Psychology and Social Networks

A Dynamic Network Theory Perspective

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Research on social networks has grown exponentially in recent years. However, despite its relevance, the field of psychology has been relatively slow to explain the underlying goal pursuit and resistance processes influencing social networks in the first place. In this vein, this article aims to demonstrate how a dynamic network theory perspective explains the way in which social networks influence these processes and related outcomes, such as goal achievement, performance, learning, and emotional contagion at the interpersonal level of analysis. The theory integrates goal pursuit, motivation, and conflict conceptualizations from psychology with social network concepts from sociology and organizational science to provide a taxonomy of social network role behaviors, such as goal striving, system supporting, goal preventing, system negating, and observing. This theoretical perspective provides psychologists with new tools to map social networks (e.g., dynamic network charts), which can help inform the development of change interventions. Implications for social, industrial-organizational, and counseling psychology as well as conflict resolution are discussed, and new opportunities for research are highlighted, such as those related to dynamic network intelligence (also known as cognitive accuracy), levels of analysis, methodological/ethical issues, and the need to theoretically broaden the study of social networking and social media behavior.

Keywords: dynamic network systems, network resistance, constructive resistance, network intention model, network rippling of emotions

Social networks have received enormous attention across the social sciences since the turn of the 21st century, such as in social, organizational, and social media contexts (Borgatti, Mehra, Brass, & Labianca, 2009; Burt, Kilduff, & Tasselli, 2013). Surprisingly, however, relatively few comprehensive theoretical perspectives in psychology have attempted to explain how social networks influence goal pursuit and resistance processes. Although the field of psychology has theoretically described the power of goals and human conflict with great sophistication in the psychological domain (Austin & Vancouver, 1996; Elliot & Fryer, 2008; Vallacher, Coleman, Nowak, & Bui-Wrzosinska, 2010), it has not comprehensively examined these concepts in the broader context of social network frameworks. In contrast, the fields of sociology, organizational science, and information science have elegantly described the structural properties of social networks (Watts, 2004) but have not sufficiently described the key underlying goal striving and conflict mechanisms. The field of psychology has also lagged behind in the study of social networks and performance. For example, in the ISI Web of Science database, in the various fields of psychology, only 147 papers dealing with "social networks" and performance have been published, while within the fields of sociology, organizational science, and information science, 1,024 such papers have been published (i.e., 87.4% of the total).[1]

In response to this void and imbalance, the purpose of this article is to extend previous work on dynamic network theorizing (Westaby, 2012a; Westaby & Redding, 2014) by providing a more integrative perspective that illustrates how social networks influence goal pursuit and resistance processes and related outcomes, such as goal achievement, performance, learning, and emotional contagion. Furthermore, a potential benefit of such theorizing compared with traditional social network analysis is the focus on integrating goals into network thinking. The traditional network approach focuses more exclusively on the structural linkages themselves (or the flow of information, data, or physical material through network structures), not on how social relations are linked to specific goal pursuits. As a complementary perspective, in dynamic network theory (DNT), goals serve as the critical anchor from which we can understand how and why individuals in social networks do what they do, thereby substantively extending the network approach to the psychological and motivational domain. In addition, this approach provides a new dynamic network chart method that has not been postulated in traditional

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[1] Web of Science categories (as of October 25, 2013) for psychology: applied, social, multidisciplinary, developmental, clinical, educational, and experimental as well as general "psychology," neuroscience, and psychiatry. Web of Science categories for sociology, organizational science, and information science: management, business, computer science information systems, computer science theory method, computer science artificial intelligence, information science library science, sociology, computer science interdisciplinary applications, operations research management science, and industrial relations labor.

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network research, which infuses goals into social network contexts, where goal conflicts can also exist.

Before detailing the DNT perspective, we provide a brief overview of traditional social network analysis for those not familiar with the popular and burgeoning approach. Figure 1 presents a traditional analysis of a small social network interacting around a person named Amy in her aspiration to get a promotion; such a diagram is commonly referred to as a sociogram (Burt et al., 2013). Here, five individuals (nodes or vertices) are connected by linkages (edges or ties) to show their dyadic interactions (Newman, 2003). Not only are such charts intuitive for describing how people connect, they also allow social scientists to create numerous statistics to describe the given case under analysis (Wasserman & Faust, 1994). For example, *density* represents the number of observed linkages divided by the number of total possible linkages. In Figure 1, there are six observed linkages divided by 10 possible linkages, resulting in a density of .60. When the metric approaches 1, it illustrates that everyone is connected and potentially interdependent. When the metric approaches 0, it illustrates that no one is connected and everyone is likely independent.[2]

Level of centrality is another important metric used to describe social networks. Generally speaking, centrality describes the degree to which information flows through central entities in the network, such as through hub-and-spoke structures. For example, a leader may be at the center of information flow when team members report back their findings on a project. The implications of being in a central position involve the possibility of controlling information flow across the network, which can provide individual advantage (Burt et al., 2013). There are different types of centrality (Knoke & Yang, 2008), such as *betweenness centrality,* representing "how other actors control or medi-

ate the relations between dyads that are not directly connected" (p. 67) and *degree centrality*, representing the extent to which "a node connects to all other nodes in a social network" (p. 63). These metrics are often calculated through computer programs, such as UCINET (Borgatti et al., 2009). When the metrics describing the centrality of systems approach 1, it often suggests that information or resources are flowing through key entities in the given social network. When the metrics approach 0, it suggests that no one is more central than anyone else in the social structure. Research suggests that centrality is directly and indirectly associated with various criteria, such as power (Kameda, Ohtsubo, & Takezawa, 1997), performance (Ahuja, Galletta, & Carley, 2003; Borgatti et al., 2009), charismatic leadership (Balkundi, Kilduff, & Harrison, 2011), and perceived status in organizations (Venkataramani, Green, & Schleicher, 2010).

Beyond the standard metrics associated with network structure, social network research has identified other important ways to conceptualize the qualities of networks. For example, *structural holes* (Burt, 1980) represent "gaps in the social world across which there are no current connections, but that can be connected by savvy entrepreneurs who thereby gain control over the flow of information across the gaps" (Kilduff & Tsai, 2003, p. 28). Bridging such holes has been related to higher performance evaluations, compensation, and promotability (Burt, 2004). Granovetter (1973) has also demonstrated the power of "weak links" where individuals can draw upon their lower frequency interactions with others to provide new opportunities in their lives when needed, including linkages to other groups. Social network analyses can further show positive and negative linkages between nodes, such as general liking or preference structures (Newman, 2003; Wasserman & Faust, 1994). Although this focus is justified and important for many investigations, it may at times overestimate the overall level of positivity in a system, especially in competitive and conflicted environments. For example, Westaby and Redding (2014) demonstrated that while two people can have a positive relationship with each other, that relation could in fact be serving as a joint effort to resist other entities in the network. Thus, the linkage could be conceptualized as resistance working jointly against others instead of simply a positive relation (i.e., a negative force in a competitive system). This work illustrated how a DNT approach can complement traditional network approaches.

Overview

Despite the astonishing advances in social network research, the network literature has not provided a sufficient theoretical explanation of the motivational foundation underlying goal pursuit and resistance processes, grounded by psychological roots. In this article, we attempt to provide

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[2] As for size, Wrzus, Hanel, Wagner, and Neyer's (2013) meta-analysis found that overall social network size tends to grow through young adulthood and then decreases steadily thereafter, although family network size is stable from adolescence onward.

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such an explanation through a DNT perspective. Further, this article substantively goes beyond earlier dynamic network theorizing: It articulates how the theoretical roles were derived, expands upon theoretical predictions, addresses the importance of cognitive accuracy, and proposes new areas of research. The perspective also goes beyond classic "systems approaches" (Katz & Kahn, 1978) by carefully articulating the relationship between social networks and goals. To orient readers, we define a DNT perspective as a conceptual approach that explicitly integrates social network and psychological concepts to provide a fuller understanding of the complexities and dynamics of human goal pursuit and resistance processes and related outcomes. In the sections that follow, we first illustrate how the eight social network role behaviors in the theory are critical for explaining goal pursuit and resistance and provide a description of how the roles were developed. We then illustrate how the DNT concepts can be operationalized in dynamic network charts to analyze specific goal pursuits—an approach that has been lacking in the psychological literature. After this, we discuss how emotions can spread in networks, contingent on goal progress, and the importance of dynamic network intelligence (cognitive accuracy). Last, we highlight opportunities for future research informed by this perspective.
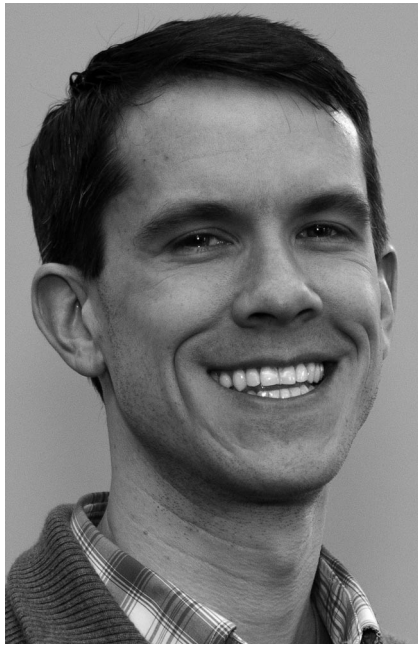
Eight Social Network Roles

In his influential work on structural hole theory, Granovetter (2005) recognized that "social structure can dominate motivation" (p. 34). We expand on this important insight by seeking to provide a taxonomy of the key social network roles, with psychological roots, that explain how social networks are involved in goal pursuit and prevention processes. Our perspective also draws on Kilduff and Brass's

(2010) important assumption that motivational aspects of agency in networks (along with cognitive awareness of network opportunities and actor characteristics) may be "necessary components of the utility of social connections" (p. 338). Figure 2 presents a visual representation of the eight social network roles proposed in the taxonomy, such as goal striving and system supporting, and the antecedents and consequences of the roles. To illustrate, a person's judgment and decision-making process is presumed to influence his or her decision to engage in different social network role behaviors, which in turn can impact goal-related outcomes, such as goal achievement. The contextual variables can also interact with the role behaviors to impact outcomes, such as salient goal progress resulting in the network rippling of positive emotions for goal strivers and their supporters. Figure 2 concepts will be discussed throughout the article. As for boundaries, our focus in this article is among individuals at the interpersonal level of analysis, in contrast to the study of higher level network relations such as those at the interunit and interorganizational levels (Brass, Galaskiewicz, Greve, & Tsai, 2004), although we discuss the importance of levels of analysis in subsequent sections.

Decision Making

Grounded in psychology, the DNT perspective starts with the assumption that implicit or explicit decision-making processes trigger the implementation of key behavioral role linkages in dynamic network systems[3] as well as the allocation of resources related to those behaviors (Kanfer et al., 1994). For example, a person may realize that he or she is having difficulty with a goal pursuit and therefore decide to ask a potential supporter for assistance during a social networking event. The importance of decision making as a key antecedent that influences such behaviors is consistent with various individual (Kahneman, 2003; Westaby, 2005) and interpersonal psychological theories (Kelley & Thibaut, 1978). Functionally, the impacts of such connections allow people to build and regulate social capital to pursue their goals and objectives (or to resist others with whom they disagree). The DNT perspective characterizes these important behavioral connections as *social network role behaviors*, which we generally define as those key activities and orientations in social networks that relate to goal pursuit and resistance processes. Uniquely, DNT posits a taxonomy of only eight social network role behaviors that explain how social networks are essentially oriented toward goal pursuit or resistance: (1) goal striving, (2) system supporting, (3) goal preventing, (4) supportive resisting, (5) system negating, (6) system reacting, (7) interacting, and (8) observing. Each is considered in turn.

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[3] Dynamic network systems are defined as the "totality of entities and social network roles directly or indirectly involved in targeted goal pursuits" (Westaby, 2012a, p. 5).

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(1) Goal Striving

A unique feature of a DNT perspective is the explicit focus on goals in the modeling of social network behavior. Thus, it is essential for the theory to account for two critical roles functionally involved in the promotion of goal pursuit processes: goal striving and system supporting. First, the *goal striving* (G) role represents entities who are directly trying to pursue a given goal, desire, or behavior of interest. This concept integrates research showing the power of goals (Austin & Vancouver, 1996; Gollwitzer, 1999), goal setting (Kanfer et al., 1994; Locke & Latham, 2002), and behavioral intentions (Westaby, Versenyi, & Hausmann, 2005) on human behavior and performance. For example, students often intend to strive toward academic goals, while employees often strive to achieve their work goals and stay committed to the organization (e.g., "I will stay at this organization"). Such striving can also include learning, innovation, and creativity goals, which are often formally implemented by employees in research and development positions. Many goal strivings will trigger subgoals (Austin & Vancouver, 1996) and other social network roles as well, such as securing support from others related to teamwork and organizational functioning.[4] This is consistent with political skill models that illustrate how goals can trigger networking and support connections (Ferris et al., 2007).

(2) System Supporting

Second, the *system supporting* (S) role represents individuals in the social network engaged in activities that support others in their goal pursuits, including instrumental, financial, empathetic, or other types of support (e.g., "likes" on Facebook or helping those in need of assistance). The system supporter concept integrates the powerful role of social support (Cohen, 2004; Rhoades & Eisenberger, 2002) in enhancing human behavior and performance. Such scholarship often assumes that supportive behavior is functional for the collective good. To illustrate, a tutor may play a key system supporter role for a student's goal of learning a new language, while an employee may perceive considerable support to stay at the company (e.g., "others support my staying here"). Hence, many of these motivational effects are secured through perception processes alone. The perception of support has been shown to motivate people, even when it is not necessarily connected to actual support levels (Bolger & Amarel, 2007). Similar disconnects between perceived versus objective indicators have been found in relation to organizational reputation and work performance (Kilduff & Krackhardt, 1994). The importance of cognitive accuracy is elaborated on in a later section.

As for goal initiation, system supporters can play an influential role in the early formulation of individual goals within networks, an idea that has not received sufficient attention in psychological theory. For example, a person may suggest a new goal for someone at a networking event, who then decides to strive for the goal with implicit support from this person.

System support is commonly seen in work settings when individuals help one another beyond their formal job duties, which integrates important conceptualizations from organizational citizenship behavior research (Bowler & Brass, 2006; LePine, Erez, & Johnson, 2002). We also conceive of advice linkages (Balkundi et al., 2011) as system supporter linkages often geared toward helping others learn in their goal pursuits. Moreover, politically skilled individuals are ones who likely attempt to secure system support for their various goals by demonstrating social astuteness, interpersonal influence, apparent sincerity, and networking ability, as theorized in Ferris and colleagues' comprehensive political skill framework, which has predicted reputation level, work attitudes, and performance ratings of managers (Ferris et al., 2005, 2007).

Social networking. We view a key function of social networking and social media activity as securing or maintaining system support linkages for personal, professional, or socialization goals, either in person, such as by going to networking or social events, or online, such as using Facebook, Twitter, Linkedin, or Google+. In line with this theorizing, Farh, Bartol, Shapiro, and Shin (2010) proposed that informational and emotional support from networking is key for expatriate adjustment, and Manago, Taylor, and Greenfield (2012) conceptualized the criticality of support functions in Facebook usage. Empirically, using

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[4] Goal striving on social media often implements multiple subgoals, such as posting new information (to presumed observers or system supporters), checking updates, and connecting with new entities. When postings may have wide appeal, other observers of a post will often activate a goal of reposting the information, and a cascading, contagion effect can occur, spreading information on a topic (or hashtag/#) throughout a mass network, such as when key tweets about the suspected bombers during the 2013 Boston Marathon quickly spread throughout the United States.

Figure 1
Traditional Social Network Analysis of Interpersonal Linkages
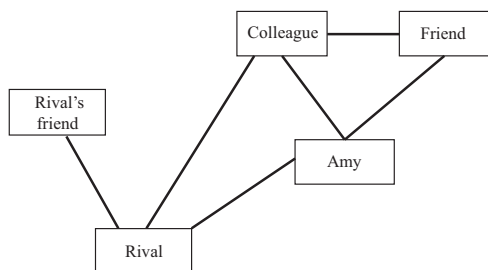
longitudinal methodology, Wolff and Moser (2009) documented the positive correlates of social networking on subjective and objective measures, such as salary and concurrent career satisfaction, especially for internal networking. They further summarized other research showing that networking positively correlated with career success, positive performance ratings, and effective job search strategizing. Research has also found networking to be related to reduced loneliness (Green, Richardson, Lago, & Schatten-Jones, 2001) and closer relationships on Facebook (Manago et al., 2012), and Ingram and Morris (2007) found, ironically, that individuals attending networking events interacted more with people they already knew.

However, despite the popularity of social networking and social media, fundamental theory has not sufficiently addressed the breadth of negative and competitive relationships that can exist in such contexts.[5] For example, on social networking and social media platforms, people may publicly post information for their potential system supporters and observers in their networks (Manago et al., 2012). However, some individuals, in response, may post hostile or insulting content about the postings. For instance, this behavior can be seen on various social media platforms, such as when people post hostile or vulgar responses to videos uploaded on YouTube. Although applied research, such as on bullying in social media, is starting to address some of these areas (see Westaby & Redding, 2014, for a review), the further grounding of such work in broader theoretical perspectives is needed. A DNT perspective provides one such alternative that can formally portray such conflict linkages, as is addressed below.

Overall effects. In general, goal striving and system supporting typically represent the functional network behaviors involved in goal pursuit and are often expected to have positive effects on goal-related outcomes at the individual level, such as increased goal achievement, performance, and learning. System supporters in highly central positions may also garner social power and influence in goal pursuits, consistent with the notion that centrality can provide advantage (Burt et al., 2013). In addition, goal strivers and system supporters with high system competency in a goal pursuit would be predicted to facil-

itate goal performance, for example, by reducing errors, promoting wise processes, and ensuring that network linkages are of optimal size and appropriate density, which could help prevent social inefficiency and process-loss (Kozlowski & Bell, 2003). System competency is also important to account for given the predictive power of the related concepts of self-efficacy (Bandura, 1982) and cognitive ability (Nisbett et al., 2012) with regard to performance. However, in contrast to these functional aspects, there are contextual moderators that may result in maladaptive outcomes. For example, consistent with the classic Motivation $\times$ Ability interaction in psychology, we would expect individuals who manifest lower levels of system competency to have lower levels of performance despite high goal striving and system supporting. Another concern is that people often overestimate their skills and abilities (Kruger & Dunning, 1999). This becomes problematic when individuals overstate their competencies to attain more desirable goal striving or system supporting roles within a system, such as in a job interview, which could result in less than ideal performance in an organization. Further, individuals who constantly, or naively, show only system support to everyone in a system may be vulnerable to exploitation in competitive or conflict domains (Olekalns & Smith, 2005). We address these domains next.

(3) Goal Preventing

Individuals engaged in *goal preventing* (P) roles are trying to prevent, thwart, or hinder target goal pursuits of others, thereby creating a competitive or conflicted social environment (Deutsch, 1973; Vallacher et al., 2010). For example, a homeowner may directly try to prevent a company president from striving to open a new store in the neighborhood by making factual arguments at a town hall meeting about potential consequences. A more vivid example is provided by individuals engaged in terrorist activities (or sabotage), who can be conceptualized as engaging in goal prevention against others in the network who are pursuing law-abiding goals. While researchers should strive to frame goals in the most relevant way possible, it is important to note that roles can be formally *transposed* in a DNT perspective; that is, terrorists can be framed as goal striving toward terror goals and police as goal preventing those pursuits. Importantly, the network members' motivations relative to one another remain the same (e.g., police and terrorists are working against each other in both frames), although psychological framing effects may occur (Higgins, 1997), such as losses or negative frames looming larger in the mind than gains or positive frames (Kahneman, 2003).

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[5] The positive focus is seen in recent definitions such as "networking is defined as behaviors that are aimed at building, maintaining, and using informal relationships that possess the (potential) benefit of facilitating work-related activities of individuals by voluntarily granting access to resources and maximizing common advantage" (Wolff & Moser, 2009, p. 197). See chapter 4 of Westaby (2012a) for a review of other social networking and media research.

Figure 2
Major Concepts in a Dynamic Network Theory Perspective
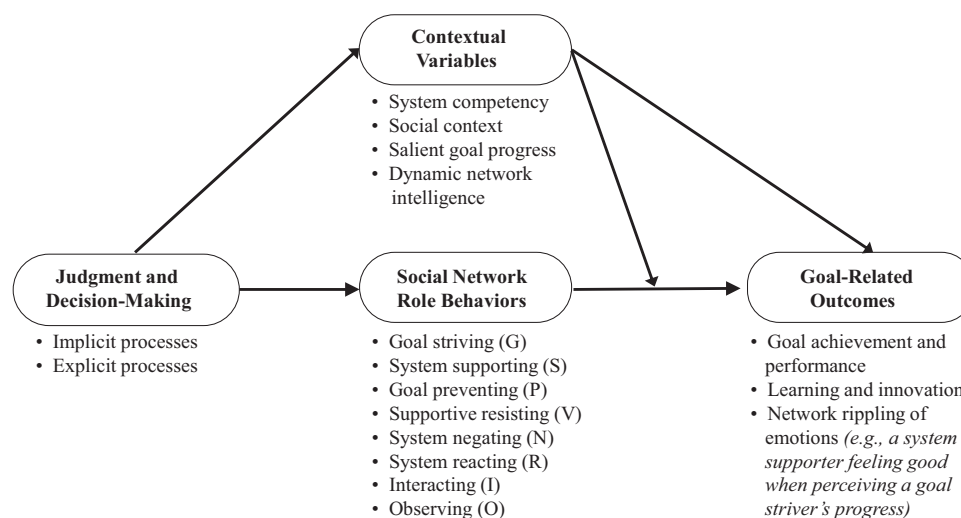
(4) Supportive Resisting

There can also be indirect efforts at resistance in social networks. Specifically, individuals engaged in *supportive resisting* (V) are supporting others in their network resistance efforts. For instance, a lawyer may provide the homeowner with professional advice about what to say at the town hall meeting when the homeowner tries to prevent the company president from opening a store in the homeowner's neighborhood. Given the potential power of centrality (Burt et al., 2013), individuals with high centrality in a supportive resistance subnetwork may also be relatively more influential in the resistance effort.

The role behaviors of goal prevention and supportive resistance help to clarify the important elements of network resistance, constraint, and hindrance processes in social networks (Kilduff & Brass, 2010; Labianca & Brass, 2006), which are often predicted to have negative effects on goal achievement and performance. This theorizing expands on traditional force-field concepts (e.g., Lewin & Cartwright, 1951) by differentiating between direct efforts (goal preventers) and indirect efforts (supportive resistors) at goal resistance within social network structures. Going beyond earlier work on DNT, we propose that *constructive resistance* is also possible. This can occur when the goal prevention and supportive resistance behaviors stop others from engaging in goals and behaviors that prevent them from attaining other more valuable goals, such as when a parent prevents a child from playing near traffic so that more important safety and well-being goals are met for the child's future.

(5) System Negating

The study of negative interpersonal relationships and prejudice is another important domain of inquiry in the psychological sciences (M. B. Brewer, 1999) that is also highly relevant to the study of interpersonal linkages in social networks. DNT uniquely accounts for such affective linkages through system negator and system reactor roles. *System negating* (N) occurs when individuals are negatively responding with affect to others who are pursuing a goal under study. For example, a bully may show intense system negation by making fun of a person engaged in an activity (in person or on social media). Theoretically, system negation can be conceptually differentiated from exclusive goal prevention and supportive resistance behaviors. To illustrate, a person may sinisterly laugh at another person's behavior but not care about changing the person's behavior (i.e., N but no P). In contrast, a manager who needs to downsize an entire department for economic reasons (and has no negative affect toward the employees themselves) represents goal prevention of the employees' current employment goals and desires without any system negation (i.e., P but no N).[6]

(6) System Reacting

In contrast, s*ystem reacting* (R) occurs when entities react negatively with affect to others who are showing network resistance or negativity toward them or toward others in their goal pursuit. To illustrate, the person who is the target of the bully's system negating, or a friend of that person, may respond with tears and expressions of stress and anxiety in reaction to the bully's verbal behavior. System negation and system reactance can also have complex

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[6] We expect N and P to be related in some contexts, such as when system negation triggers goal prevention or co-occurs with it in multiplex expressions (e.g., a person yelling with hostility while trying to change someone).

effects depending on the context. For example, system negators may rudely alert goal strivers to serious problems with their goal striving behavior, which could trigger the goal strivers' system reactance but could also result in their learning and adapting to the negative situation. This perspective integrates and extends aspects of psychological control and regulatory models (Baumeister, Schmeichel, & Vohs, 2007; Carver & Scheier, 1998; Greenberg, 2012) as well as feedback intervention theory (Kluger & DeNisi, 1996). On the other hand, some goal strivers may become so distracted by the negativity and hostilities coming from others that their performance in the system could be reduced. For example, De Dreu and Weingart (2003), in an influential meta-analysis of conflict in work teams, illustrated how some types of negativity, in the form of task and relationship conflict, are inversely associated with team performance and team member satisfaction.

(7) Interacting

The last two social network role behaviors in the DNT perspective (i.e., interacting and observing) recognize the remaining peripheral forces presumably involved in goal pursuit processes. First, individuals exclusively involved in *interacting* (I) are individuals who are encountering others involved in their goal pursuits but are not involved in intentionally helping, hurting, or even observing their process. For example, a person trying to hurriedly walk down a congested sidewalk may need to navigate around some individuals who are not attending to the flow of pedestrian traffic (i.e., the other interactants). Such interactions can impact performance inadvertently, such as by slowing a person's ability to move quickly because of the high social density. See Watts (2004) for a discussion about network congestion effects in the context of traditional social network analysis.

(8) Observing

Second, individuals exclusively engaged in *observing* (O) are individuals who are merely "observing (or aware of) the people involved in the target behavior/goal pursuit context or situation" (Westaby, 2012a, p. 5). For example, people simply watching a police officer making an arrest from a distance (or over media) are not helping, hurting, or closely interacting with the police officer's arresting goal. They simply represent observers in the context of the officer's goal pursuit (Darley & Latané, 1968). The social context can also affect how such peripheral players moderate other people's goal striving and performance. For example, observers in a social network can motivate highly experienced goal strivers through social facilitation effects in one context, but in another context they might distract other goal strivers just learning how to pursue the task by increasing their stress and anxiety (Geen, 1991).

Summarizing the Derivation of the Eight Roles

Theoretically, how were the eight roles derived? In summary, they were first derived deductively, as a logical construction, and then confirmed as essential through their use in dynamic network charts and case study analyses (Westaby, 2012a; Westaby & Redding, 2014). To illustrate the deductive progression, the first logical step was to account for those roles that are directly involved in promoting or preventing goal pursuits and desires (i.e., G and P), consistent with concepts in social psychology and human conflict (Deutsch, 1973; Elliot & Fryer, 2008). The second step was to account for those roles that are indirectly supporting the promotion or prevention of goal pursuits (i.e., S and V). However, these four roles were not sufficient to theoretically account for the complex way that negative interpersonal relations in networks can affect people's goals. For example, while some goal prevention can be professional without interpersonal hostility (P without N), other goal contexts can have goal preventers who show strong negativity or hostility toward the goal strivers in the system (P with N). Thus, it was logically necessary to include two additional roles that show how people can have negative affective links toward those promoting the goal (N) and those resisting the goal (R). Last, even though the above six role behaviors provided a detailed understanding about how positive and negative forces can describe goal pursuits in networks, they still did not sufficiently account for how inadvertent bystanders in social networks can also influence goal pursuits and outcomes, as demonstrated in seminal social psychological research (Darley & Latané, 1968). Hence, the interactant and observer roles (I and O) were necessary to flesh out the remaining peripheral roles that can influence goal pursuit and prevention processes.[7]

In the spirit of scientific parsimony, it is assumed in the theory that only eight roles are necessary to capture the essential ways in which social networks influence goal pursuits, akin to how other theories try to clearly demarcate the number of concepts necessary (and potentially sufficient) to explain important domains.[8] These eight roles were also shown to be essential when developing the dynamic network chart methodology illustrated below. Additional role constructs provided relatively little added value or were largely redundant with the eight roles.[9] Preliminary research also supports the reliability of the proposed constructs and key empirical linkages among the social network roles (Westaby, 2012b), although additional empirical work is needed. Furthermore, our perspective does not preclude researchers from challenging or extending the

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[7] Although we focused on each social network role behavior separately in the earlier sections, many individuals can implement other multiplex role combinations (Westaby, 2012a), such as a person providing system support to another while also interacting with and observing the other person in the goal pursuit (i.e., an "S-I-O" linkage).

[8] For example, Campbell and Stanley (1963) used two overarching dimensions to explain research validity (i.e., internal and external), Ajzen (1991) used three concepts as proximal determinants of intention (i.e., attitude, subjective norm, and perceived control), and various scholars have used the Big Five variables to account for personality domains.

[9] The eight roles can serve as mediators of other concepts, such as "trustworthiness" being mediated by situations in which people show us support as needed (S), engage in partner goal striving with us as needed (G), do not inordinately obstruct us (P), do not conspire against us (V), and do not show us unwelcomed prejudice (N).

taxonomy, in line with Kilduff and Brass's (2010) recommendation for further debate in the network sciences. We urge researchers when doing so to propose how any new (or modified) role set would meaningfully change the use of dynamic network charts and the portrayal of overall dynamics in case studies, as discussed next. In sum, in this section we aimed to illustrate that having a clear set of network role behaviors allows for a parsimonious explanation of social influence in human goal pursuit. Having such theoretical clarity is particularly useful in the development and use of new dynamic network charts, which we turn to next.

Dynamic Network Charts

An advantage of a DNT perspective is that the social network role behaviors can be carefully operationalized and visualized in specific case studies through dynamic network charts. The case study method using charting techniques is a vital aspect of traditional social network analysis (Wasserman & Faust, 1994). However, it has received relatively little application in the study of goal pursuit in the psychological sciences. This is largely because relevant methods, grounded in psychological theory, have not been available in the past. In response to this, a DNT perspective utilizes dynamic network charts to methodologically show how social network linkages may be involved in goal pursuits. As one approach, based on steps in previous work (Westaby, 2012a; Westaby & Redding, 2014),[10] individuals can create these charts based on their self-reported perceptions of the finite set of network entities involved in their own goal pursuits. For example, individuals have used these charts to model important goal pursuits in their lives, such as losing weight, getting a job, quitting tobacco, running a marathon, starting a business, finding internships, working on projects, and improving group and organizational systems (Westaby, 2012b). Alternatively, in applied case work that attempts to be less dependent on individual self-perceptions alone, practitioners, specialists, or teams of experts can create these charts based on a rigorous search of available information and obtainable evidence about role behaviors in a system, which can then be scrutinized for accuracy. (The importance of cognitive accuracy is further discussed below.) The information derived from these charts may help individuals, leaders, counselors, or researchers strategize interventions, such as when individuals realize that they need to seek many more system supporters or bridge more structural holes in their goal pursuits. As for regulatory mechanisms, the method may also help individuals evaluate their goal progress when multiple chart assessments are made over time and compared.

Technically, the symbols used in dynamic network charts show how the social network is involved in the given goal pursuit(s) under study. Squares represent entities, ovals represent goals, and lines represent the social network role behaviors. As a complementary approach to traditional sociograms, such as shown in Figure 1, Figure 3 il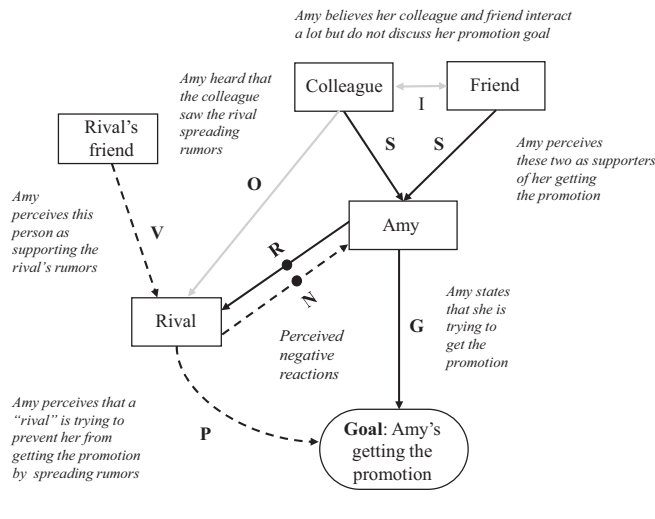lustrates a dynamic network chart examining Amy's ego-centric goal of getting a promotion. This hypothetical illustration represents Amy's perceptions of the bounded set of entities and their social network roles involved in her goal pursuit, such as derived from the steps in past research (Westaby, 2012a; Westaby & Redding, 2014). To illustrate, Amy states that she is striving to get the promotion (G path) and perceives that a friend and colleague have been supportive of her efforts (S paths), as seen in their Facebook messages and work discussions, respectively. She believes that the colleague and friend interact often in the context of her trying to get the promotion, but these two individuals are not jointly working together to help (or hurt) her in the pursuit (I path). As for the broader context, Amy indicates that her colleague had observed her rival spreading rumors about her at work (O path). Amy perceives that this rival is acting as a significant goal preventer in her efforts at getting the promotion by spreading unfair rumors (P path). She also believes that the rival has a friend significantly agreeing with the rumors (V path). Lastly, Amy perceives that the rival has been upset by her trying to get the promotion, while, reciprocally, Amy feels upset about the rival's perceived behavioral resistance (N and R paths, respectively).[11]

What are some of the benefits of this charting approach? First, the basic steps involved in the creation of such charts can result in a bounded network of perceived entities and their perceived relations around goal pursuits. Early research also provides reliability and validity evidence for the perceived social network roles in DNT (Westaby, 2012b). Future research needs to continue testing the framework and investigate how different instructions (or other survey assessments) can enhance reliability and its assessment, such as using test–retest recall designs, comparing recall data to recognition data, and comparing self-reported linkages to objective indicators of those linkages, when possible (D. D. Brewer, 2000). Second, once reliable self-reported linkages are established, researchers should find opportunities to examine the degree to which those linkages are accurate, such as by asking other people named in the network about the stated relations. For example, is Amy's belief about system support from the colleague confirmed by the colleague when asked? If so, such findings can give us more insight about individuals' abilities to recognize the social network forces involved in their goal pursuits and their dynamic network intelligence about perceived systems, as further discussed below. This orientation also applies important insights by Krackhardt (1987), who advocated collecting data from all members of a network, when feasible, to help

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[10] Researchers can use simplified worksheet versions, as needed, such as Westaby and Redding's (2014) network conflict worksheet, which can be transformed for use in more general goal pursuit analyses. Contact the first author for recent versions.

[11] While only salient linkages are shown in Figure 3, see Westaby (2012a) for modeling of multiplex linkages. A simpler "single black line" technique can also be used that places all the codes only on solid black lines.

Figure 3
Example Dynamic Network Chart of Amy's Perceived System

Note. Italicized text illustrates some of the perceived behaviors and orientations for the paths. Aspects of dynamic network intelligence (DNI) could also be assessed in the network by asking the people that Amy mentions whether they agree with her designations of them (and whether they perceive other unaccounted-for social network role behaviors in the context of her goal pursuit). G = goal striving; S = system supporting; P = goal preventing; V = supportive resisting; N = system negating; R = system reacting; I = exclusive interacting; O = exclusive observing.

determine which relations between actors are perceived to exist.

The individual-level information collected from a dynamic network chart can be further aggregated to provide descriptive characteristics of the larger system. In line with Chan's (1998) model of multilevel concepts, one could use an "additive composition model" to aggregate information according to theoretical parameters. Example results of this approach are shown on the right side of Figure 3. The *goal pursuit linkages* are interpreted as the perceived motivational forces functionally facilitating the goal; in this case, it is the amount of goal striving (1 link) plus system supporting (2 links) that Amy perceives to exist in the system (total = 3). In contrast, building from the important concept of constraint (Kilduff & Brass, 2010), *network resistance* linkages are interpreted as those links an individual perceives to be working against (or constraining) the goal pursuit. In Figure 3, this value results from Amy's perception of goal prevention (1 link) and perception of supportive resistance (1 link; total = 2). One can also examine a *network affirmation ratio* in the system, which is generally interpreted as the percentage of motivated linkages being on the side of the goal pursuit (i.e., G, S, and R links divided by G, S, and R plus P, V, and N links). This is related to how ratios are used in the counseling literature to describe interactions (Gottman, 1998) but is extended to network dynamics. In Amy's case, she perceives a system that is somewhat favoring her pursuit (.57) but not entirely, especially given the

perceived resistance and negation coming from the rival and the rival's friend. Although the linkages in a dynamic network chart appear static in nature, many of the linkages are based on dynamic psychological processes associated with goal accomplishment or failure that trigger lasting emotional connections, both good and bad, which we articulate in the next section.

Network Rippling of Emotions

Going beyond motivational orientations alone, a DNT perspective can help social scientists understand how positive and negative emotional connections form in social networks. Given emotion's conceptual breadth, many definitions of it have been presented in the psychological literature, and they often illustrate the importance of psychological and neurobiological processes as well as "phenomenal experience or feeling," as illustrated in Izard's (2010) extensive review (p. 368). Although psychologists have rigorously examined emotional reactions among individuals (Carver & Scheier, 1998; Greenberg, 2012) and groups (Barsade & Gibson, 2012), the field has attended much less to how goal progression (or failure) triggers various emotional linkages to specific entities across social networks. Thus, an especially important contribution that psychologists can make to the network literature is to help explain how emotions spread and become contagious among individuals (Fowler & Christakis, 2008). To this end, from a DNT perspective, we propose that emotional contagion,

in part, depends on goal progress feedback (or actual achievement) and role activations, which improves upon earlier formulations in DNT concerning the *network rippling of emotions* process (Westaby, 2012a). To be specific, when there are moments of perceived salient goal progress feedback (or achievement), goal strivers as well as their system supporters in the broader network are expected to generate positive emotional reactions, while entities activating exclusive interactant or observer roles will experience less network rippling of emotions. In our earlier example, Amy's goal accomplishment would be expected to result not only in her own happiness, obviously, but would spread contagiously to her supporters' happiness in the broader network, perhaps after they hear about her success through colleagues or social media. This in turn could further bolster their system support for Amy's future goals. According to DNT, such spreading could even impact individuals in outgroups, as long as they are supportive of the goal strivers (e.g., an individual may morally support a disadvantaged person's struggle against discrimination and then feel good about the person's successes even if the person is not part of the individual's ingroup). This extends Barsade and Gibson's (2012) important work on emotional contagion and affective transfer in groups by embracing a broader network perspective. Complementing their recommendations, research will need to examine how different (or more finely grained) emotions may result from various types of goal pursuit.

But there is more to emotional contagion. Negative emotions can also become contagious through the network rippling of negative emotions: Individuals implementing goal preventer and supportive resistor roles are predicted to experience a negative network rippling of emotions when they perceive feedback that rival goal strivers are progressing toward or achieving their goals. For example, Amy's rival would likely become even more upset toward Amy if he or she learned that Amy received the large promotion in the company. In more extreme cases, the rival would be expected to target his or her negative emotions, jealousies, or even hostilities toward Amy and her system supporters, which could result in the potential formation of new system negation linkages to Amy's supporters in this example. Theoretically, this approach uniquely demonstrates how goal progress feedback can generate the formation of new linkages in network structures, including those links that have elements of personal hostility.

Connecting psychological processes with network structure opens up broader possibilities for conflict resolution strategies in emotionally charged contexts. For example, Westaby and Redding (2014) discuss an array of strategies to mitigate the effects of goal conflict. To illustrate, they propose ways to transform roles in the system, such as through motivating observers to enact conflict-resolution supporter roles, which, like the role of mediators, would support both sides in terms of generating a solution (i.e., S and V roles). This would

place more social pressure on both sides to resolve the conflict. Unfortunately, some goal conflicts are based on perceived system negation and goal prevention linkages that may not be grounded in reality—highlighting the importance of cognitive accuracy in social networks, which we address next.

Dynamic Network Intelligence and Cognitive Accuracy

Psychological theory and research can be particularly helpful in delineating how individuals accurately or inaccurately perceive other people's behavior in social networks. We address this issue through the concept of *dynamic network intelligence* (DNI), which generally represents the degree to which people are accurate or inaccurate about how others in a network are involved in goal pursuit and resistance processes (Westaby, 2012a). This concept is related to important work on cognitive social structures (CSS) (Krackhardt, 1987) and the critical concept of cognitive accuracy, which Krackhardt and colleagues have defined as "the degree of similarity between an individual's perception of the structure of informal relationships in a given social context and the actual structure of those relationships" (Casciaro, Carley, & Krackhardt, 1999, p. 286).[12] To illustrate DNI, when Amy perceives that her colleague and her friend support her efforts to get a promotion at work and these two individuals truthfully acknowledge holding such support, DNI is presumed to exist for these system supporter links, and the cognitive accuracy of those social structural linkages can be confirmed. Going beyond the accuracy of interpersonal connections alone, DNI can also include how accurate individuals are in characterizing others' direct goal striving or goal preventing toward given goals, such as Amy accurately perceiving that the rival is trying to prevent her from getting a promotion.

DNI is further related to the social astuteness dimension in Ferris et al.'s (2005) political skill theorizing: "People high in social astuteness have an accurate understanding of social situations as well as the interpersonal interactions that take place in these settings" (p. 129). A DNT perspective may complement such conceptualizing by allowing researchers to concretely examine the degree to which individual perceptions map onto the actual social relations involved in their goal pursuits, aspirations, and interests.

DNI can also help theoretically explain accuracy issues associated with *network optimism* and *network pessimism* (Westaby, 2012a), which have implications for human motivation and achievement. For example, when inaccurate network pessimism exists in the system, it can lead people to not seek help, which in turn could lower

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[12] In CSS (Krackhardt, 1987), the collection of data from one individual in the network can be seen as a "slice" of the network, whereas collection of data from multiple individuals from a network can be aggregated using the locally aggregated structures (LAS) or consensus structures (CS) methods, which need application in DNT.

their capacity to achieve goals. In psychological terms, this would generate a *network-based self-fulfilling prophecy*: A person does not ask for needed help because it is not perceived to exist (but in reality it could exist); in turn, the person may not succeed and may then blame members of the social network for not helping. This is indirectly related to Flynn and Lake's (2008) research that demonstrates how people often underestimate the help that is available.

As a general proposition, we expect that individuals who have greater DNI about others' social network roles in a system may be better equipped to regulate their social environment to facilitate goal pursuit or to better cope with the reality of a situation. This idea has been partially demonstrated in the context of forming project teams and alliance building (Janicik & Larrick, 2005) and in work teams (Bashshur, Hernandez, & Gonzalez-Roma, 2011), but more research examining moderators is needed. For example, there may be situations in which individuals' accurate or realistic perceptions of system negation could actually distract them from their own goal striving. This taps into the debate about depressive realism (Ackermann & DeRubeis, 1991) and whether it is helpful or harmful in human activity and coping. Illustrating other examples of low DNI, Goel, Mason, and Watts (2010) have shown that friends are often unaware of their areas of disagreement in networks, and Fleenor, Smither, Atwater, Braddy, and Sturm (2010) noted the various contexts in which employees overestimate their positive performance ratings from others in multirater (i.e., 360°) feedback assessments. On the one hand, such processes may psychologically protect individuals from realizing that others hold system negation toward their pursuits, positions, or performance and thereby mitigate distress or distraction. On the other hand, not accurately knowing others' views may result in less than ideal decision making and problem solving when pursuing and self-regulating one's goals and dreams.

Schematic processing in which people can call on previous experiences to make inferences about future network interactions is likely an important underpinning of DNI. For example, Janicik and Larrick (2005) found that schematic processing, such as from balanced and linear-ordered schemata, was critical to learning when there was missing information about linkages in incomplete networks. Likewise, consistent with balance theories, Krackhardt and Kilduff (1999) found that people frequently perceive balance among close and distal relations. More recently, Flynn, Reagans, and Guillory (2010) found that individuals with a high need for cognitive closure were more likely to perceive more connections among their social contacts and greater racial homophily than actually existed.

Network structure can also affect perception. For example, cognitive accuracy in social networks has been associated with individuals' greater centrality (Casciaro, 1998). To extend such work to the context of goal pursuit, one could speculate that highly central system supporters, as well as the goal strivers themselves, would have greater accuracy about behavior in the network than those in peripheral roles or less central supporter roles. Krackhardt

(1990) also discussed how authority figures in organizations have greater access to information about subordinates. Hence, one may expect that they will have greater accuracy about those engaged in goal striving and system supporting toward important goals in the organization. In contrast, Casciaro et al. (1999) noted that authority figures may be more isolated and less interested in behaviors at the lower level. Thus, one may infer that subordinates are more accurate about those involved in more informal socializing goal striving and system supporting than are authority figures. Curiously, Simpson, Markovsky, and Steketee (2011) found that individuals primed with lower power were more accurate about social network relations. Given such diverse findings, research is needed to examine the domains under which leaders and authority figures have greater or less accuracy in perceiving the network relations involved in organizational goal pursuits. Research also needs to examine whether high self-monitors' ability to span structural holes and have greater centrality (Kilduff & Tsai, 2003) is related to greater DNI in their pursuits.

Last, DNI may provide another perspective on the notion of social and emotional intelligence (EI). While traditional EI frameworks often test individuals in terms of their presumed appropriate responsiveness to various social stimuli or scenarios or assess self-report behavior on different dimensions (Goleman, 1995; Mayer, Roberts, & Barsade, 2008), they do not examine how accurately (or inaccurately) people are perceiving the exact roles of others involved in their important goal pursuits in various life domains. Hence, research is needed to examine how a cognitive accuracy perspective in networks can more deeply extend our understanding of what it means to be "socially intelligent." For example, examining the relation between EI (and its subdimensions), DNI indicators, and/or social network role behaviors across social and organizational goal domains would be a fruitful line of research inquiry. The relevance of a DNT perspective to broader organizational behavior is addressed next.

Interpersonal Relations in Organizations

From a broader structural vantage point, a DNT perspective can provide new ways to examine social relations in organizations. For example, dynamic network charts can provide an alternative perspective into interpersonal relations in groups and organizations when contrasted with classic organizational charts and network diagrams (sociograms). While organizational charts show responsibility reporting mechanisms and network diagrams show the interactions in the social structure itself, dynamic network charts allow researchers to examine how the entities are functionally involved in furthering key organizational objectives. For example, in many university settings, professors are typically involved in goal striver roles (G) for research and teaching goals, while administrators and staff often serve important system supporter (S) roles for the professors' goal striving. This is also related to the important concept of "assignment networks" in Carley, Lee, and Krackhardt's (2002) framework, although dynamic network charts

explicitly include goal nodes to capture the assignment direction for each individual.

Figure 4 illustrates interpersonal linkages in a small hypothetical organization, such as derived through consensus discussion in a leadership meeting focusing on positive aspects of organizational functioning. (A positive focus may reduce potential defensiveness in meetings.) One can see that the dynamic network chart, depicting only the positive G and S focus, provides a complementary perspective to the traditional charting approaches. For example, instead of Worker 3 not serving a social purpose, as implied in the traditional social network, this worker is shown to be working on an important goal for the organization where high levels of continuous support are not necessary for his or her functioning. This conceptualizing differs from classic social capital models that imply that having greater connections in the broader constellation of relationships is often preferable (Coleman, 1988; Wolff & Moser, 2009). From a DNT perspective, it depends on the system. For example, while a politician can benefit from having countless supporters involved in his or her goal of becoming reelected, such as getting as many volunteers and supportive votes as possible, an employee who has too many people trying to help when a task is best accomplished alone could become distracted, resulting in an inefficient use of the labor force and reduced performance (i.e., overdensity of helping).[13] Further development of the social capital concept could benefit from a deeper examination and integration of goal pursuit mechanisms from the psychological literature.

Discussion

So what are the major contributions of a dynamic network theory perspective? First, its grounding in motivational principles in psychology complements traditional social network scholarship by explicitly accounting for human goal pursuit and resistance processes in social networks. However, it is imperative to remember that the traditional network analysis of structure (i.e., focusing on the links between entities only) serves another important focus (Newman, 2003; Watts, 2004), such as understanding information, energy, or resource flow through various types of network structures (e.g., roadways, airways, electronic or Web/Internet systems, communication networks, biological/natural systems, symbolic/semantic networks, and social and organizational networks). A DNT perspective is meant to provide a unique complement when researchers or practitioners are examining the ways in which social networks impact goal pursuit and aspiration, including the rich dynamics that occur in conflict settings. Second, by providing a clear taxonomy of eight social network roles, this perspective allows researchers to use dynamic network charts, surveys, and worksheets to model goal pursuits in specific cases, including social networking contexts, modeling that has been largely missing in the psychological literature. Last, this article has substantively expanded upon earlier DNT conceptualizing by accounting for many other important processes that can impact goal pursuits and related outcomes as well as by proposing new areas of research, more of which we discuss next.

Future Research and Implications

Various lines of work on cognitive accuracy need to be extended to perceptions about how social networks are involved in goal pursuit processes. First, Lewinsohn, Mischel, Chaplin, and Barton (1980) found that people often overestimate their popularity in groups. Hence, would people also have a tendency to overestimate the level of system support in their own systems compared with other network roles? Second, given the asymmetrical power of negative over positive information in memory (Taylor, 1991), are people's memories more accurate (or enduring) when they observe network resistance or system negation toward their pursuits than when they observe system support? Finally, future research should examine whether cognitive representations of small-world phenomena (e.g., perceptions of highly central hub-and-spoke linkages in networks) systematically vary by role behaviors (Kilduff, Crossland, Tsai, & Krackhardt, 2008; Newman, 2003; Watts, 2004). For example, are functional system supporter linkages more reliably and readily organized in memory by small-world structures than network resistance linkages?

Another ripe area for future research pertains to using DNT parameters for the observational analysis of social interactions in dyads and groups, which would provide a new approach over traditional methods in counseling (e.g., Gottman, 1998) and group dynamics (e.g., Bales, 1950). For example, Westaby, Woods, and Pfaff (in press) have proposed an approach that first frames an important goal of many social interactions as advancing a communication or viewpoint. In this manner, the social network roles around the goal become clear and more easily quantifiable.[14] This line of work may help further advance research in organizational psychology, because it can be used to predict emergent states in groups over time, such as the emergence of cooperative/competitive climates during social interactions. Other potential applications of DNT in this domain include applying similar analyses to online social media and network communications as well as examining different communication styles across developmental stages.[15]

Advancing a DNT perspective will also require more theory and research articulating social influence effects

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[13] The dynamic network chart also uniquely shows that the second manager's role may be marginal in that he or she receives support from the executive but is not working on key organizational goals nor supporting any other workers.

[14] For example, a single unit of goal striving behavior could be operationalized as occurring each time a person articulates a discrete phrase that advances the communication (without antagonism or questioning), while a unit of system support behavior could be viewed as manifesting each time the other person shows supportive verbal phrases or nonverbal behaviors in response, such as a stated agreement (e.g., "I agree") or an affirmative head nod, respectively. As another simple example, a goal prevention behavioral unit could be counted for each phrase of disagreement (or disagreeing head turn).

[15] Integrating techniques on word/phrase count methods (Pennebaker, Mehl, & Niederhoffer, 2003), researchers could use assumptions in DNT to analyze behavior on social media platforms or communication databases (e.g., words such as "agree," "support," and "like" often representing system supporter functions).

Figure 4
Chart Comparisons
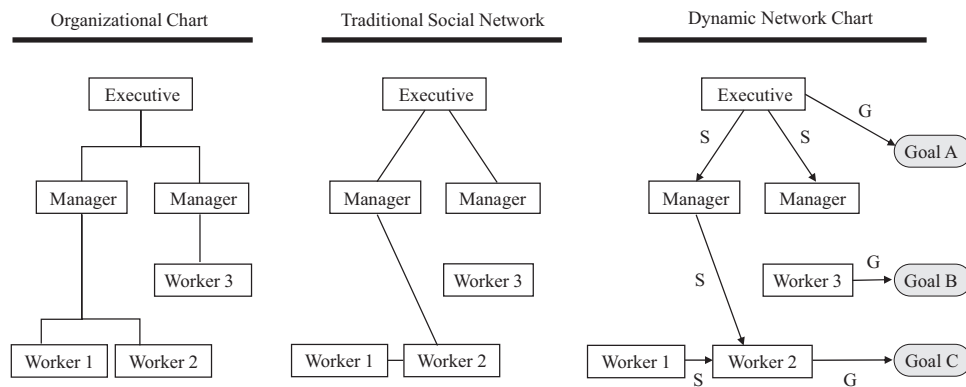
Note. G = goal striving; S = system supporting.

across levels of analysis, drawing on developments in multilevel theory (Kozlowski & Bell, 2003). For example, we propose that higher level variables in groups and organizations can downwardly influence individual-level social network role behaviors. To illustrate, one could predict that perceived higher level hostile group climates would increase the likelihood that the individuals embedded in those groups will manifest significant variation in interpersonal goal prevention and system negation behavior. However, Mathieu and Chen (2011) noted that "at present, most organizational researchers have been more interested in downward (contextual) cross-level processes and influences and less about upward (emergent) cross-level processes and influences" (p. 616), but they emphasized the need for theory and research to address the emergent side. In response, we assume that social network role behaviors could have strong upward cross-level effects on higher level emergent states. For example, in a newly formed social networking group, one may find that a shared emergent state of cohesion occurs as individuals competently contribute to shared goal striving and system supporting efforts while not showing inordinate goal prevention or system negation in their efforts. Original dynamic network theorizing did not sufficiently address the potential for both downward and upward multilevel effects. Case studies are also needed to examine the opportunities and complexities related to mapping higher level systems, such as interorganizational and international systems.

Research needs to extend our understanding of compositional measures in dynamic network systems as well, especially as they relate to understanding agreement in the context of DNI assessments. For example, to refer back to Figure 3, each person mentioned in the chart could be asked whether they agree with Amy's designations in the system, and a rudimentary composite DNI score could be formed concerning Amy's stated perceptions. A similar approach could be applied to the main goals in a group or team, perhaps using dynamic network surveys or worksheets, which are relatively easier to administer. For instance, each team member would first report their perceptions of which individuals play major roles in the social network in relation to the primary goals of the group. Then, each team member would rate his or her agreement or disagreement with each other team member's role designations. When team members largely agree with one another's designations, a strong DNI climate would be presumed to exist. When team members do not confirm each other's role designations, a weak DNI climate would exist. Research could then examine the consequences of such DNI climates on important criteria. Interestingly, a strong DNI climate could confirm either positive or negative social environments (e.g., agreement that considerable system support or system negation exists, respectively).[16]

Further, past work on DNT has not succinctly articulated how perceptions about key social network roles can impact individual choices and intentions. To address this, we recommend that researchers start exploring a new class of *network intention models* that integrate network-oriented concepts with behavioral intention theories, such as the theory of planned behavior (Ajzen, 1991) and behavioral reasoning theory (Westaby, 2005), both of which have received empirical support (Westaby, 2005; Westaby, Probst, & Lee, 2010). Even though these theories have utilized social concepts, such

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[16] Research needs to examine how perceptions about group social influence map onto agreement indicators. Although Westaby (2012a) made assumptions about how people use entity-abstraction processes to describe higher level social influence (e.g., "*My family* supports my going to college"), research needs to assess the degree to which such abstractions map onto shared reality in the groups (e.g., Do all family members agree that they hold system support for the person as implied in the phrase "my family"?).

as subjective norm, they have lacked other network concepts, such as perceived system support, system negation, and standard network metrics.[17]

Methodological issues also need attention. First, more research needs to examine the reliability, validity, and accuracy of self-reported linkages in dynamic network charts (and surveys), including an examination of the effects of building such charts individually versus through group dialogue and consensus. However, a challenge with dynamic network charting, as with traditional network diagrams, is that considerably more data are required as researchers assess perceptions across larger systems. For example, research could assess the presence of the various entities and major goals in the network, their potential social network role linkages, and the accuracy of network members' perceptions, such as by comparing each person's responses to those of other network members or to objective indicators (D. D. Brewer, 2000). Likewise, researchers should be as clear as possible when making assumptions about allegedly objective indicators of social network role behaviors.[18] On the technological side, work is needed to automate the creation and visualization of dynamic network charts and their metrics using computer or web-based programs. For example, by responding to questions via survey methods (such as through underlying adjacency matrices), computer programs could generate visual representations and simulations that display dynamical changes over time. In contrast, using a simpler worksheet alternative, Westaby and Redding (2014) illustrated how researchers or practitioners can categorize entities in a given network according to their major motivational orientations, which may provide practical information for conflict resolution workshops or interventions (e.g., quickly identifying the parties directly, indirectly, or peripherally involved in the various sides of a conflict). However, future research is needed to evaluate the pros and cons of such simplified approaches, depending on the context, and their utility in applied versus scientific examinations.

Additionally, more research needs to examine network interventions (McGrath & Krackhardt, 2003), especially those using controlled randomized trials.[19] Such work could also examine the mechanisms under which "network therapy" (Speck, 1998) is effective in helping people cope with serious problems. However, challenges for such research are the complexities associated with implementing larger scale interventions and acquiring informed consent from individuals occupying relevant roles in the larger network.

Neuroscience offers another potential area of research for DNT. For example, there have been ample findings that brain activation differs in response to various social stimuli (Lieberman, 2007). Future research should examine how different aspects of such stimuli, as expressed in social network role behaviors, influence the activation of cortical and subcortical regions of the brain, among other processes. For instance, in a functional magnetic resonance imaging study, researchers could expose participants to scenes that display various social network role behaviors (e.g., scenes of system support versus system negation) or other combinations and changes over time. They could then assess corresponding brain activation to determine potential neurobiological mechanisms underlying the perception of these behaviors.

Last, there are critical ethical considerations. For example, network researchers need to safely protect the identities of individuals in reports and presentations, especially through the use of proper informed consent. Unfortunately, some researchers and practitioners may rush to present their visually interesting network diagrams without thinking through the implications. For instance, even when names are not shown in allegedly confidential diagrams, savvy readers may be able to detect the identities of the participants, especially with individuals who are known to be isolates in an organization or who are at the center of activities (i.e., having high centrality). In such cases, researchers could alternatively report and interpret broader statistical findings about the network case, such as reporting density, centrality, and network affirmation indicators, or use network linkage information privately to structure interventions, such as having a trained manager, consultant, counselor, or coach use linkage results to discretely provide coaching to an individual who is perceived to be a system negator and goal preventer by many coworkers.

In closing, psychology has been at the forefront of explaining motivation, goal pursuit processes, behavioral prediction, and human emotion processes, among many other concepts, but the field has missed numerous opportunities to apply this conceptual breadth to the exponentially growing fields of social network analysis, social networking, and social media activity. In this article we have presented a dynamic network theory perspective in an attempt to bridge this gap and have illustrated a host of new research opportunities that need rigorous psychological attention.

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[17] Various propositions could be explored: (a) Intentions, a proxy for goal striving, would be expected to predict objective behavior, and the global motives of attitude, subjective norm, and perceived control would predict intention; (b) reasons would predict global motives; and (c) network perceptions would predict reasons (e.g., system support predicting "reasons for" and system negation and goal prevention predicting "reasons against").

[18] For instance, in predicting objective sales, each salesperson's clocked working hours could represent goal striving, and each salesperson's number of past positive customer satisfaction evaluations could represent system support.

[19] One could hypothesize that interventions building functional role linkages (and minimizing dysfunctional ones) will have a larger impact on change than will focusing on individually directed psychological strategies alone.

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