivistic leadership approaches: Putting the “we” in leadership science and practice. *Industrial and Organizational Psychology*:

- Perspectives on Science and Practice*, 5, 382–402. <http://dx.doi.org/10.1111/j.1754-9434.2012.01467.x>
- Yukl, G. A. (2010). *Leadership in organizations* (7th ed.). Upper Saddle River, NJ: Pearson-Prentice Hall.
- Zaccaro, S. J. (2007). Trait-based perspectives of leadership. *American Psychologist*, 62, 6–16. <http://dx.doi.org/10.1037/0003-066X.62.1.6>
- *Zhang, Z., & Peterson, S. J. (2011). Advice networks in teams: The role of transformational leadership and members' core self-evaluations. *Journal of Applied Psychology*, 96, 1004–1017. <http://dx.doi.org/10.1037/a0023254>
- *Zhang, Z., Waldman, D. A., & Wang, Z. (2012). A multilevel investigation of leader–member exchange, informal leader emergence, and individual and team performance. *Personnel Psychology*, 65, 49–78. <http://dx.doi.org/10.1111/j.1744-6570.2011.01238.x>
- *Zhu, H., Kraut, R., & Kittur, A. (2012). Effectiveness of shared leadership in online communities. In S. Poltrock & C. Simone (Chairs), *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work* (pp. 407–416). New York, NY: Association for Computing Machinery.
- *Zhu, H., Kraut, R. E., Wang, Y. C., & Kittur, A. (2011). Identifying shared leadership in Wikipedia. In J. Landay & Y. Shi (Chairs), *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 3431–3434). New York, NY: Association for Computing Machinery.
- *Zohar, D., & Tenne-Gazit, O. (2008). Transformational leadership and group interaction as climate antecedents: A social network analysis. *Journal of Applied Psychology*, 93, 744–757. <http://dx.doi.org/10.1037/0021-9010.93.4.744>

Received December 29, 2013

Revision received December 8, 2014

Accepted December 16, 2014 ■