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THE SOCIAL SIDE OF CREATIVITY: A STATIC AND DYNAMIC SOCIAL NETWORK PERSPECTIVE

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We explore the association between the context of social relationships and individual creativity. We go beyond a one-dimensional treatment of social relationships, highlighting the importance of both static and dynamic social network concepts. We argue that weaker ties are generally but not always beneficial for creativity, propose the network positions that facilitate and constrain creative work, and describe three moderators. A spiraling model is presented, capturing the cyclical relationship between creativity and network position. Collectively, our propositions describe an individual's creative life cycle in terms of network position.

As firms struggle to establish or maintain prosperity in turbulent and competitive environments, innovation and creativity become increasingly important (DeVanna & Tichy, 1990; Van Gundy, 1987). Not only can creative contributions be valuable to a firm, but the ability to come up with unique yet appropriate ideas and solutions can be an important advantage for individuals as well. Particularly for the professional worker who uses unseen and unobservable inputs like intellect, the ability to incorporate unique and effective twists should help him or her stand out from the crowd. Consistent with its practical relevance, there has been a burgeoning interest among management scholars in understanding what factors influence individual creative contributions. Initial creativity research focused primarily on creativity as an individual trait (see Barron & Harrington, 1981, for a review), but more recent perspectives on creativity tend to focus on how contextual factors can affect an individual's creative activity. Some of these factors are the more objective type, such as the receipt of rewards (Eisenberger & Armeli, 1997), the evaluative context (Shalley

& Perry-Smith, 2001), and the complexity of jobs (Oldham & Cummings, 1996); however, in several cases these factors have a decidedly social dimension.

It has been proposed that creativity is, in part, a social process. In two prominent creativity models (Amabile, 1988; Woodman, Sawyer, & Griffin, 1993), researchers propose that factors in the work environment, such as supervisory support and social influences resulting from group interaction, are important antecedents to creativity. This more social view of creativity is supported by a limited but growing collection of empirical evidence. For example, several researchers found that creative accolades tend to be bestowed on those who study under highly creative types or who have been exposed to creative role models (Simonton, 1975, 1984; Zuckerman, 1977). However, if creativity is truly a social process, then focusing more explicitly on the decidedly social side of creativity should enhance our understanding of what it takes to be creative in the highly interactive work environments of which most workers are a part. As Simonton asserts, "A successful 'social psychology of creativity' demands that the creative individual be placed within a network of interpersonal relationships" (1984: 1273).

Social networks have been used to explain and understand a variety of organizational behavior phenomena, such as commitment and satisfaction (Krackhardt & Porter, 1985), job-

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related rewards (Bian, 1997; Burt, 1992, 1997; Granovetter, 1974), influence and power (Brass, 1984), and conflict (Labianca, Brass, & Gray, 1998; Nelson, 1989). However, in social network studies researchers tend to view networks as static and do not often consider networks as changing over time (Marsden, 1990). With regard to creativity, social networks have been widely unexplored, with one intriguing exception. In an essay/commentary Brass (1995) introduced the idea that social networks, particularly weaker relationships, may have some influence on creativity; however, a comprehensive conceptualization was beyond the scope of this piece. Social relationships in general have been addressed in theoretical models and empirical studies of creativity, but at a very minimal level—in the form of interactions with diverse others and increased communication (e.g., Kanter, 1988; Woodman et al., 1993).

Unfortunately, there are many unanswered questions about how patterns of relationships, or social networks, affect creativity at work. For instance, we know little that addresses the reality that relationships are not homogeneous; rather, their content, intensity, and depth vary. Are certain types of relationships helpful for individuals to be creative at work? And which ones are harmful? In addition, direct relationships are only one piece of the social environment. These relationships are embedded in a context of social relationships. How do indirect relationships and the pattern of relationships in which an individual is embedded influence creativity at work? And how does one's position in the social environment influence an individual's level of creativity in a work situation? Furthermore, the connection between social relationships and creativity may be more complex than the one-way, direct, static relationship implied in previous work. For example, is there an interplay between relationships and creativity, where the two build off of one another? And are there contextual factors that alter or exaggerate the interplay between the social environment and creativity? Finally, social relationships may not always facilitate creativity. When are relationships or network position constraining?

We address these questions and extend what has been, until now, peripheral attention to social relationships in the creativity literature. Our purpose is to explore, using social network theories, the influence of patterns of relation-

ships on an individual's creativity. In doing so we focus attention on the social side of creativity from a macroperspective.

Taken together, our propositions can be summarized as describing an individual's journey from the fringe of the network to the center. We argue that weak ties are better than strong ties for creativity and that a peripheral position with many connections outside of the network is likely to be associated with more creative insights and potentially groundbreaking advancements. We suggest that once this high level of creativity has been achieved, the peripheral individual will find himself or herself becoming relatively more central in position. The exposure to diverse people and information brought about by this centrality will spark new ideas and aid in the generation of additional creative insights. We propose that these insights will maintain and enhance the actor's centrality, and this reciprocal, spiraling process of increasing centrality and increasing creativity will continue. Eventually, the person will become so central in the network that he or she will become too entrenched or immersed, ultimately constraining creativity.

To anchor our social network ideas, we begin with an overview of creativity.

CREATIVITY DEFINED

Individuals can be creative in their jobs by generating new ways to perform their work, by coming up with novel procedures or innovative ideas, and by reconfiguring known approaches into new alternatives. Thus, creativity does not have to exist only on specific types of projects; it can occur while an individual performs in various work situations. We define creativity at work—an individual-level construct—as an approach to work that leads to the generation of novel and appropriate ideas, processes, or solutions (Amabile, 1996; Ford, 1996; Shalley, 1991). This definition can involve creative business strategies, creative solutions to business problems, or creative changes to job processes. In order to be considered creative, however, these outputs must have some level of uniqueness compared to other ideas, yet not be so bizarre that adoption or implementation is not feasible. Within the work context, the concepts of novelty and appropriateness are important in a variety of jobs or professions. However, the feature of

novelty or uniqueness in the creativity conceptualization is based on relatively broad reference boundaries and is determined within the bounds of social, cultural, and historical precedents of the field (Amabile, 1996).

Moreover, the concept of creativity is continuous (Amabile, 1996; Shalley, 1995), with a focus on the relative level of creativity of any output, rather than whether an output is purely creative or not. For example, a minor adaptation of existing ideas so that they are reconfigured to a new application is creative, but at a relatively low level. Alternatively, a major breakthrough that represents a new, radical idea can be considered highly creative. These examples represent both ends of the same spectrum. For instance, Mumford and Gustafson (1988) discuss the differences between major and minor contributions. Major contributions are more groundbreaking advancements that really alter the way problems are approached or solved and, thus, reflect new ideas that have a greater applicability within the field. Minor contributions reflect adjustments, recombinations, or extensions of existing principles within the field and result from the discovery or application of less divergent ideas. Therefore, when we refer to creativity at work, we are referring to the full spectrum, with some work relatively more creative than other work. Furthermore, we are not only dealing with one of the two extreme ends of the spectrum; rather, we are concerned with all levels of creativity within the spectrum.

CREATIVITY AND THE SOCIAL CONTEXT

Several contextual factors have been linked to creativity. For example, nonconstraining reward systems, collaborative and supportive leadership styles, and ample resources have been proposed to be positively associated with individual creativity (Amabile, Conti, Coon, Lazenby, & Herron, 1996; Glynn, 1996; Tierney, Farmer, & Graen, 1999; Woodman et al., 1993). In addition, work environments with norms that promote risk taking, autonomy, and external competition are expected to facilitate creativity (Amabile, 1983; Shalley, Gilson, & Blum, 2000; Woodman et al., 1993). Although these are relevant features that influence how individuals work, and can have a social dimension, two important social factors—interpersonal communication and interpersonal

interaction—are directly relevant to a social network perspective.

Several theorists propose that the communication of ideas and information should enhance creativity (Amabile, 1988, 1996; Kanter, 1988; Woodman et al., 1993). Although not directly stated, the process through which this occurs can be linked to both domain-relevant knowledge and creativity-relevant skills. Domain-relevant knowledge is an individual's knowledge of facts, circumstances, and issues surrounding a given problem or area (Amabile, 1996). It involves technical expertise and experience necessary to be able to come up with feasible solutions to a given problem. Enhancements to domain-relevant knowledge should influence the incidence of creative performance (Campbell, 1960; Mumford & Gustafson, 1988; Simonton, 1999) by increasing the ability to generate and validate potential solutions so as to determine their appropriateness. This is supported by the finding that product managers with more knowledge of the marketing environment produced more creative marketing programs (Andrews & Smith, 1996). Communication with others in the domain should enhance one's understanding of the area and facilitate the generation of approaches that are feasible and appropriate, but also unique.

Creativity-relevant skills refer to the ability to think creatively (e.g., to generate alternatives, think outside the box, suspend judgment). These skills can include any problem-solving approach that helps one come up with different alternatives. This primarily influences the generation of novel responses and describes when an individual "searches memory and the immediate environment to generate response possibilities" (Amabile, 1996: 94). Individuals who have access to a variety of alternatives, example solutions, or any potentially relevant ideas are more likely to make connections that could lead to creativity (Amabile et al., 1996). Exposure to different alternatives also might "trigger" the process of using wider categorizations and generating more divergent solutions (Kanter, 1988). Some individuals may have innately high levels of creativity-relevant skills, but this dimension of the creative process can also be altered by external factors, such as teaching and training (Basadur, Graen, & Green, 1982; Basadur, Wakabayashi, & Graen, 1990), or by merely giving

instructions or goals to be creative (Shalley, 1991, 1995).

Similar to interpersonal communication, contact with diverse associates within or external to the firm is expected to enhance important creativity-relevant skills. The type of diversity particularly relevant to creativity includes differences in terms of background, areas of specialization, and work responsibilities (Amabile et al., 1996; Andrews, 1979; Payne, 1990; Woodman et al., 1993). An individual working within diverse contexts more likely will be exposed to different and unusual ideas. If an individual has contact with a diverse group of people, the likelihood that he or she has knowledge or can obtain knowledge of different approaches to a given problem is increased. As Kanter states, "Contact with those who see the world differently is a logical prerequisite to seeing it differently ourselves" (1988: 175).

The relevance of interacting with diverse associates and communicating ideas is supported in a variety of studies. Several researchers have found that team diversity is related to higher creative performance (Andrews, 1979; Payne, 1990; Visart, 1979). In addition, Kimberly and Evanisko (1981) found that contact with professionals outside the organization was related to the increased adoption of innovations. Similarly, Andrews and Smith (1996) found that interactions with other functional areas enhanced the creativity of marketing campaigns, and Kasperson (1978) found that scientists with access to different scientific disciplines were rated as making a more creative contribution to their field. With regard to communication, Monge, Cozzens, and Contractor (1992) found that group communication was positively related to the generation of innovative ideas. And in a study of R&D teams, internal and external group communication was positively related to performance, as evidenced by such work outputs as patents and published reports that required some level of creativity (Payne, 1990; Visart, 1979).

Interaction with diverse associates and increased communication with others are both nice starts to understanding how more social behaviors affect creativity and an important foundation for a social perspective; however, there is more to understanding the ramifications of social interactions. For instance, we argue that the value of communication and interaction depends on the kind of exposure and informa-

tion communicated, which depends on the strength of the relationship and the network position of the individuals involved. As we alluded to in the introduction, we build on these ideas and go beyond them by incorporating a variety of social network concepts. In the sections that follow we deal with the more traditional way of looking at networks by discussing networks at one point in time—static network concepts. Specifically, we focus on the relationship between tie strength and position in the network with creativity. Our tie strength arguments refer to comparisons across individuals within a network. For position in the network, we conceptualize about what position may be more desirable for creativity to occur, both with regard to inside the network and across network boundaries. We then take a less traditional approach by discussing dynamic network processes. We propose a spiraling model that describes a more fluid situation, where one's position in the network and strength of ties can change over time.

NETWORK TIES

Social relationships, or network ties, can be described in a number of ways; however, central and basic to social network theories is the concept of tie strength (Granovetter, 1973). This concept can be easily understood by thinking of a continuum that has weak relationships at one end and strong relationships at the other. Movement along this continuum is a function of the amount of interaction, emotional intensity, and reciprocity that takes place between two individuals (Granovetter, 1973). The strongest relationships, therefore, are those that have the highest levels of each of the components, such as when the two parties truly like each other and are concerned about one another, see each other relatively frequently, and have similar perspectives and outlooks on the importance of their relationship. Weaker relationships are not necessarily reciprocal and involve less frequent interactions. In the work context these relationships may only involve discussions about work, with little affect or social exchange.

Thus, we define weak ties, on the one hand, as direct relationships between two actors at the low end of the tie strength continuum that involve relatively infrequent interactions, comparatively low emotional closeness, and one-way exchanges. We define strong ties, on the other

hand, as direct relationships that involve relatively frequent interactions, high emotional closeness, and reciprocity. On the face of it, one can envision how strong relationships may be beneficial, such as by providing social support (Ibarra, 1992; Krackhardt, 1992). The benefits of weak ties, in contrast, are less obvious and are largely related to their structural properties.

According to Granovetter's (1973) seminal and counterintuitive "strength of weak ties" perspective, weak ties are more likely to be nonredundant connections between dense social circles. This type of connection, also known as a structural bridge, is a unique direct network tie between two social circles, where no other direct or indirect ties connect the two groups (Granovetter, 1973, 1982). A simple example of a structural bridge is when person A is connected to person B but is not directly connected to any of the people in person B's network. This is represented in Figure 1a; the connection between actor A and actor B is a structural bridge.

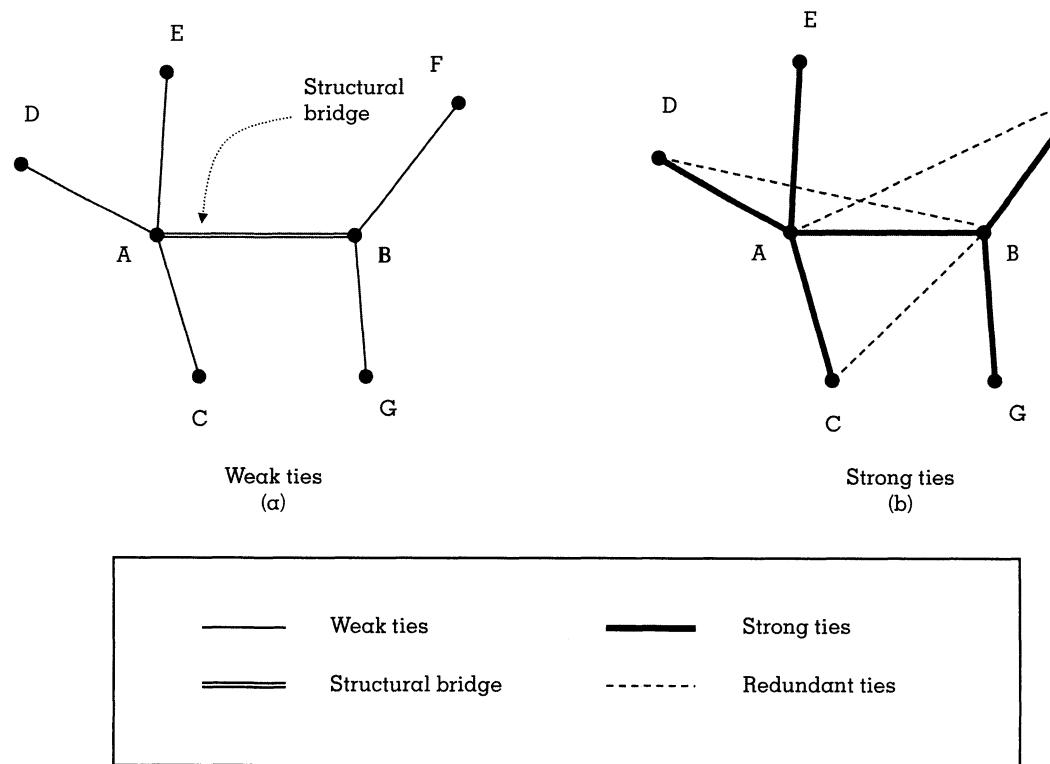
Stronger ties, however, are less likely to fulfill the structural role of a bridge, because two individuals connected with a strong relationship

will come to know the individuals in each other's network (Granovetter, 1973). Figure 1b provides a simplified example of this. If the connection between A and B is a strong tie, additional connections will form between A and B and the other actors, and, as a result, the connection between A and B will no longer be a structural bridge. This arises because of the frequency of interaction and the tendency for similarity between strongly tied actors; actor A's strongly tied connections likely will be similar to one another and likely will spend time together while interacting with A. As a result, the two are more likely to form a relationship upon interacting. When this occurs, alternate redundant connections are formed.

The structural distinctions between strong and weak ties have been supported by Friedkin (1980), who found that all local bridges were weak ties, that ties across groups tended to be weak ties, and that two actors connected to the same individual via strong ties were more likely to be connected to one another.

As a result of their structural properties, weaker ties are more likely to connect individu-

FIGURE 1
Example of a Structural Bridge



als to different social circles, compared to stronger ties (Granovetter, 1973). Strong ties more typically exist between people who share similarities (Ibarra, 1992; Lincoln & Miller, 1979). Unlike stronger ties, weaker ties involve lower levels of affect and interaction, which are less contingent on similarity between actors. As a result, actors connected by weak ties are more likely to be different because they are not immersed in the same interconnected web of relationships, shaped, to some extent, by similarities (Ibarra, 1992; Lincoln & Miller, 1979). Therefore, weaker ties are more likely to connect people with diverse perspectives, different outlooks, varying interests, and diverse approaches to problems (Coser, 1975; Granovetter, 1982). Researchers have objectively captured and observed these differences in terms of status, levels in the organizational hierarchy, and demographics (Ibarra, 1992; Lin, Ensel, & Vaughn, 1981; Lincoln & Miller, 1979).

Weaker connections also provide access to a wider array of people and more nonredundant information (Burt, 1997; Granovetter, 1973, 1982; Ibarra & Andrews, 1993). This is demonstrated by the argument that the best way to spread a rumor to many people is through weak ties (Granovetter, 1973). Information flowing in a strongly tied network tends to be redundant and travel circular paths, such that an actor will tend to receive the same information from different individuals. The rumor traversing a weaker connection that is a structural bridge, however, will reach different groups of people; instead of circulating back to the initiator, the rumor will reach more and more people who are farther removed from the initiator. It follows that, from the receiver's perspective, information traveling across a weak connection is more likely to be diverse relative to what he or she is already aware of, because it emanates from people outside the individual's immediate social circle. As Granovetter states, people with weak ties are "less confined to the provincial news and views of their close friends" (1982: 106).

Although individuals may feel more comfortable sharing information that requires trust and candor across stronger relationships, the type of exposure and work-related information relevant to creativity does not necessarily require a stronger tie and can be effectively exchanged across weaker ties. General information about work or projects may be enough to help spark

new ideas, broaden response possibilities, and increase the recognition of diverse connections. An individual may feel less sensitive about sharing this level of information with more weakly tied associates, since any negative consequences for sharing general information may be less apparent. For instance, Shah (1998) found that individuals tended to freely share job-related information with weaker contacts. Boudy (2000) argues that information exchanged between R&D scientists for instrumental purposes does not require the trust associated with other types of exchanges. For more complex and proprietary information, however, the trust and affect associated with stronger connections become more critical (Hansen, 1999). We also assume here that uncertainty and insecurity are relatively low, because in uncertain contexts people are generally more likely to rely on stronger ties (Granovetter, 1982; Shah, 1998).

The access to more nonredundant information and diverse social circles provided by weak ties should facilitate a variety of processes helpful for creativity. First, the access to more information should enhance the type of knowledge relevant to creativity- or domain-relevant knowledge (Csikszentmihalyi, 1996; Glynn, 1996; Simonton, 1999). Given a problem or task, the individual with more weak ties can validate potential responses against implemented solutions used by others in his or her network as a result of the efficient access to a wider breadth of knowledge.

Second, the exposure to different approaches and perspectives should enhance important creativity-relevant skills, such as the ability to generate different alternatives and facilitate flexible thinking (Coser, 1975; Granovetter, 1982). Exposure to a new process of working or a new approach to a problem may serve as a seed that causes one to pursue previously unexplored directions or may be a spark that propels one to integrate new ideas in such a way that novel and innovative solutions are formed. In addition, when an individual has connections with people who have different perceptions, expectations, or interests, he or she cannot easily, without reflection, make choices or come to decisions that are consistent with his or her contacts. In this case the individual is forced to think in broader terms and must combine these differing approaches in a unique way.

Finally, weak ties facilitate autonomy, because the actor is less likely to strongly identify with one group and is more likely to define himself or herself apart from the diverse connections (Coser, 1975). The assumption is that the relationships are sufficiently weak to avoid automatic conformity with one group. This type of autonomous thinking should facilitate creativity (Woodman et al., 1993).

Whereas we expect weaker connections to facilitate creativity, we expect stronger ties to constrain it. Unlike networks of weak ties, strongly tied networks tend to be dense networks of similar individuals, where most of the actors have some type of connection to one another (Granovetter, 1973). As a result, information and perspectives can circulate quickly and are likely to be redundant. Ultimately, "contagion by cohesion" results, which involves shared attitudes, opinions, and beliefs that form among strongly connected groups (Burt, 1991). This suggests that social influence pressures leading to conformity tend to characterize stronger ties (Granovetter, 1973; Ibarra, 1992; Krackhardt, 1992), and conformity is generally considered to hinder creativity (Amabile, 1996; Cashdan & Welsch, 1966). The conformity associated with strong ties leaves little room for autonomy and little chance for helpful information to surface from other cliques (Hansen, 1999). Furthermore, the time required to reciprocate advice from stronger ties may detract from creative pursuits, and the ease and comfort level associated with the stronger relationship will foster repeat contact and limit the need to go to other sources (Hansen, 1999). Although the social support and acceptance expected from strong contacts may help with gaining acceptance and approval for pursuing or adopting creative ideas, we do not see strong ties as normally facilitating the initial development of creativity; rather, they will likely be constraining.

Proposition 1a: Weak ties should facilitate creativity at work compared to strong ties.

Proposition 1b: Relatively many weak ties and fewer strong ties should correspond with higher creativity at work than many strong ties and fewer weak ties.

If weak ties are optimal, then more weak ties should be better than fewer. The more weak ties one has, the more diverse information and the more people one is exposed to, and the more opportunity one has for autonomy and flexible thinking. However, too many weak ties may be problematic. There may be a point of diminishing returns, where too many weak ties are no longer advantageous. Only so much time is available to devote to one's contacts (Mayhew & Levinger, 1976; Scott, 1991). Since one has to spread a limited amount of time across a larger number of contacts, the amount of time given to each contact diminishes. As a result, the intensity of each contact decreases, and helpful discussions and involvement, which are more likely to lead to new knowledge and approaches, are less likely to surface. This essentially suggests that the ties are too weak to be beneficial.

In addition, a very large number of weak ties may become distracting. An individual with a larger number of weak ties may spend too much time developing and maintaining such a large network of ties and may not have enough time to integrate and develop more creative ideas. Although weak ties require little maintenance compared to strong ties, even a weak tie requires some minimal level of time and attention, so when a person has a very large number of weak ties, the collective time spent maintaining relationships may be large enough to be distracting. As Csikszentmihalyi (1996) describes, a certain amount of focus, devoted attention, and mental energy is needed to pursue creativity, and circumstances that distract from these pursuits may not leave one with enough time to be creative. Therefore, weak ties will facilitate creativity, provided that their number is not so large as to be distracting or meaningless.

Proposition 1c: A larger number of weak ties should correspond with higher creativity at work, up to a point; beyond this point, there is less benefit realized from larger numbers of weak ties, and they may constrain creativity at work.

NETWORK POSITION

While the number and type of relationships give us important insights into the social side of

creativity and provide an important foundation for our more structural ideas, we have not explicitly captured an individual's position within the greater social structure. Not only does each individual have direct relationships but his or her relationships are also embedded in a network of relationships. Within the network literature researchers typically have defined network boundaries to reflect socially defined groups from the actor's perspective or to include actors with similar attributes that have conceptual relevance to the researcher (Laumann, Marsden, & Prensky, 1983). In this article we define the network to include all individuals working in similar domains who represent the reference group used to judge creativity, and the network also may include those who determine what is considered to be creative. Consistent with this definition, we envision the network boundary to be drawn around individuals of a professional group, such as architects or physicians, or an organization. Given the facilitating role of weak ties, we primarily focus on networks of weak ties.

Within a given network, one's centrality or position is often of interest (Freeman, 1979). Centrality describes an actor's position relative to the entire social network being considered. Although centrality has been defined in a variety of ways in the social network literature (see Freeman, 1979, for a review), we have chosen the closeness approach because of its conceptual relevance to our ideas. Closeness centrality reflects the distance between an actor and all other actors in the network and is computed as the average distance between an actor and other members of the network (Freeman, 1979).

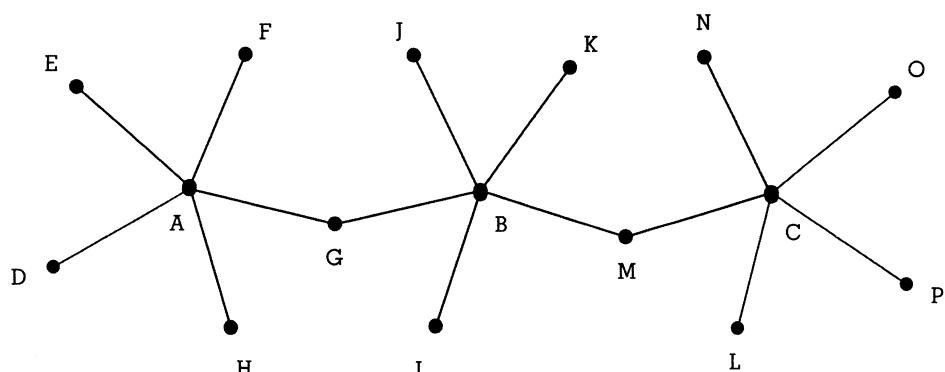
An actor with high closeness centrality can access other members of the network with the fewest links. Thus, the actor is not too far removed from the majority of other actors in the network, consistent with the intuitive notion of being in the center.

Closeness centrality is considered a global measure of centrality because it captures direct as well as indirect links (Scott, 1991). The person with the largest number of direct connections does not necessarily have the highest centrality. In Figure 2 actor B has the highest closeness centrality score, followed by actors G and M. This is in contrast to a simple count of the number of ties, where actors A, B, and C would have equally high scores (i.e., degree centrality). The opposite of centrality is a peripheral position (Scott, 1991). Thus, individuals with the lowest closeness centrality score are considered the most peripheral. Actors H, D, E, and F (or L, N, O, and P) in Figure 2 are the least central and the most peripheral.

The Central Network Position

Actors occupying closeness centrality positions are likely to feel more comfortable taking informed risks. Compared to less central people, these individuals are aware of whatever is going on in the network, and they have the ability to access, through personal connections, a larger portion of individuals in the network. Consistent with their increased centrality, they are likely to be perceived as having higher status by the rest of the members of the network (Ibarra, 1992; Lincoln & Miller, 1979). This access and status should result in more favorable per-

FIGURE 2
Sample Network to Illustrate Closeness Centrality



spectives and outlooks (Ibarra & Andrews, 1993) and perceptions of freedom and power (Brass, 1984; Krackhardt, 1990), which should provide the confidence and personal discretion needed for calculated risk taking. Empirical evidence also supports the idea that centrality is correlated with perceptions of risk taking (Cancian, 1967; Ibarra & Andrews, 1993). Creativity involves risk, either for doing something that is unlike what has been done before or for simply presenting an approach that is unusual for the context. Similar to other work contexts that enhance creativity by supporting risk taking (Woodman et al., 1993), more central positions should also enhance creativity.

In addition, the access facilitated by closeness centrality means a higher likelihood of exposure to the various disparate social circles within the network and closeness to more clusters or pockets of highly connected people. Consider the very peripheral actor E in Figure 2, compared to the more central actor G. Actor G is exposed to the D, E, F, H, A cluster, as well as the J, K, M, I, B cluster, but actor E, in contrast, has direct access only to one cluster. This increased access for actor G, or even the more central actor B, means that the chances of being exposed to the diversity of information within the network increases, which may lead to enhanced creativity-relevant skills and domain-relevant knowledge. However, this is more likely to be true for networks with many weak ties, given that weak ties are more likely to be nonredundant connections to disconnected social circles (Granovetter, 1973).

Although closeness centrality may facilitate creativity, too much centrality—beyond a moderate degree—may be constraining. A person who is too central may be pulled in too many directions. This may result in that individual's being aware of too many conflicting viewpoints among various subgroups, which, in turn, results in stress and conflict (see Podolny & Baron, 1997). Too much stress and conflict can stifle creativity, but a lower, more manageable amount of stress and conflict, such as that likely to result from moderate centrality, may facilitate creativity (Amabile et al., 1996; Simonton, 1977). For instance, Coser (1975) argues that the conflict created by trying to reconcile different expectations is good for flexible thinking and autonomy. As with stress and conflict, extreme centrality may mean that less time exists to develop and pursue new creative ideas. The very

central person is likely to be a more common source of advice and input, which would drain attention away from the focus required to foster creativity at work (Csikszentmihalyi, 1996).

In addition, extreme closeness centrality may be associated with too much domain-relevant knowledge and experience, which can lead to difficulty in seeing things broadly and in exploring creative ideas that, at first blush, may seem impossible (Mumford & Gustafson, 1988). As one becomes aware of various perspectives, his or her breadth of knowledge also increases. For the neophyte, more exposure and a deeper understanding of the field are helpful. Enough knowledge is needed to understand what is considered creative and to be able to compile different ideas and information to yield novel yet appropriate alternatives. However, for the person more entrenched in the network, more knowledge within his or her domain—beyond already acquired expertise—will not necessarily be helpful. In essence, although enhancements to domain-relevant knowledge may facilitate creativity, too much knowledge can constrain creativity (Mumford & Gustafson, 1998; Simonton, 1999) if it reduces the individual's ability to explore divergent ideas and take calculated risks.

Therefore, closeness centrality should facilitate creativity, unless centrality is so high that stress and conflict become overwhelming and the breadth of knowledge becomes constraining. Considering Figure 2 as a simplified example, positions G and M (moderate closeness centrality) should correspond with higher levels of creativity, compared to position B. However, one caveat is in order. Our line of reasoning makes the least sense for networks of predominantly strong ties. Networks of strong ties are likely to be very dense networks, where many of the actors are connected to all other actors within the network (Granovetter, 1973; Krackhardt, 1992). The denser the network, the more each actor has similar access to all other actors or is similarly close. In this case closeness centrality becomes less meaningful as a distinguishing network characteristic. In addition, the constraining factors associated with strong ties would be a problem for creativity. Thus, the relationship between closeness centrality and creativity makes more sense for networks with some proportion of weak ties.

Proposition 2: Holding constant ties outside the network, individuals with greater closeness centrality are likely to have higher creativity at work, through some moderate level of closeness centrality; beyond this level, greater closeness centrality may constrain creativity.

The Peripheral Network Position

A peripheral position in a given network may suggest connections outside the network that can facilitate creativity. For example, in a qualitative study (Sutton & Hargadon, 1996), product designers within an organization network were considered to be on the periphery, but the researchers argued that their peripheral position coincided with centrality in many networks outside the organization, which facilitated their creativity. Outside connections can provide the peripheral actor with approaches used in related but different areas. Approaches drawn from outside areas will likely be seen in the actor's own network as novel relative to the standards within the domain. For example, an architect with many connections to the graphic design profession, a related yet different area, is likely to be more novel relative to architects with fewer boundary-spanning connections, because the alternative methods used by graphic designers may prompt the architect to initiate new approaches and techniques.

Furthermore, the person with boundary-spanning ties will have a wider range of response possibilities to draw from when coming up with solutions, thereby enhancing creativity-related processes. It is not just that the person with outside connections will apply known ideas from other areas to new areas but that these ideas will also expand the way the individual thinks about problems. Ideas from other areas may spark new thoughts, resulting in a greater set of options for work-related problems. This exposure is similar to that expected from structural bridges within a network, but differences in perspectives, viewpoints, and areas of work will be greater across a network boundary than within. Kasperson's (1978) study of scientists supports these arguments, in that those with connections to scientists outside their discipline were more creative. In the related field of innovation, Rogers (1983) argues that early

adopters of innovations tend to have more connections outside their areas of expertise compared to later adopters.

Not only does being on the periphery suggest the presence of outside connections, but this position in the network provides a unique opportunity to fully take advantage of boundary-spanning ties and to see things in fresh ways. Compared to a highly central person, the peripheral actor is not firmly embedded in the network. Thus, he or she should be more able to recognize and attend to new, divergent ideas sparked by outside connections to different networks and be more free to take advantage of these ideas without the constraints of breaking established norms, worrying what key others will say, or experiencing personal stress from potentially going against some accepted tenets of the network.

In addition, because peripheral individuals are somewhat isolated from the rest of their network, they may not only have more outside connections but also may see themselves as being part of other social systems. The social pressure from the outside group to conform may outweigh pressure from within the network. However, since peripheral actors have some connections within the network, though limited, they should have enough knowledge and experience within the domain for their work to reflect the required degree of appropriateness.

When ideas from distinct fields can be brought together without constraint and applied to another field, we expect more groundbreaking advancements that really alter the way problems are approached or solved. This is similar to Mumford and Gustafson's (1988) suggestion that the highest levels of creativity are the result of very different schemata or cognitive structures coming together.

The suggestion that a peripheral position, or low network centrality, should be associated with the highest level of creativity may at first glance appear to contradict the idea that closeness centrality facilitates creativity. Our arguments regarding peripheral positions, however, are premised on the presence of boundary-spanning ties. It is the boundary-spanning ties in combination with a peripheral position that provides a unique mechanism for creativity by making it more likely that one will access, use, and explore diverse information from related areas.

Essentially, we are proposing an interaction between boundary-spanning ties and centrality. When boundary-spanning ties are high, we expect a more linear effect, where low closeness centrality (a peripheral position) coincides with the highest level of creativity and high centrality is associated with the lowest creativity. However, we recognize that highly central actors may be less likely than more peripheral actors to have high numbers of boundary-spanning ties, because they tend to be more consumed by relationships within the network. When boundary-spanning ties are low, we expect a curvilinear form, where moderate closeness centrality is associated with relatively high creativity but not potentially as high as the boundary-spanning-low centrality condition.

Another point of clarification concerns the level of creativity. Compared to the creativity-optimal combination of a peripheral network position with boundary-spanning ties, the level of creativity facilitated by centrality will less likely be groundbreaking and will more likely reflect adjustments, recombinations, or extensions of existing principles within the field. A more central person is being exposed to ideas that reflect accepted norms of the social field. Therefore, while this person will be creative, he or she will less likely have extremely high levels of creative contributions. This corresponds to the more incremental levels of creativity often studied within organizations, versus the higher levels of creativity more often the focus of studies on radical innovations.

Proposition 3: Individuals occupying a peripheral position in a network with a large number of connections outside the network will have the highest creativity at work, compared to both more central actors and other peripheral actors with fewer outside connections.

THE CREATIVITY-CENTRALITY SPIRAL

While network position is expected to affect creativity, it is also likely that creativity may have some effect on network position. In fields where creativity is valued, being creative at work should bring a certain degree of prestige and status to an individual. Others will see the creative work as interesting and intriguing and

may put this work on a pedestal as a model for their own. Moreover, the creative work likely will stimulate thoughts and ideas in others, ultimately forming the basis of and acting as a catalyst for their work. Because of this, individuals in the network will be drawn to the originator. They will want to be around and have exposure to the creative person, and he or she will be sought out for advice, input, and involvement in projects. Essentially, creativity will help a relatively unknown person become known to a much larger number of people. Thus, the individual will become more central, and as his or her level of closeness centrality increases, he or she will become more highly visible and well known within the network.

Consider the following example. A junior faculty member publishes research in one of the field's most prestigious and groundbreaking journals. As members of the profession digest this creative work, the junior faculty member may be asked to review more articles, appear on panels, and provide input and advice on other projects. This key work has helped increase the young faculty member's prominence and centrality within his or her professional network.

Similarly, Rogers (1983) argues that early adopters of innovations tend to be sought out for their advice and opinions, particularly in fields where norms favor innovative behavior, and Burkhardt and Brass (1990) found that early adopters of a technological innovation increased their power and centrality. Although adopting innovations is clearly different from generating them, these ideas from the innovation literature do provide some insight.

Creative contributions, even smaller ones, are necessary to help the creative actor simply maintain his or her status as well as enhance it. In other words, an actor must at least pursue creative ideas in order to maintain the respect of his or her peers and the resulting relationships. Weaker contacts, likely to initially form because of highly creative works, are not necessarily loyal. These weak connections tend to have lower levels of affect and emotional intensity, so they can more easily be discontinued if they are not maintained or if a stronger connection does not develop over time.

The continued occurrence of creative insights will further enhance the actor's reputation for creativity, attracting more and more attention. Rogers (1983) discusses a similar idea: contin-

ued adoption of innovations is needed for early adopters to maintain their status. These ideas imply that the incremental levels of creativity expected of central actors may result in their becoming even more central and that the high levels of creativity expected of peripheral actors with boundary-spanning ties may propel them more toward the center of a network.

Proposition 4: An individual's creativity at work will lead him or her to occupy a position of higher closeness centrality.

By introducing the idea that creativity leads to centrality, we are essentially embracing a recursive model that some suggest is prevalent with many of the relationships studied in organizations (Masuch, 1985; Weick, 1979). The combinations of propositions surrounding centrality and creativity paint a picture of a spiraling model—a case of reciprocal causation where a cyclical relationship exists between two variables, and an increase in one variable results in an increase in the other (Lindsley, Brass, & Thomas, 1995). Centrality facilitates creativity; creativity, in turn, facilitates centrality, and the process repeats itself.

The spiral has been used to describe other organizational phenomena (e.g., Masuch, 1985; Weick, 1979). For example, Lindsley et al. (1995) describe the relationship between efficacy and performance as a spiral and highlight the factors that can start, stop, or modify the spiral. In addition, Masuch (1985) explains organizational outcomes like underperformance and stagnation in terms of self-reinforcing loops between such variables as trust of customers and cash flow and between bureaucracy and an unmotivated workforce.

As with other spirals found in organizations, the positive, reciprocal causation spiral between centrality and creativity will not continue indefinitely. A spiraling process will continue until the system is changed or destroyed or until a ceiling is reached (Masuch, 1985; Weick, 1979). We propose that the centrality-creativity spiral has two phases. During phase 1, the spiral is positive; each concept facilitates the other. The conceptual turning point in the spiral, a transition of sorts, is driven by several processes. As the spiral continues, one becomes more and more central. Relationships that were originally weak and a source of diverse information be-

come stronger. As a person spends more time with people in the network, his or her thoughts and ideas tend to converge because of shared experiences and an increase in redundant information sharing. With time, both proximity brought about by being closer to other members and a greater degree of similarity resulting from shared experiences increase. Now, the highly central actor is likely to have a larger number of stronger ties within the field, leading to creativity-stifling conformity. In other words, the individual has become more like the connections that surround him or her, and the ability to see beyond this—to see new paradigms and approaches—becomes more difficult; however, this actor will still be central within weaker networks because of his or her accrued status.

In addition, the person who is too central in the network or has been central over a long period of time more likely represents the person entrenched within the status quo of the organization or profession. Because this person is so immersed in the network—in the center of a web of direct and indirect ties—it almost becomes unmanageable or extremely difficult to break free of the web of ties and to see beyond them to new ideas. Another way of saying this is that the person becomes entangled and strangled by the web. Because the web is so deep, there is always another tie to the status quo to hinder the person's freedom of thought. Also, the individual probably spends less time with weak ties outside the network, so he or she is less likely to be exposed to fresh, new ideas and approaches.

Finally, the transition process between phase 1 and phase 2 of the spiral corresponds with the inflection point suggested in Proposition 2. Thus, as one becomes more and more central, the stress, conflict, and knowledge overload proposed for extreme levels of centrality will diminish gains in creativity.

As this transition process ends, phase 2 of the spiral begins. During this phase, centrality will not be associated with higher levels of creativity and may actually constrain creativity. Because of prior creative contributions and his or her ensuing central position, the highly central person embodies and represents the field. This individual now defines acceptable knowledge and perspectives and shapes norms and expectations. In addition, many weak ties have become stronger, and the individual is fulfilling multiple roles that take attention and focus

away from creativity. Thus, during phase 2, centrality becomes a constraint, and the spiral becomes self-correcting, with increasing centrality leading to lower levels of creativity. Eventually, equilibrium will occur, because the person will not be able to become any more central, or he or she will consciously try to become less central.

Proposition 5a: In phase 1 a positive, self-reinforcing spiral exists between centrality and creativity such that an increase in one leads to an increase in the other, until centrality becomes constraining. In phase 2 the spiral becomes self-correcting such that an increase in centrality no longer leads to an increase in creativity.

Proposition 5b: The more creative the person is, the more he or she will move from a position with many weak ties and fewer strong ones to one with many strong ties and many (but proportionally fewer) weak ties.

Proposition 5c: As an individual becomes more central, his or her creativity should continue to increase at a decreasing rate, up to a point. Beyond this point, increases in centrality may constrain creativity.

POTENTIAL MODERATORS

The propositions described in the preceding sections suggest the network characteristics that may facilitate or constrain creativity, but we also recognize that certain factors may make it more likely that one will take advantage of creativity-beneficial social positions. This is similar to Brass, Butterfield, and Skaggs' (1998) argument that social networks provide the opportunity for unethical behavior, but the utilization of the opportunity is dependent on individual characteristics. In the case of creativity at work, it would be reasonable to explore the moderating role of the individual characteristics typically discussed in the creativity literature—for example, intrinsic motivation or cognitive ability. Although these individual factors deserve attention, we focus on the moderators that are particularly important to our social network perspective: diversity relative to the network, cultural norms, and tightness of the symbolic

structure. These contextual characteristics are likely to influence social relationships and the pattern of relationships within a network.

Diversity relative to the network comes into play because initiating new ties, even weak ones, is more comfortable when some type of similarity exists. We broadly define diversity to include both observable characteristics such as race/ethnicity and sex as well as background characteristics, which can encompass education, tenure, and functional area, among others (Williams & O'Reilly, 1998). When similarity exists, communication is easier and behavior is more predictable (Byrne, 1971). Natural group formations in organizations commonly tend to form based on similarity, familiarity, and proximity (e.g., Ancona & Caldwell, 1992; Jehn, Northcraft, & Neale, 1999). This is consistent with the tendency for homophily—that is, relationships with similar others (Brass, 1985; Ibarra, 1992). Mehra, Kilduff, and Brass (1998) found that centrality is less likely when an individual is part of a group that is rare in the network. When a person achieves some sort of creativity at work and is somehow different relative to the rest of the people in the network, that individual's creativity will less likely lead to increases in centrality, because the formation of new, weak relationships will be hindered by the individual's diversity. This does not mean the diverse person will not become more central but that the link between creativity and centrality will likely be stronger when similarity exists.

In addition to diversity relative to the network, cultural norms are important. Culture is the beliefs and values held by management and communicated to employees through norms, socialization processes, and observations of management responses to critical events (Schein, 1990). Cultures will vary in terms of how much creativity is desired and rewarded and the extent to which there is task and socioemotional support for creativity. Creativity theorists have proposed a variety of cultural norms, such as cooperation/collaboration and competition, that are expected to influence creativity (e.g., Amabile, 1996; Woodman et al., 1993). Cultural norms that support information sharing should make it more likely that individuals will not withhold information and will be willing to share, even with their weaker contacts. In competitive environments, however, individuals are less likely to discuss work-related projects

(Bouty, 2000). While mere exposure can be enough to stimulate creativity, if the culture is highly competitive or job stability is tenuous, relationships within the profession that lead to exposure to diverse perspectives are less likely. Furthermore, this type of environment is likely to pull necessary attention away from work and more toward external matters.

Finally, the tightness of the symbolic structure of the dominant field is relevant (Csikszentmihalyi, 1996). In fields with strict logic and a high degree of structure, such as mathematics, a person new to the field can make creativity contributions that are accepted and lauded, whereas in fields such as philosophy or social science, it can take many years for creative ideas to be recognized (Csikszentmihalyi, 1996). Creative achievements in the tightly organized field are likely to be more universally and unanimously accepted as creative. The progression from fringe to center for the individual whose work is creative in these fields is likely to be greater and more rapid. Because an accomplishment can be more widely recognized as creative, more people will want to be around the individual, and changes in his or her status will occur quickly. In contrast, in fields such as psychology, where the rules are less clearly defined, it may take experience within the field, as well as time, for the impact of highly creative work to be recognized.

Proposition 6: The relationship between network position and creativity at work will be influenced by certain contextual characteristics, such as diversity relative to the network, cultural norms, and tightness of the symbolic structures.

DISCUSSION

The social network perspective developed in this article highlights the social side of creativity and suggests a variety of mechanisms through which the social context influences creative performance. Specifically, we propose that weak ties are preferable to strong when it comes to stimulating creativity at work, and more weak ties should generally be better than fewer, as long as the person does not have so many that the weak ties become a constraint. Position in the network—both being central and being on

the fringe—is also relevant. We expect moderate centrality—not too little or too much—to be associated with the highest relative level of creativity, with the exception of the peripheral position that is combined with boundary-spanning ties. We expect this latter combination to be associated with some of the more groundbreaking ideas and solutions. Ultimately, we propose a multiphase spiraling relationship between centrality and creativity, where centrality not only influences creativity but creativity influences centrality. Finally, we propose contextual characteristics that are particularly important for a social context that may moderate the relationship between social networks and creativity.

The concepts presented extend existing theoretical models of creativity by incorporating a variety of facets of social relationships, commensurate with the complexity of the social environment. We go beyond the idea that communication and interaction in general facilitate creativity by describing the dynamic interplay between social networks and creativity. Although social relationships may facilitate creativity, when an individual has too many weak ties or is too central, his or her social relationships may actually constrain creativity. This extends the presumption that more communication and more interaction will be helpful. In addition, we provide a greater understanding of the challenges associated with achieving high levels of creativity, since our social network perspective suggests the difficulty involved in making continual groundbreaking contributions. A result of such high levels of creativity may be increased centrality that is likely to lead to creativity, but at relatively lower levels, and that may, ultimately, constrain creativity.

Furthermore, the suggestion of a mutually reinforcing relationship, or spiral, between social networks and creativity adds to the creativity literature by highlighting an outcome of creativity for individuals in addition to antecedents. Finally, we make an important extension to creativity theories by focusing on intervening mechanisms not previously examined in the literature. While creativity-relevant skills and knowledge in the domain have been incorporated in theoretical models (e.g., Amabile, 1996), these ideas have not been a research focus for explaining contextual effects on creativity. A more complete explanation of creative occur-

rence may be particularly useful for the work environment.

The perspective described in this paper also provides more insight into the role of social networks. We suggest one factor—creativity—that explains how and when an individual's network position may change from fringe to center. This is important because it presents a more dynamic and fluid picture of social networks and addresses some of the criticisms of social network research for assuming networks are static and not addressing change in network position (i.e., Marsden, 1990). In addition, much social network research focuses on the impact of social networks on individual behavior. We present a more balanced view by suggesting one antecedent to social network position. Finally, the theme of this paper meshes macro- and microoriented concepts in organizational behavior and provides another example of how the two areas are interrelated. As O'Reilly (1991) suggests, social network perspectives provide a viable approach to incorporating context into microorganizational behavior. The inclusion of contextual moderators also advances this objective.

The propositions we include offer several implications for organizations and the individuals within them. The notion that social relationships may be good for creativity alters, to some extent, conventional expectations that highly creative individuals are social isolates with minimal social skills (e.g., Martindale, 1989). When creativity is applied to practical concepts where the end product fulfills some function other than aesthetic pleasure, social relationships and the pattern of these relationships may be important. This supports the idea that organizations interested in being innovative and creative should consider facilitating interactions across work-groups, departments, and other discrete subgroups (Kanter, 1988).

Similarly, support and sponsorship in social activities that promote contact with professionals outside the organization may facilitate innovative strategies. For the professional worker interested in navigating the organizational environments in which he or she resides, maintaining and cultivating weaker relationships both within and across organizational boundaries may be helpful. This should allow the individual to think in broader terms, to think outside the box, and to shine as a valuable employee who solves work issues in unique yet

effective ways. Furthermore, this type of creativity at work may enhance the worker's centrality—a desirable position for a variety of professional outcomes (see Brass, 1984; Burt, 1992). However, the insights described in this paper suggest that individuals should be mindful of becoming too central and, thus, being constrained. If individuals feel this is happening, developing boundary-spanning relationships may be helpful.

The social network perspective of creativity also provides many implications and avenues for future empirical exploration. As we point out in this article, the context of social relationships is not one dimensional. Not only should the extent of social relationships be considered by creativity researchers but the character of relationships in terms of their strength and the extent they span boundaries should also be taken into account. Creativity researchers should think about the broader social context as well by incorporating the individual's place within his or her social network, and the extent that creativity influences contextual factors such as and in addition to social networks should not be overlooked. Measuring the formal work context without incorporating informal aspects of organizational structure may result in an unintended omission.

Finally, researchers should give careful thought to when a facilitating contextual factor may also constrain creativity. For example, our propositions involve tradeoffs between concepts such that there is a certain level that is desirable for creativity and beyond that point there is a reduction in an individual's ability to be creative (e.g., the tradeoffs between how many weak ties are beneficial and what level of centrality is optimal). Conceptually, it is difficult to specify where the thresholds occur, because they likely will vary by the contextual moderators highlighted, among other things. However, in future empirical work researchers can begin to test, for example, under what conditions the transition process between phase 1 and phase 2 of the spiral will occur and how this may vary by cultural norms, tightness of the symbolic structure, or an individual's diversity relative to the network. The specific propositions further defining these ideas can be tested directly, or they can shape and influence other research avenues related to creativity or social networks, respectively. In conclusion, focusing on the social side

of creativity, and in particular a social network perspective, can inform the creativity literature and enhance our understanding of individual creativity at work.

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