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SOCIAL NETWORKS, COGNITIVE STYLE, AND INNOVATIVE PERFORMANCE: A CONTINGENCY PERSPECTIVE

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Integrating insights from cognitive psychology into current network theory on the social capital of brokering and closed networks, we argue that cognitive style is a critical contingency explaining the relation between social network position and innovative performance. Based on a "complementary fit" argument, we posit that a social network rich in structural holes enhances the innovative performance of employees with an *adaptive* cognitive style; however, individuals with an *innovative* cognitive style are most innovative when embedded within a closed network of densely interconnected contacts. Using data on the individual cognitive styles and complete workplace social networks of all employees within a design and manufacturing firm, we show that our theorized contingency mechanism accounts for a large share of empirical variation in employee innovative performance over and above existing social network explanations.

Extant research has shown that the workplace social network within which an employee is embedded deeply affects his or her ability to produce useful organizational innovations (Brass, Galaskiewicz, Greve, & Tsai, 2004; Sparrowe, Liden, & Wayne, 2001). One well-established line of inquiry in particular argues that occupying a brokering network position that spans structural holes expands the inventiveness of individuals (Burt, 2000). By tapping information from mutually unconnected colleagues (Aral & Van Alstyne, 2011; Burt, 2004), employees in such positions are more likely to come across and combine diverse and apparently unrelated information, which is critical to conceiving novel approaches and creative solutions (Amabile, 1996b; Burt, 2005). Supporting this argument, prior research found that employees with a workplace network rich in structural holes generate more numerous and more original ideas than do comparable individuals embedded within a closed web of interconnected contacts (Burt, 2004).

While research into the benefits of structural holes has significantly advanced our understanding of how workplace social networks affect employee innovation, recent discussions have highlighted an unresolved theoretical tension in this line of argument. As innovation scholars have pointed out, successful innovation requires *both* creating *and* implementing novel ideas; however, the same conditions favoring the creation of novel ideas often impede the idea-implementation process (Hargadon & Douglas, 2001; Laureiro-Martínez, Brusoni, Canessa, & Zollo, 2015), leading to an "innovation paradox" (Miron-Spektor, Erez, & Naveh, 2011). Recent network studies have noted a similar paradox, arguing that although having a network rich in structural holes helps employees to come up with novel ideas, it is an impediment during idea implementation because converting a creative idea into an actual innovation requires internal support, alignment, and coordinated action (Kijkuit & Van Den Ende, 2007). Thus, as Obstfeld (2005: 101) eloquently put it, social networks rich in structural holes "present both an opportunity structure for generating new ideas and an action problem ... because the dispersed, unconnected people found around structural holes are inherently more difficult to mobilize or coordinate, especially around novel ideas."

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One way in which recent network scholarship has addressed this "innovation paradox" is by pointing out that brokering and closed social networks confer different kinds of social capital, each of which is useful at different stages in the innovation process. During the initial phase, when coming up with a wide range of creative, out-of-the box ideas is of critical importance, employees embedded in a brokering network have an advantage (Rodan & Galunic, 2004). When it comes to championing a novel idea and integrating it into the existing technologies, processes, and structures of an organization, however, employees who can leverage a closed web of contacts may be in a better position (Flap & Völker, 2001). This line of argument has clarified how the social capital of brokering versus closed social networks facilitates the innovation process at different points in the "organizational life of an idea" (Kijkuit & Van Den Ende, 2007). However, since each employee is structurally embedded within a single network position, he or she will generally be able to mobilize only one kind of social capital, irrespective of the phase of the innovation process with which he or she is dealing. Recognizing that brokering networks are beneficial during early phases of the innovation process, while closed networks become critical during idea implementation, is therefore not enough to produce a conclusive answer to a question of both practical and theoretical relevance: Which network structure is most conducive to innovative performance at the level of the individual employee?

In an attempt to address this question, the present study develops a "complementary fit" argument (Cable & Edwards, 2004; Ostroff, 2012) that integrates an individual-level, cognitive perspective into the current network theory of social capital. Departing from the widespread assumption that workplace social networks affect all employees in the same way, we draw insights from adaption–innovation theory (Kirton, 1976, 1989) to argue that whether a brokering or a closed network will enhance an employee's innovative performance is contingent on that employee's idiosyncratic cognitive style. We put our argument to an empirical test using unusually rich data on the cognitive styles and complete intraorganizational networks of all employees within a design and manufacturing company. Our empirical analyses lend support to our theoretical claim, showing that our theorized mechanism accounts for a substantial share of empirical variation in employee innovative performance that is not captured by existing network theory. By demonstrating that individual cognitive style is a key factor influencing whether closed or brokering social networks enhance employees' innovative performance, this study makes three main contributions to the extant literature.

First, we address the innovation paradox at the level of the individual employee. Responding to recent calls for micro-founded, psychologically informed conceptualizations of social networks (Barsade, Casciaro, Edmondson, Gibson, Krackhardt, & Labianca, 2012; Kilduff & Krackhardt, 2008), we illuminate the conditions under which a brokering or a closed network structure is most conducive to individual innovation.

Second, our study advances the stream of literature that considers social networks from a contingency perspective (Anderson, 2008; Burt, 1997). This line of inquiry argues that network effects vary depending on the contextual characteristics of the network (Kijkuit & Van Den Ende, 2007), of the information flowing through the network (Aral & Van Alstyne, 2011; Hansen, 1999), or of the actors themselves (Kilduff & Krackhardt, 2008). We contribute to this emerging research field by showing that cognitive style is a key contingency variable in explaining the link between social networks and employee innovation.

Third, we develop a novel theoretical argument that accounts for both the closure and brokerage views of social capital within a unitary explanation. Incorporating the role of cognitive style into existing network-structural models of social capital is straightforward because the latter explains which kind of information accrues to individuals, while the former explains which kind of information individuals need most. Despite its underlying simplicity, our theoretical integration reconciles apparent discrepancies between the closure and brokerage views within a more general theory of social capital, and yields consequential implications for both scholars and managers.

NETWORK BROKERAGE AND INDIVIDUAL INNOVATION

The extant literature widely concurs that developing a workplace network spanning structural holes enhances individuals' innovative performance by making them more likely to come up with new and original ideas (Burt, 2000). Since much organizational information flows through networks of interpersonal relations (Cross & Cummings, 2004), tapping information from mutually unconnected contacts exposes individuals to a diverse range of views, opinions, and ideas that are hardly accessible to employees embedded within closely connected networks (Granovetter, 1973). This heterogeneous

information environment is key to the social capital inherent in brokering networks because, by stimulating individuals to envision novel combinations of seemingly unrelated ideas, it fosters the idea-generation process (Aral & Van Alstyne, 2011; Burt, 2004; Hemphala & Magnusson, 2012; Kijkuit & Van Den Ende, 2007; Rodan & Galunic, 2004). Although closed social networks are more conducive to idea implementation than brokering ones (Obstfeld, 2005), there is broad consensus in the literature that occupying a brokering network position has an overall positive effect on an individual's innovative performance (Burt, 2005). The reason is that although both idea creation and idea implementation play a role in innovation dynamics, implementation cannot occur unless creative ideas have been generated (Baer, 2012: 1104). Conversely, the ability to come up with original, out-of-the-box ideas represents a salient and intrinsically valuable aspect of an employee's innovative performance because such ideas are the buds from which organizational innovations can develop (Baer, Oldham, & Cummings, 2003). Extant research from a variety of empirical settings supports the view that individuals embedded in brokering networks tend to be more innovative than equally skilled colleagues occupying closed network positions. For example, Burt (2004) studied a large sample of managers running the supply chain of a multinational electronics company, and found that those embedded in brokering workplace networks systematically come up with more numerous and more valuable ideas than those in closed network positions. Similarly, Fleming (2002) examined innovative dynamics within Hewlett-Packard and found that brokering social networks that cut across projects help engineers to develop innovative technologies. Lastly, Rodan and Galunic (2004) showed that having a workplace network rich in structural holes improved the innovative performance of senior managers in a Scandinavian telecommunications company. In line with prior literature, we therefore advance the following baseline hypothesis:

Hypothesis 1. The more brokering (closed) an employee's workplace social network, the higher (lower) his or her innovative performance.

Hypothesis 1 is "structuralist" in the sense that it focuses solely on the characteristics of the network within which employees are embedded, not on characteristics inherent to the employees themselves (Emirbayer & Goodwin, 1994). Interestingly, though, a long-established line of research in the psychology of problem solving literature offers evidence that individuals with different cognitive styles use information differently, suggesting that employees might differ in the extent to which they profit from the social capital inherent in closed versus brokering networks. Before we can explicitly integrate the structuralist and psychological perspectives into a unified theoretical argument, a discussion of existing literature on cognitive styles is in order.

ADAPTIVE–INNOVATIVE COGNITIVE STYLE

"Cognitive style" refers to "consistent individual differences in the ways people organize and process information" (Martinsen, Kaufmann, & Furnham, 2011: 214), which influence how individuals conceive of and deal with problems. Theories of cognitive style have become increasingly relevant in organizational research, because evidence shows that cognitive styles are "a fundamental factor determining both individual and organizational behavior" (Kozhevnikov, 2007: 464). One prominent example is the adaption–innovation theory of Kirton (1976, 1989), which has received much attention as an approach to both conceptualizing and measuring cognitive style (Shalley, Zhou, & Oldham, 2004), and has influenced research in a broad range of fields including entrepreneurship, leadership, and team dynamics (Stum, 2009). Adaption–innovation theory posits that individuals differ starkly in terms of how they make decisions, solve problems, and construe change (Tullett & Davies, 1997). Such differences in cognitive style develop early in life and determine how the individual deals with all stages of the problem-solving process, including the view of the nature of problem, the scope of possible solutions, and the implementation of chosen solutions (Chan, 1996; Kirton, 1989).

Adaption and *innovation* are two ends of a continuum, having a normal distribution around the theoretical mean (Goldsmith & Kerr, 1991). Descriptions of individuals on the two extremes of the continuum are in stark opposition. *Adaptors* use the information available to them to find solutions that fit within established frameworks (Kaufmann, 2004). As such, they are more adept at "doing things better" than they are at "doing things differently" (Kirton, 1976: 622). While they are meticulous and thorough in their approach to problem solving, their focus on established frameworks inhibits them from venturing far from current ways of thinking, winnowing the range of ideas and information they consider (Talbot, 1997). Adaptors' solutions generally fit well

with those of others and with the commonly accepted way of doing things. However, it is often difficult for them to recognize when existing solutions are no longer effective (Pounds & Bailey, 2001). In addition, adaptors tend to analyze problems logically and methodically instead of turning to free idea generation (Basadur, 1995). While this approach helps them solve "problems by proceeding at a disciplined pace in a predictable direction" (Kirton, 1994: 13), it also makes divergent thinking unlikely, reducing their likelihood of generating truly novel and creative ideas. *Innovators* process information in a very different fashion, their cognitive focus being on finding new ways in which to conceptualize and frame the problem (Kirton, 1976), and not on immediate solutions. Being less inclined to adjust their ideas to the expectations of others, innovators typically approach problems from original and unusual perspectives (Singer, 1990), "breaking the customary starting point" for their solution (Kirton & De Ciantis, 1986: 141). Furthermore, they solve problems by systematically turning around the information accruing to them through repeated cognitive reframings, allowing them to see new ways of linking apparently unrelated ideas (Hayes & Allinson, 1998). This approach helps them come up with creative ideas and initiatives that often break away from established practice, facilitating the idea-generation process (Kirton, 1976).

In sum, innovators find it relatively easy to generate original ideas by recombining seemingly unrelated perspectives and information, although it is quite difficult for them to convert creative ideas into implemented innovations. Conversely, adaptors come up with fewer and less original ideas, but their focus on finding solutions that fit well within the organization's established way of doing things aids them during the idea-implementation process. Such differences in cognitive style describe an individual's preferred way of processing and organizing information, and are thus conceptually different from cognitive level or ability (Goldsmith, 1985). Nevertheless, extant research suggests that innovators are likely to achieve higher performance in tasks in which the relative importance of idea creation is greater than that of idea implementation, while the opposite is true for adaptors (Pounds & Bailey, 2001).

We mentioned earlier that although both idea creation and idea implementation constitute important facets of innovation, the former represents a highly salient aspect of an employee's innovative performance that most contemporary workplaces regard as intrinsically valuable (Baer et al., 2003). In line with this view, prior literature indicates that the tendency to shift mental models and to combine seemingly unrelated information, which is characteristic of innovators, but not of adaptors, is a critical antecedent of individual innovative performance (Holyoak & Thagard, 1995; Simonton, 1999). For example, Rostan (1994) showed that the most innovative scientists and artists spend significantly more time framing problems from alternative perspectives than their less innovative peers. Furthermore, research found that combining concepts in unconventional ways is a main driver of employees' innovative performance in such diverse areas as engineering and advertising (Mumford, Baughman, Maher, Costanza, & Supinski, 1997; Owens, 1969). Building on this prior literature, we advance a second baseline hypothesis:

Hypothesis 2. The more innovative (adaptive) an employee's cognitive style, the higher (lower) his or her innovative performance.

SOCIAL NETWORK POSITION AND COGNITIVE STYLE: A CONTINGENCY PERSPECTIVE

The two baseline hypotheses presented so far descend from the well-established premise that, within the contemporary workplace, the ability to generate original, out-of-the-box ideas is a defining aspect of individual creativity that has a direct positive impact on the innovative performance of employees (Baer et al., 2003). While being innovative undoubtedly requires an individual to come up with creative ideas, extant research also suggests that the extent to which the process of idea creation converts into an employee's overall innovative performance depends on his or her efficacy in turning novel ideas into implemented innovations (Amabile, 1996a; Baer, 2012). In the present section, we elaborate on this insight, which is at the core of the innovation paradox, to advance extant theory on the network structures most conducive to an employee's innovative performance. Specifically, we argue that the effect of social network position on individual innovative performance varies depending on employees' cognitive style. The logical principle underpinning our hypothesis is that of "complementary fit" (Ostroff, 2012), which suggests that an individual's performance will be highest when "the weaknesses or needs of the environment are offset by the strength of the individual, and vice versa" (Muchinsky & Monahan, 1987: 271). Following this logic, we posit that a closed network of densely connected contacts will effectively complement the

weaknesses of innovators, while a network rich in structural holes will best complement those of adaptors. Table 1 summarizes the arguments that we will detail in the following paragraphs, presenting a schematic description of how, according to our theory, complementarity between cognitive style and social network position affects individuals' innovative performance.

Let us begin by explaining why we expect innovators to exhibit lower innovative performance when embedded in a brokering network than when embedded in a closed one. As argued above, individuals with an innovative cognitive style tend to come up with more numerous and more creative ideas, which is a critical factor in producing successful innovations. The extent to which creative ideas get implemented into actual innovations, however, depends on whether those ideas can be integrated within the organization's existing processes and aligned with "the set of existing understandings and actions" predominant within the organization (Hargadon & Douglas, 2001: 476). Prior research has found that innovators frequently fail to gain the consensus needed to implement their ideas within the organization because their cognitive style funnels their thought processes and efforts toward idea creation, rather than toward idea implementation. As a consequence, innovators' creative output often does not accommodate the needs, constraints, or interests of organizational decision makers (Kirton, 1988), with the result that a fair share of their ideas are never implemented into successful innovations. Since gaining the support and coordinated action needed for idea implementation is especially difficult for individuals embedded in brokering networks (Gargiulo, Ertug, & Galunic, 2009; Obstfeld, 2005), innovators whose workplace ties span many structural holes may come up with many novel ideas, but the share of those ideas that become implemented into actual innovations is likely to be especially low.

Based on a complementary fit argument (Ostroff, 2012), we argue conversely that innovators will benefit from a closed social network of densely interconnected colleagues. By facilitating cooperation and "coordinated action," closed networks convey a form of social capital conducive to idea implementation (Obstfeld, 2005: 101). Corroborating this view, prior research found that employees embedded in closed networks have an edge when seeking the

TABLE 1
Summary of the Combined Effects of Network Structure and Cognitive Style on Innovative Performance

Type of social capital	Adaptive–innovative cognitive style	
	Innovators • More likely to reframe problems, recombine information, and generate novel ideas • Inept at gaining support for ideas and making them acceptable to others, thus hindering their implementation	*Adaptors* • Ideas more acceptable to others and in line with existing frames, making implementation easier • Strong adherence to consensually agreed cognitive frames impedes recombination and novel idea generation
Brokering network structure • Heterogeneous information environment aids idea creation and information recombination • Unconnected contacts make coordination and implementation difficult	*Innovators in brokering position* Although supportive of idea generation, disconnected networks make coordination and mobilization difficult. As a result, such networks fail to make up for *innovators'* inaptitude in idea implementation.	*Adaptors in brokering position* Diversity of perspectives in a brokering network stimulates *adaptors* to discover novel connections among them. This vision advantage is complemented by *adaptors*' innate ability to frame solutions in acceptable ways, allowing them to garner support for the implementation of new ideas.
Closed network structure • Homogeneous information environment simplifies coordination and makes network more supportive, aiding idea implementation • Information redundancy and normative pressure hinders novel idea generation	*Innovators in closed position* *Innovators'* inborn ability to reframe problems and generate novel solutions is complemented by a supportive social milieu wherein coordination is less difficult, making ideas more likely to be implemented.	*Adaptors in closed position* Despite its benefits with respect to idea implementation, closed networks provide little support in the generation of novel ideas, which is where *adaptors* are lacking.

sponsorship and resources needed to realize their initiatives (Flap & Völker, 2001), and that this is especially true when such initiatives are based on unconventional, creative ideas (Baer, 2012). Furthermore, closed networks facilitate consensus formation (Lott & Lott, 1961), which is critical when trying to put novel ideas into effect within the organizational context (Baer, 2012; Kijkuit & Van Den Ende, 2007). Because innovators frequently come up with creative ideas, but often fail to implement them, they should benefit most from a social milieu that supports them throughout the process of idea implementation. Consistent with the notion of complementarity fit, these arguments suggest that a closed workplace network will confer the kind of social capital necessary to take full stock of innovators' characteristic inclination to focus on idea creation, while concurrently compensating for their main weakness: their limited focus on idea implementation.

The complementary fit argument also suggests that the innovative performance of adaptors will be lower when they are embedded within a closed network than when they are embedded in a brokering one. The social capital generated by closed workplace networks is valuable insofar as it facilitates the idea-implementation process, but offers little support in generating creative ideas, which is precisely where adaptors are lacking. Therefore, although closed networks may aid adaptors in implementing their ideas, these ideas will most likely not be novel. Extant research found that closed networks often cut individuals off from novel ideas flowing outside of their immediate social environment (Uzzi, 1997), which may amplify adaptors' inherent preference for well-established ideas over novel ones, as well as their reluctance to consider solutions that break away from current practice. Similarly, adaptors' inclination to address problems through commonly accepted frameworks is likely to intensify, since closed networks often present a "well-defined and consistent normative framework" that disciplines social action (Gargiulo et al., 2009) and curtails individual creativity (Gargiulo & Benassi, 1999: 305). As a result, adaptors embedded within a closed workplace network can be expected to exhibit a very low innovative performance.

Adaptors' innovative performance should instead benefit from the kind of social capital generated by brokering social networks. Because adaptors' information-processing style discourages cognitive reframing, adaptors generally find it hard to envision creative idea combinations, which reduces both the number and the novelty of the ideas they generate (Basadur, 1995; Talbot, 1997). A workplace network spanning structural holes would provide the kind of social capital needed to offset this weakness. By broadening the diversity of views and opinions that individuals must discuss and try to reconcile while carrying out their tasks, a brokering network would make it necessary for adaptors to frame and reframe problems from multiple, and possibly discrepant, perspectives, stimulating them to envision connections between previously unrelated ideas. Furthermore, by embedding employees within a heterogeneous information environment, brokering social networks would serve to counteract adaptors' tendency to focus on well-established and commonly accepted solutions, pushing them to process novel information and to combine ideas in unusual ways. At the same time, the close attention that adaptors pay to converting creative ideas into implemented solutions would allow them to take full stock of the idea-generation benefits inherent in brokering network positions. As a result, we expect that a workplace network rich in structural holes will confer the kind of social capital necessary to compensate for adaptors' main weakness—their tendency to generate few creative ideas—while concurrently helping them to fully profit from their strength in implementing creative ideas. These arguments lead to our central hypothesis:

Hypothesis 3. The more innovative (adaptive) an individual's cognitive style, the more a closed (brokering) workplace social network will enhance his or her innovative performance.

SETTING, DATA, AND MEASURES

We drew the empirical data to test our theory from a small Italian design and manufacturing firm, which we dub "ItalianSofa" to preserve anonymity. ItalianSofa has been a leading designer and producer of sofas for more than 40 years, with a presence both in Italy and abroad. This empirical setting is strategic to test the theoretical integration postulated in this study for multiple reasons. Interviews with the chief executive officer (CEO) and upper management suggest that both idea creation and idea implementation are of utmost importance to the organization. While some combination of idea creation and idea implementation is essential in all organizations and jobs (Amabile, 1996a), finding *evidence* of complementarity effects is not necessarily easy in many empirical settings. Creativity is certainly pivotal in a fashion-driven market in which design is a key element of success;

nevertheless, ItalianSofa is also a manufacturing firm, and as such it values operational and organizational efficiency. Furthermore, most of our interviewees stressed that ItalianSofa has a collaborative culture that emphasizes the role of informal, interpersonal relations within the workplace, both as a value in itself and as a means of increasing employee performance. Such emphasis on cooperation and social networks may partly reflect the fact that ItalianSofa is a family-owned business, as well as the broader national culture within which the company is embedded (Hofstede, 1976), and confirms us in our opinion that ItalianSofa is a suitable site in which to test how workplace social networks affect employees' innovative performance.

The sample that we use comprises the entire organization, including first-line managers and the CEO, amounting to 68 persons in total. A sample of this size is appropriate for complete-network studies using survey data. Smaller samples may be too low on statistical power, while larger ones may generate poor-quality network data owing to the cognitive effort required by complete-network surveys. For that reason, prior survey-based research using complete-network data has used samples of comparable size (Hayton, Carnabuci, & Eisenberger, 2012; Mehra, Kilduff, & Brass, 2001). We collected the data through personal distribution of two questionnaires: one to all members of the organization, and one only to managers. Because the organization is located in Italy, we administered the questionnaires in Italian. Participation was voluntary, and we assured participants that we would use the results only for research purposes and would not reveal their identities. The first questionnaire consisted of two parts: the first collecting demographic information and questions related to cognitive style, the second collecting relational data. We obtained a 100% response rate, which is of key importance because incomplete data create serious methodological problems in social network analysis (Wasserman & Faust, 1994). We stress that we collected network data through a "roster method"—that is, we did not ask employees to freely recall their contacts; rather, we presented them with a complete list of all other employees and asked them to tick their contacts. The roster method is superior to the less time-consuming "free recall" approach for two reasons: First, free recalls tend to provide less accurate information (Hammer, 1984); and second, research has shown that respondents have systematic biases when asked to recall their contacts' contacts (Kumbasar, Romney, & Batchelder, 1994). This is a problem for studies of brokerage, since individuals tend to recall fewer structural holes than there actually are, and such recall errors vary systematically with individuals' previous experience and personality traits (Casciaro, 1998; Janicik & Larrick, 2005). Because the roster approach reconstructs the complete network by consolidating information from respondents' direct contacts, it eliminates this problem. The second questionnaire asked questions related to employee performance and we distributed this only to those in a supervisory position (25 people).

We collected relational data about intraorganizational *advice* relations. These relations are key conduits of information within organizations (Lomi, Lusher, Pattison, & Robins, 2013), and have been found to influence performance (Sparrowe et al., 2001). Following a consolidated practice (Sparrowe et al., 2001), we phrased the network question as follows: "Which of your colleagues do you turn to for advice in professional, technical, or work-related matters?" We accompanied this question with a list containing (in alphabetical order) the names of all employees. We asked respondents to tick next to the names of their colleagues, indicating their sources of advice. We also asked them how often they turn to each colleague for advice. Possible answers were "at least once a week," "at least once a month," and "less than once a month" (Burt, 1984). We did not limit the number of nominated contacts, in order to reduce measurement error (Holland & Leinhardt, 1973). We recoded answers to indicate tie strengths, resulting in a directed, weighted network of interpersonal advice ties. We entered the data in a 68×68 square matrix and used UCINET 6.381 (Borgatti, Everett, & Freeman, 2002) to compute all network measures.

Respondents reported an average of 10.2 colleagues as contacts whom they consult for advice. Of these advice relations, 14.3% represent strong ties ("at least once a week"), 37% represent moderately strong ties ("at least once a month"), and the remaining 48.7% represent weak ties ("less than once a month"). The distribution of network ties suggests that lateral relations are of key importance. For example, 65% of advice relations by lower ranked employees are directed at their own hierarchical level, and interdepartmental ties abound, with as many as 69% of advice relations among lower ranked employees cutting across departmental borders. These statistics align well with the company descriptions that emerged during the interviews, which emphasized the role of interpersonal ties and collaboration as a key part of ItalianSofa's culture.

Measures

Cognitive style. We measured *cognitive style* using Kirton's (1976) Adaption–Innovation Inventory (KAI).[1] Kirton developed the KAI to measure his adaption–innovation construct (Kirton, 1976, 1989). It is a measure of cognitive style and not of level, meaning that it is independent of cognitive ability, cognitive complexity, and creative capability (Goldsmith, 1985; Kirton, 1978, 1987). Several studies found the scale's internal consistency to be high (Foxall & Haskins, 1986; Goldsmith & Kerr, 1991). Significant correlations between adaptive-innovative cognitive style and sensation seeking (Goldsmith, 1984), openness to change (Kwang, Ang, Ooi, Shin, Oei, & Leng, 2005), and other theoretically relevant personality dimensions (e.g., Basadur, 1995; Houtz, Selby, Esquivel, Okoye, Peters, & Treffinger, 2003) provide evidence of convergent validity. Discriminant validity is evidenced by statistical independence between cognitive style and measures of cognitive ability (Chan, 1996; Kirton, 1978, 1992). Cognitive style has been found to be stable over time (Taylor, 1994). Evidence for the scale's reliability is provided by a large number of studies conducted with different populations and in different countries (e.g., Bagozzi & Foxall, 1995; Shiomi & Loo, 1999). The instrument comprises 32 questions. Each question asks respondents how difficult it would be for them to behave in the way described—that is, to present a certain image of themselves for an extended period of time. Example items include "Never acts without proper authority" and "Likes to vary set routines at a moment's notice." Respondents select their answers from a scale of 1 to 5 (1 = *very hard*, 5 = *very easy*). Answers are coded in such a way that innovators score high, while adaptors score low. Because we use absolute scores (Pounds & Bailey, 2001), theoretical values range from 32 to 160, while the observed range in our sample is between 68 and 108. Consistent with theory and prior research (e.g., Kirton 1976, 1992), the observed distribution is normal according to both the Shapiro–Wilk test (Shapiro & Wilk, 1965) and the Skewness–Kurtosis test (Jarque & Bera, 1987), with a mean of 87.40 and a standard deviation of 7.72. The Cronbach's α for our sample is acceptable, but rather low (0.64)—an issue that we will address in the additional analysis section. Finally, we observed interdepartmental differences in average KAI scores, in accordance with prior research (Kirton & McCarthy, 1988). We found "marketing and communication" and "research and development" to be the most innovator-oriented departments (with average KAI scores of, respectively, 101.2 and 92.8), while "production" (85.3), "quality, safety and environment" (84.8), and "administration, finance, and controlling" (82.5) are geared more toward adaptors.

Network brokerage. We calculated *network brokerage* using the "structural holes" routine in UCINET 6.381 (Borgatti, Everett, & Freeman, 2002), which we specified as (the additive inverse of) Burt's original constraint measure (Burt, 1992: 55). This specification allows us to measure brokerage and closure as two polar opposites—that is, a high level of brokerage implies a low level of closure, and vice versa. This is consistent with our theory, with Burt's original formulation, and with extant literature on the brokerage–closure debate (Adler & Kwon, 2000; Burt, 1992, 2005). The measure of network brokerage pertains to the weighted, directed advice network, and ranges within the [0, 1] interval (0 = *maximal closure*, 1 = *maximal brokerage*).

Innovator–brokerage interaction. To test our interaction hypothesis (Hypothesis 3), we first mean-centered, and then multiplied, innovator and network brokerage to create a new variable, labeled *innovator–brokerage interaction*.

Innovative performance. We measured employees' *innovative performance* using the Role-Based Performance Scale (RBPS), a theory-based and widely validated measure of role performance (Welbourne, Johnson, & Erez, 1998).[2] The RBPS is a generalizable (that is, not context-specific) measure of employee performance, consisting of the following five components: job, career, team, organization, and innovation. For the purposes of this study, we used only the "innovation" subsection, because it directly captures the explanandum of our theory. The "innovation" subsection measures both idea creation and idea implementation, and comprises the following four items: "Coming up with new ideas," "Working to implement new ideas," "Finding improved ways to do things," and "Creating better processes and routines." The response format was a five-point Likert scale (1 = *needs much improvement*, 5 = *excellent*). Following Welbourne and colleagues (1998), our dependent variable was created using the sum of all responses, ranging from a theoretical minimum of 4 to a theoretical maximum of 20. We relied on supervisory ratings, asking supervisors to compile the "innovation" subscale of the RBPS for each

[1] The instrument is protected by copyright and was used with permission from the copyright owner.

[2] The instrument was used with written permission from Theresa M. Welbourne.

employee reporting directly to them, resulting in a single performance value for each employee based solely on the evaluations provided by his or her supervisor without discussing the evaluations with others. Supervisory ratings are the most commonly used proxy for measuring performance in organizations (Arvey & Murphy, 1998). The employee innovative performance data pertain to 67 employees rather than 68, because the CEO reports to no supervisor and hence was not evaluated.

Control variables. We controlled for a number of demographic, organizational, and psychological variables that might unduly affect our estimates of interest. Demographic variables include *gender* (female = 1), *age*, and *level of education*. Controlling for gender is important because it may affect employee cognitive style (Sim & Wright, 2002) and because supervisory biases may lead to differential performance evaluations based on subordinates' gender (Shore & Thornton, 1986). Age was included because older individuals tend to have a more adaptive cognitive style (Kirton, 1976) and may receive lower performance ratings than their younger peers (Ferris, Yates, Gilmore, & Rowland, 1985). Education was included mainly because of its theorized connection with innovative behavior (Scott & Bruce, 1994). Reflecting the Italian higher education system, the level of education variable was measured on a four-point scale (1 = *high school diploma*, 2 = *bachelor's degree* (three years), 3 = *laurea* (four-year, post-secondary, academic degree), 4 = *bachelor's plus master's degree*).

We included a control for *job tenure*, measured as the number of years in the job, because tenure may affect both employees' performance (Sturman, 2003) and ability to occupy brokering positions (Mehra et al., 2001). We also controlled for *hierarchical position* on a three-point scale (1 = *lowest level*, 3 = *highest level*), with a fourth level (4) as a reference category including only the CEO. We included this variable because prior work found it to relate to both advice network brokerage and innovative performance (Ibarra & Andrews, 1993).

We also added two variables characterizing individual traits that might confound our effects of interest. We controlled for employees' level of *self-monitoring*, using a revised version of the Self-Monitoring Scale (O'Cass, 2000). Prior research found high self-monitors to be more likely to occupy brokering network positions and to be better able to reap the benefits inherent in these positions (Mehra et al., 2001). Furthermore, high self-monitors are more likely to have an innovative cognitive style (Hutchinson & Skinner, 2007). We also measured employees' individualistic–collectivistic value orientation (*collectivism*) by using the Individualism–Collectivism Scale (Wagner & Moch, 1986). Evidence exists that individuals engaging in brokering behaviors may come across as being oriented toward individualistic values, which may hamper their performance in contexts in which collectivistic values are predominant (Xiao & Tsui, 2007). In addition, the connection between individualism and creativity (Goncalo & Staw, 2006) might suggest that individualistic–collectivistic value orientations may relate to cognitive style and innovative performance.

Extant research suggests that an employee's web of friendship relations within the workplace is an important source of both instrumental and emotional support that may enhance employees' performance (Brass, 1984; Hayton et al., 2012). To account for this, we collected data on each employee's friendship ties using a roster method and constructed a variable identified as *number of friends*. Because people's perceptions of who sees them as a friend are not always accurate (Crockett, 1982), we followed past research and considered a friendship tie to exist between two actors only if both actors reported it (Balkundi, Kilduff, Barsness, & Michael, 2007). We phrased the question for the friendship network as follows: "Please indicate the colleagues you regard as your friends." We also asked employees to indicate the strengths of their friendship relations, which we recoded to indicate tie strengths (1 = *weak*, 2 = *strong*, 3 = *very strong*). Because supervisors' ratings might be affected by their relations with the employees whom they are rating (Lefkowitz, 2000), we introduced two further control variables to account for this possibility. *Friendship from supervisor* controls for whether or not the supervisor rating the focal employee indicated a friendship relation to the employee, and if so, the strength of this tie (1 = *weak*, 2 = *strong*, 3 = *very strong*), with a tie strength of zero (0) indicating the absence of a tie. *Collaboration from supervisor* accounts for whether the supervisor indicated a collaborative relation with the focal employee; tie strengths were based on indications of collaboration frequency, phrased as "a few times over the whole year" (weak tie), "a few times a month" (medium tie), and "daily or almost daily" (strong tie).

EMPIRICAL ANALYSIS AND RESULTS

Because we estimated our model through ordinary least squares (OLS), we ran an extensive set of diagnostic tests to ensure that all assumptions

underpinning linear regression models were met in the context of our data. Both graphical and formal analyses showed that the residuals are normally distributed (Shapiro–Wilk W test for normality, $p = .14$), which is important for hypothesis testing. We found no evidence of influential observations. Studentized residuals were all below 2.5, and below 2 in all but four cases. These four cases were employees who had all been hired recently. Removing or keeping these observations left unaltered the direction and significance of our estimates of interest. The data show no sign of heteroskedasticity, as is confirmed by Cameron and Trivedi's (1990) decomposition test ($p = .44$) and appear to be linear in the parameters.

Table 2 presents means, standard deviations, and pairwise correlations among the variables. We notice that zero-order correlations provide prima facie evidence for two of our three hypotheses, indicating a positive relation between brokerage and innovative performance ($r = .36$, $p < .01$), as well as a positive relation between innovator and innovative performance ($r = .24$, $p < .05$). Pairwise correlations among our independent variables are relatively low. The triad of variables age, job tenure, and hierarchical position represents a mild exception, showing moderately high correlation coefficients and individual variance inflation factors ranging from 3.03 to 3.75. We are not concerned about multicollinearity, though, because the mean variance inflation factor (VIF) for our model is 1.85 and the highest value is 3.75. Furthermore, removing the triad of variables from our regression equation does not have any noteworthy effect on the significance and effect size of our variables of interest. It may also be interesting to note the significant positive correlation between the dependent variable and several of the control variables—namely, job tenure and hierarchical level ($p < .01$), as well as age, self-monitoring, collectivism, and collaboration from supervisor ($p < .05$). Of the organizational control variables, job tenure is the most strongly correlated with innovative performance ($r = .41$, $p < .01$), which suggests that accumulated work-related experience also plays a role in innovation success. Further, the fact that brokerage is positively correlated to hierarchical position ($r = .27$, $p < .05$) underscores the importance of controlling for hierarchy in our analysis.

Table 3 presents the results of our OLS estimations. Models 1–3 are nested: Model 1 estimates a specification including only control variables; Model 2 adds the effects of innovator and brokerage; Model 3 adds the interaction term—our core variable of interest. In all models, we mean-centered self-monitoring, collectivism, brokerage, and innovator to facilitate interpretation. Model 1 shows that, of all the control variables, only collectivism has an effect on our dependent variable. However, the effect is barely significant ($p = .097$) and loses significance completely with the addition of innovator. Model 2 introduces the innovator and brokerage variables. Their inclusion significantly improves the overall fit of the model, as the difference in *F*-tests between Models 2 and 1 is significant at the 0.01 level ($F(2, 54) = 5.17$). While collectivism is no longer significant, we do observe a weak positive effect of self-monitoring ($p < .1$), a result that might reflect the importance of interpersonal dynamics within ItalianSofa. In line with prior studies (Burt, 1992; Mehra et al., 2001), we find that being embedded in a brokering network positively influences employees' performance ($p < .05$), providing support for Hypothesis 1. With regard to cognitive style, we observe that innovators in our sample reach significantly higher performance levels than adaptors ($p < .05$), in line with Hypothesis 2. Model 3 introduces our core variable of interest, innovator–brokerage interaction. The coefficient for this variable is negative and statistically significant ($p < .01$). Importantly, introducing innovator–brokerage interaction substantially improves model fit, as indicated by the fact that the difference in *F*-tests between Models 3 and 2 is significant at the 0.01 level ($F(1, 53) = 13.46$). These results corroborate Hypothesis 3.

Owing to the nested nature of our data, we added a model to account for possible unobserved differences in performance ratings across departments. If not accounted for, these differences might generate clusters in the error structure, potentially affecting standard errors and significance statistics. We therefore augmented Model 3 by specifying cluster-robust standard errors at the department level (White, 1984) (see Model 4). Our three hypothesized effects became somewhat weaker, but continued to hold (innovator: $b = .17$, $p < .05$; brokerage: $b = 5.67$, $p = .05$; innovator–brokerage interaction: $b = -1.78$, $p = .02$). The highest VIF value in this model was 3.75, and the average value was 1.85. Furthermore, since our dependent variable is based on supervisory ratings and supervisors may systematically differ in their rating of employees, we added an additional model to account for this possibility. In Model 5, we augmented Model 3 by specifying cluster-robust standard errors at the supervisor level. The significance of our main estimates of interest remained unchanged (innovator: $b = .17$, $p < .05$; brokerage: $b = 5.67$, $p = .06$; innovator–brokerage interaction: $b = -1.78$, $p < .01$) (highest VIF = 3.75, mean VIF = 1.85).

TABLE 2
Descriptive Statistics and Correlations[a]

	Variable	Mean	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Dependent variable																
1	Innovative performance	12.97	3.07	1.00													
	Controls																
2	Gender	0.33	0.47	0.09	1.00												
3	Education	2.81	0.84	0.24	0.16	1.00											
4	Age	35.42	7.84	0.30	−0.13	−0.11	1.00										
5	Job tenure	3.06	2.04	0.41	−0.04	0.15	0.76	1.00									
6	Hierarchical position	1.52	0.77	0.41	−0.10	0.14	0.65	0.72	1.00								
7	Self-monitoring	40.91	4.66	0.28	−0.23	0.10	0.24	0.24	0.46	1.00							
8	Collectivism	46.48	3.64	0.29	0.07	0.11	0.04	0.12	0.17	0.09	1.00						
	Network structure																
9	Number of friends	2.60	1.93	0.13	−0.07	0.14	0.12	0.19	0.07	−0.09	0.09	1.00					
10	Collaboration from supervisor	2.81	0.40	−0.29	0.18	−0.02	−0.50	−0.47	−0.66	−0.32	−0.13	−0.10	1.00				
11	Friendship from supervisor	1.13	1.07	0.22	−0.18	0.20	0.34	0.40	0.49	0.26	0.01	0.14	−0.40	1.00			
12	Brokerage	0.69	0.12	0.36	0.01	0.16	0.12	0.17	0.27	0.11	0.14	0.24	−0.17	0.10	1.00		
	Cognitive style																
13	Innovator	87.40	7.72	0.24	0.16	−0.06	−0.05	0.04	0.02	−0.16	0.21	−0.07	0.10	0.12	−0.05	1.00	
	Interaction																
14	Innovator–brokerage interaction	−0.02	0.19	−0.19	0.01	0.22	−0.07	−0.02	−0.08	−0.08	0.20	0.06	−0.04	−0.06	−0.05	0.29	1.00

[a] All coefficients below –0.24 and above 0.24 are significant at the 0.05 level.

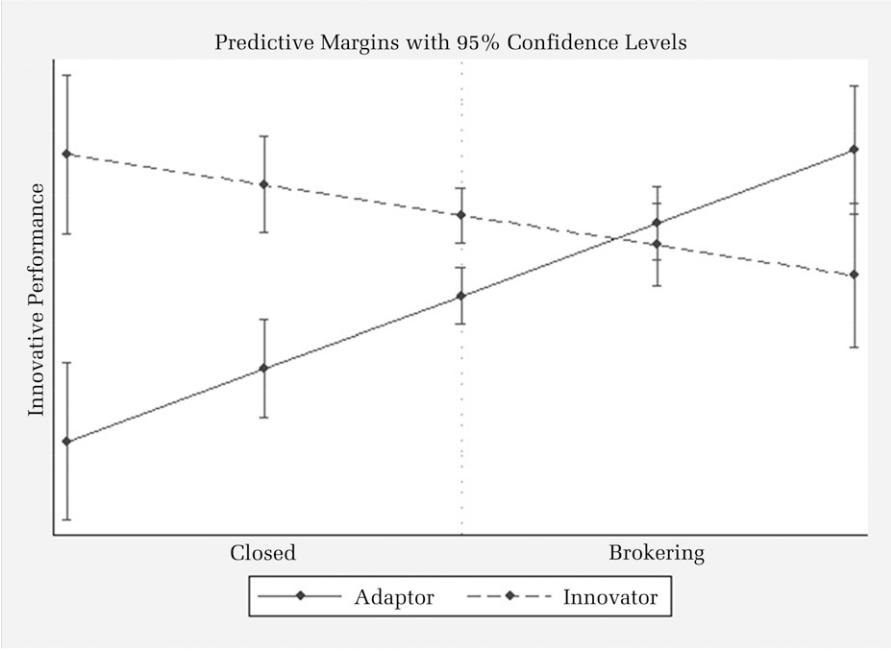
TABLE 3
Results of OLS Regression Models of Innovative Performance[a]

Variable	Model 1	Model 2	Model 3	Model 4[b]	Model 5[c]
Constant	10.37	11.72	12.84	12.84	12.84
	(4.90)	(4.59)	(4.15)	(2.37)	(3.62)
Controls					
Gender	0.85	0.58	0.31	0.31	0.31
	(0.78)	(0.74)	(0.67)	(0.33)	(0.59)
Education	0.48	0.58	1.05*	1.05**	1.05**
	(0.46)	(0.44)	(0.42)	(0.28)	(0.30)
Age	0.02	0.04	0.05	0.05	0.05
	(0.08)	(0.07)	(0.06)	(0.07)	(0.08)
Job tenure	0.32	0.29	0.29	0.29	0.29
	(0.31)	(0.29)	(0.26)	(0.22)	(0.24)
Hierarchical position	0.25	−0.27	−0.68	−0.68	−0.68
	(0.84)	(0.80)	(0.73)	(0.61)	(0.59)
Self-monitoring	0.12	0.16†	0.15*	0.15*	0.15*
	(0.09)	(0.08)	(0.07)	(0.05)	(0.06)
Collectivism	0.16†	0.09	0.13	0.13	0.13
	(0.10)	(0.09)	(0.09)	(0.08)	(0.11)
Network structure					
Number of friends	0.10	0.06	0.09	0.09	0.09
	(0.19)	(0.18)	(0.16)	(0.10)	(0.13)
Collaboration from supervisor	−0.44	−0.88	−1.63	−1.63*	−1.63*
	(1.18)	(1.11)	(1.02)	(0.68)	(0.72)
Friendship from supervisor	0.01	−0.15	−0.35	−0.35	−0.35
	(0.38)	(0.37)	(0.34)	(0.34)	(0.37)
Brokerage		6.38*	5.67*	5.67†	5.67†
		(2.87)	(2.60)	(2.58)	(2.86)
Cognitive style					
Innovator		0.11*	0.17**	0.17*	0.17*
		(0.05)	(0.04)	(0.07)	(0.07)
Interaction					
Innovator–brokerage interaction			−1.78**	−1.78*	−1.78**
			(0.48)	(0.63)	(0.61)
R^2	0.30	0.41	0.53	0.53	0.53
Adj. R^2	0.18	0.28	0.42		
F	2.42*	3.17**	4.64**		8.48**
N	67	67	67	67	67

[a] Figures in parentheses are the standard errors of the coefficients.
[b] Robust standard errors at the department level.
[c] Robust standard errors at the supervisor level.
† $p < .10$
* $p < .05$
** $p < .01$ (two-tailed tests)

Figure 1 allows us to gain more insights into the interaction effect that is the focal point of this study. The figure shows a two-dimensional interaction plot modeling the predictive margins from Model 3. The two intersecting lines show the expected innovative performance values of adaptors and innovators (defined, respectively, as 1*SD* below and above the mean innovator values observed in our sample), with all other variables held constant. Performance values are shown for 1*SD* and 2*SD* above and below the mean brokerage value observed in our sample, with the mean observed brokerage value represented by the middle dot. Standard errors, represented by vertical lines, are shown at 95% confidence levels. The figure shows that the effect of network structure on employee innovative performance is *opposite* for adaptors and innovators—namely, brokering more structural holes steeply increases the innovative performance of adaptors, but decreases that of innovators. An analysis of the margins indicates that the size of these effects is large. Compare two hypothetical employees, "Ashley" and "Judith." Both Ashley and Judith have an innovative style, defined as 1*SD*

FIGURE 1
Two-Dimensional Interaction Plot of the Innovator–Brokerage Interaction



above the mean value observed in our sample. Furthermore, they have identical characteristics (that is, age, gender, hierarchy, tenure, etc.) on all but the following aspect: Judith is embedded in a closed network (defined as a value of network brokerage 1*SD* below the mean observed in our sample), while Ashley is embedded in a brokering one (defined as a value of network brokerage 1*SD* above the observed mean). Corroborating the claim that closed social networks *improve* the innovative performance of innovators, our fitted parameters from Model 3 imply that Judith's expected innovative performance is 15% higher than Ashley's. Let us now take the hypothetical case of two employees, "Mary" and "Jane," with an adaptive style, defined as 1*SD* below the mean innovator value observed in our sample. As before, the only difference between them is that Mary is embedded within a closed network, while Jane's network is brokering (closed and brokering networks defined as above). Our predicted values imply that Mary's innovative performance score is well below average and roughly 34% below Jane's. These examples demonstrate at least two important things: First, our contingency argument explains a large share of variance in employees' innovative performance; and second, supporting our theory, there is a clear reversal effect whereby brokering networks boost the performance of adaptors, but hinder that of innovators (and vice versa for closed networks).

Robustness Checks

We ran several additional analyses to examine the robustness of our results. First, as previously mentioned, we found Cronbach's α for our sample to be acceptable (Flynn, Schroeder, & Sakakibara, 1994), but rather low (0.64). The reason for this is that four of the 32 items in our measure of cognitive style are weakly or negatively correlated to the rest of the items. When these four items are omitted, the value of Cronbach's α rises to 0.72—a commonly accepted, moderate level of reliability (Nunnally & Bernstein, 1994). Since we administered the questionnaires in Italian, the wording of these items may have had a different connotation for some of the respondents. This was the case in a recent study administering the KAI in Thailand, which also found reliability to be low owing to inadequate inter-item correlations, two of which were the same as our problematic items (Clapp, De Ciantis, Ruckthum, & Cornelius, 2010). As a robustness check, we also ran our analyses with these four items omitted. Direction and significance of our estimates of interest remained almost identical. We therefore chose to use the full 32-item measure, for comparability with other studies (Im & Hu, 2005).

Second, in addition to the analysis presented in Model 4, we conducted further analyses to account for possible unobserved differences across departments. We began by modeling departments' fixed effects, including a set of dummy variables. Because there are 11 departments within ItalianSofa and our sample size was 67, including 10 (cross-correlated) dummies in our regression model exceedingly reduced the model's degrees of freedom, while simultaneously generating huge multicollinearity (highest VIF = 18.52, mean VIF = 6.83). We therefore chose to run further analyses to pinpoint which departments systematically affected our results. We found consistently higher performance ratings in "marketing and communication" and "information systems," and consistently lower performance ratings in "logistics." We then ran our regression tests augmenting Model 3 with dummies for these departments (see Model 3 in Table A1). The main effect of innovator lost significance ($b = .01$, $p = .77$), while that of brokerage remained largely unchanged ($b = 4.30$, $p < .05$), as did the innovator–brokerage interaction ($b = -1.30$, $p < .01$). Additional analyses revealed that the effect of innovator tends to be washed away by that of "marketing and communication." As it turns out, this department has both a high average innovative performance and a strong concentration of innovators. As we discuss later, these results may suggest that the main effect of cognitive style on innovation may in part depend on how creative the context is within which employees operate.

Third, although network constraint is a widely used measure of network brokerage (Gargiulo & Benassi, 1999; Xiao & Tsui, 2007), we also ran our analysis using the alternative measure of ego network density. We found all three hypotheses to hold. The effect of innovator weakened slightly, but remained significant ($b = .15$, $p < .01$), while that of brokerage became stronger and more significant ($b = .08$, $p < .01$). The interaction of cognitive style and network structure was slightly weakened, but remained significant ($b = -.01$, $p < .05$).

We also ran additional analyses to ensure that our results held when including further control variables. We began by investigating the role of formal hierarchy. We created three dummy variables to model each hierarchical level separately, as opposed to estimating a single parameter, as in our main model. None of these dummies had a significant effect and including them did not affect our variables of interest. In an attempt to control for supervisors' span of control, we also constructed a variable called *number of subordinates*, capturing the number of direct reports of each supervisor (people in nonsupervisory roles were assigned a value of 0). This variable did not have a significant effect on innovative performance, nor did its inclusion change our results. Finally, we added a variable for *status*, since a sizeable body of work has shown that employees' informal status position within the workplace is an important predictor of performance (Brass et al., 2004; Sparrowe et al., 2001). We constructed this variable from data on advice relations. Asking for advice is a signal of deference from the advice seeker to the source of advice, and the extent to which such signals confer status depends on the status of the advice seeker (Ibarra & Andrews, 1993). Bonacich (1987) formalized this argument and proposed a network index, known as the Bonacich Centrality Index, which has become a standard measure of status among organizational network scholars (Friedkin, 1991). We therefore constructed our status variable using this measure. We set the β parameter to slightly less than the reciprocal of the eigenvalue ($\beta = .017$), as suggested by Bonacich (1987). Including this variable left our variables of interest unaffected (innovator: $b = .17$, $p < .01$; brokerage: $b = 6.29$, $p = .07$; innovator–brokerage interaction: $b = -1.76$, $p < .01$). The effect of status itself was not significant ($b = -.42$, $p = .77$).

We present additional analyses with robust standard errors, random intercepts, and random coefficients at the department and supervisor levels in the Appendix.

DISCUSSION

Although idea creation and idea implementation are both critical aspects of the innovation process, several previous studies have pointed out that the conditions favoring idea creation are often in contrast with those favoring idea implementation, resulting in what has been termed an "innovation paradox" (Miron-Spektor et al., 2011). Reflecting this paradox, research into the role of workplace social networks found that employees embedded in brokering positions have an advantage during the idea-creation phase, while closed networks of mutually tied contacts favor idea implementation. Since producing successful innovations requires both the creation and the implementation of novel ideas, this research did not offer conclusive answers to a question of both theoretical and practical relevance: Which type of network structure is most conducive to employee innovation? We offered one answer to this question by developing a "complementary fit" argument that

integrates an individual-level, cognitive perspective into existing network theory. Since workplace social networks influence the innovation process by shaping the information accruing to employees (Burt, 2004, 2005), we argued that understanding which kind of network position is more likely to heighten an employee's innovative performance requires examination of that employee's idiosyncratic information-processing style. Drawing from adaption–innovation theory (Kirton, 1976, 1989) in particular, we argued that workplace networks rich in structural holes maximize the innovative performance of employees with an adaptive cognitive style; conversely, closed networks boost the innovative performance of individuals with an innovative cognitive style. Using data on the individual cognitive styles and complete workplace social networks of all employees within a design and manufacturing firm, we found that our theorized complementary fit argument accounted for a large share of empirical variation in employee innovative performance over and above currently existing social network explanations.

By demonstrating that cognitive style moderates the effect of social networks on innovative performance, the present study contributes to the contingency view of social networks (Anderson, 2008; Burt, 1997). This line of inquiry significantly advanced our understanding of workplace social networks by unraveling how network effects vary depending on various critical contingencies, including the complexity of the information circulating through the network (Hansen, 1999), the speed at which such information changes (Aral & Van Alstyne, 2011), and the competence area of the actors receiving it (Carnabuci & Operti, 2013). Recently, multiple studies adopting a contingency perspective have focused on the role of individual cognition, showing that the same network structure may lead to very different outcomes depending on individuals' need for cognition (Anderson, 2008), level of self-monitoring (Mehra et al., 2001), and cognitive activation strategies (Smith, Menon, & Thompson, 2012). The present study contributes to this growing area of research by showing that individual cognitive style is a key contingency explaining how social networks affect employee innovation. Specifically, we posit that because adaptors and innovators have opposite strengths and weaknesses, they are likely to benefit from different network positions. Consistent with the notion of "complementary fit," we argued that a network rich in structural holes would supplement adaptors' shortcomings in the creation of original ideas, while at the same time providing them with more opportunities to exploit their distinctive strength in implementing such ideas. Conversely, a closed social network of mutually interconnected colleagues would help innovators to compensate for their main weakness—a difficulty in implementing ideas—while helping them to fully profit from their distinctive strength in coming up with novel and creative ideas.

Perhaps the most counterintuitive insight of our contingency argument is that being entrenched within a clique of densely interconnected colleagues may boost, rather than dampen, innovative performance for a nonnegligible portion of an organization's workforce. While this finding challenges the widely established tenet that individual innovation requires networks rich in structural holes, it is important to emphasize that the theoretical argument that explains this finding builds on and extends current social network theory. In line with extant network literature, we theorized and showed that employees with a brokering social network generally exhibit a higher innovative performance relative to comparable individuals occupying a closed network position. This finding corroborates the structuralist claim that networks affect employees' performance by shaping the information environment around them. Responding to recent calls for psychologically informed conceptualizations of social networks (Barsade et al., 2012; Kilduff & Krackhardt, 2008), our contingency argument advanced a straightforward, yet consequential, extension of the structuralist argument. While retaining the assumption that social networks affect the kind of information accruing to individuals, we drew from research on cognitive style to argue that individuals differ systematically in how they process the information accruing to them through the network. Allowing for such individual-level differences suggests that not all individuals benefit equally from the same network position. Consistent with this view, we combined insights from psychological and network research to argue that the heterogeneous information environment characteristic of brokering social networks is especially beneficial for individuals with an adaptive cognitive style. Departing from previous studies that found structural holes to benefit innovation in general, however, we argued further that a closed network of interconnected contacts boosts the innovative performance of employees with an innovative cognitive style. Thus our theorized mechanism enriches existing network-structural explanations by articulating

how cognitive style generates a reversal effect in the relationship between social networks and innovative performance.

In addition to contributing to the contingency view of social networks, the present study adds to the extant literature by explicitly integrating both the brokerage and the closure views of social capital within a unitary explanation. While the brokerage view builds on the premise that being innovative requires employees to generate creative ideas (Hemphala & Magnusson, 2012), the extent to which this ability converts into an employee's overall innovative performance may vary depending on his or her efficacy in implementing those ideas. Building on this insight, the closure view of social capital posits that because closed social networks facilitate idea implementation, while the presence of structural holes hinders it, under some conditions network closure may enhance innovation. Multiple scholars have pointed out that reconciling the brokerage and closure views of social capital is essential to deepening our understanding of how workplace networks affect performance (e.g., Adler & Kwon, 2002; Lin, Cook, & Burt, 2001). Toward this end, Burt (2005) proposed that one way in which to resolve the discrepancies separating the closure and brokerage views is to apply the two arguments to different levels of analysis. Accordingly, he suggested that the most innovative organizations are those whose employees build brokering connections outside their teams, but network closure within them. Other attempts at integrating the closure and brokerage views have built on the notion that innovation is a two-stage process, involving the creation of ideas and their subsequent implementation (Anderson, Potočnik, & Zhou, 2014). In this vein, for example, Obstfeld (2005) suggested that while brokering networks facilitate the generation of good ideas, as required by the first stage of innovation, success in the implementation stage necessitates the mobilization of closed networks.

Contributing to these integrative attempts, we reconciled the brokerage and closure views by incorporating the role of cognitive style within existing network-structural models of social capital. In line with the notion that social capital resides in the relations connecting individuals, received social capital research examined in detail the networks within which individuals are embedded (Brass et al., 2004), while it typically treated individual-level differences as nuisances that may be safely assumed away (Kilduff & Tsai, 2003). Departing from this approach, we proposed that individual cognition is an integral part of how social networks confer social capital to individuals. Accordingly, accounting for heterogeneity in individual cognitive style is critical to push further current theories of social capital. Augmenting existing network-structural models of social capital with insights from adaptive–innovative theory (Kirton, 1976, 1989), we illuminated the conditions under which brokering and closed networks enhance individual innovative performance, thereby explicitly incorporating both views within a unitary explanation.

Limitations and Future Research

This study has several limitations, which in turn point to opportunities for future research. While the research site chosen for our analyses allowed us to capture unusually rich information on employees' workplace social networks, a key limitation is that our data are cross-sectional. This makes it difficult to exclude the possibility of endogeneity, as well as to rule out possible alternative explanations for our findings. Because sizeable research has demonstrated that cognitive styles are stable individual traits that do not change over time (Taylor, 1994), endogeneity is unlikely to represent an issue with regard to this variable. Nevertheless, it is possible that cognitive style and innovative performance will concurrently affect which kind of social network individuals develop within the workplace. While conclusively ruling out endogeneity concerns is impossible in the absence of appropriate data, we carried out a set of additional analyses to ensure that the risk of endogeneity is limited. We begin by noticing that network position is uncorrelated with cognitive style ($r = -.05$, p = n.s.). Further, in a set of analyses not reported here, we used exponential random graph models (ERGMs) to examine further the relation between the aforementioned variables. A key strength of these models is that they enable direct parameterizing of the network structure at the dyadic and extradyadic levels, as opposed to aggregating network information at the individual level. This allows for estimating the probability that individuals with a higher innovative performance, or with a more innovative cognitive style, form a brokering tie. The ERGMs analyses suggest that neither individuals' cognitive styles nor their innovative performance affect the probability of developing a brokering network.

While these analyses alleviate our concerns of endogeneity, future research should put our theorized causal mechanisms to a more conclusive test.

Ideally, this would require a research design leveraging panel data within a quasi-experimental setting. While collecting complete social network data about various aspects of people's workplace network, as we have done, would probably make this task too daunting, a more realistic possibility would be to use archival network data in a way akin to Rider (2014). In order to tease out the causal effect of U.S. lawyers' social (professional) networks on their ability to find a prestigious job, Rider used archival data on each lawyer's history of prior organizational affiliations to trace his or her network contacts. Further, he exploited a quasi-experimental setting generated by the sudden and unexpected dissolution of six U.S. law firms. Treating these dissolution events as an exogenous shock causing mobility, the author was able to identify and gauge the causal effect of individuals' networks on structuring job opportunities net of possible endogenous factors. To provide more conclusive evidence in support of our arguments, as well as to rule out possible alternative explanations of our findings, future research could use a similar quasi-experimental design and test our theorized causal effects within a setting in which the workplace social network is shaken up by an exogenous shock.

A straightforward extension of our study would be to expand consideration to the interpersonal ties that employees create across organizations. While we focused exclusively on intraorganizational networks, prior research has shown that ties reaching out to other organizations are often an important conduit of information that may affect innovation (Mors, 2010). Indeed, one of the earliest studies on the relation between social networks and innovation identified the "gatekeeper"—an individual who draws information from the organization's external environment and spreads it internally through his or her workplace social network—as an especially critical figure within innovative organizations (Tushman & Katz, 1980). While many studies exist that examine the role of gatekeepers from a social network perspective, the theory developed in this paper suggests that it may be important to consider their cognitive styles, too. Our theory suggests that adaptors are likely to be more effective gatekeepers than innovators, for two reasons. First, the role of the gatekeepers is not to generate new ideas, but to draw ideas from the external information and to "translate" them, so that they become useful and usable within the organization (Tushman & Katz, 1980). Second, a distinguishing characteristic of a gatekeeper is that his or her internal and external networks are both rich in structural holes, because this is essential for the gatekeeper to be able to both tap and disseminate information efficiently (Allen & Cohen, 1969; Tushman, 1977). While testing this presumption empirically should be relatively straightforward, we believe that the results of such a test might shed new light on an important line of inquiry for scholars of networks and innovation.

The central hypothesis advanced and tested in the present study emphasizes the importance of complementary fit. Future research should extend our arguments by addressing a related question that we have left unanswered: What is the role of "similarity fit" in the link between cognitive style and social networks? Our conjecture is that, while complementary fit is important to understanding how cognitive style and social networks combine to affect individual performance, similarity fit may play a role in explaining with whom individuals prefer to form a tie. As Cable and Edwards (2004: 823) put it, similarity fit occurs when individuals experience value congruence, and as such it "should affect employees' attitudes and behaviors because people are more attracted to and trusting of others who are similar to them." In line with the concept of "network homophily" (McPherson, Smith-Lovin, & Cook, 2001), therefore, the notion of similarity fit suggests that employees should generally prefer to form a tie with contacts who are similar to them on some relevant dimension. Because people find it easier to trust and understand those similar to them, the similarity fit logic suggests further that similarity-based ties are also more likely to survive over time than ties between dissimilar persons. Taken together, these arguments lead to the conjecture that employees' social networks will generally comprise contacts with a similar cognitive style to that of the focal employee. By shifting the focus of analysis to the composition of social networks, rather than its structure, this line of argument highlights an interesting tension between the complementary fit and the similarity fit logics. On the one hand, people may preferentially form interpersonal ties with colleagues whose cognitive style is similar to theirs; on the other hand, the complementarity logic suggests that forming ties with contacts whose cognitive style is similar to their own might stifle individuals' innovative performance.

We began to explore this pair of conjectures using our study population. To examine whether employees are more likely to have ties with colleagues with a similar cognitive style, we ran a Geary (1954) autocorrelation test. The results of the test suggest that people do tend to have more ties with contacts whose cognitive style is similar to their own (pseudo $p < .05$).

To investigate whether this tendency depresses individuals' innovative performance, we first constructed a variable called *cognitive misfit*. This variable captures the extent to which an individual's contacts have a cognitive style that differs from his or her own. Specifically, it measures the (absolute value of the) difference between the focal individual's KAI score and that of each of his or her contacts, weighted by the strength of each tie. We then included this variable as an additional covariate to our main statistical model. The results show a positive and significant result of cognitive misfit on individuals' innovative performance ($b = .12$, $p < .05$). Taken together, our analyses provide initial evidence that people tend to form ties with others whose cognitive style is similar to theirs (reflecting a similarity fit logic), but that doing so hampers their innovative performance (in line with the complementary fit logic). While we regard this evidence as merely suggestive, we are hopeful that future studies will further explore these interesting results empirically, as well as theoretically.[3]

Future research could extend the arguments presented in this paper in several directions. One direction that seems especially promising links our results to the recent stream of research on social network activation. For example, Smith and colleagues (2012) found that high-status persons respond to job threats by seeking support from a relatively large share of their contacts and that the contacts they activate are often separated by structural holes. Conversely, low-status individuals respond to the same kind of threat by activating a smaller and more densely connected portion of their network. As mentioned above, we found that cognitive style does not influence individuals' social network position within our empirical setting. However, it is possible that adaptors and innovators differ in how they *use* their social networks. Since adaptors and innovators differ systematically in how they seek information when trying to solve a problem, they might also differ in how they navigate their network when seeking information. While we think that delving into these questions would help us to gain a better understanding of the link between cognitive style and social networks, the scope and research design of our study did not allow us to explore them. Similarly, we used a single organization for our empirical analyses. Testing our hypotheses across multiple organizations and sectors would be important in order to understand the scope conditions of our arguments. Most notably, the setting of our study places a premium on creativity. While this trait is typical of most innovation and brokerage studies, it would be important to examine whether our results hold in less creative settings. Interestingly, the theoretical arguments that we developed suggest that while the main effect of social networks and cognitive style may vary depending on how much emphasis the context places on creativity, the contingent effect that is at the core of our theory should not. The reason is that we predicted brokerage and innovator to have a main effect on innovative performance, because they increase the likelihood that employees will come up with new ideas. Since idea creation (unlike idea implementation) is a defining aspect of innovative performance in most contemporary organizations, one might speculate that the smaller the premium placed on creativity within a given context, the smaller the main effect of brokerage and innovator will be. Alternatively, one might suppose that contexts that place a premium on creativity may attract innovators, while repelling adaptors (Kirton & McCarthy, 1988), thereby generating a differential selection process. In line with this conjecture, we found a remarkable concentration of innovators within ItalianSofa's marketing and communication department, and additional analyses (see Appendix) provide initial evidence that a selection process may be at work. Whatever the specific mechanism, it seems likely that the effects of brokerage and innovator vary in intensity depending on context. Conversely, the complementarity benefit derived from combining idea creation with idea implementation, which is at the basis of our contingency hypothesis, should be robust across creative and noncreative sectors. We hope that future research will test the veridicality of these arguments.

[3] We thank an anonymous reviewer for pointing us in this fruitful direction.

Managerial Implications

This study also bears straightforward implications for managers and practitioners. The advances made over the past years in our understanding of workplace social networks have not only deeply influenced current management scholarship, but also changed the curriculum of management courses in executive education, as well the services offered by consulting firms in human resources and organization-related areas (Burt & Ronchi, 2007; Cross & Parker, 2004). Similarly, we think that the

insights generated by our study have direct and actionable implications that might enhance current managerial practice. On a general level, our findings demonstrate that if managers want to enhance the innovative performance of their employees, they need to develop a keen understanding not only of their employees' social networks, but also of their cognitive styles. Collecting social network data has become a well-established practice among many managers trying to increase the social capital of their employees (Cross & Parker, 2004). Our findings suggest that collecting data on employees' individual cognitive styles would provide managers with the additional information needed to understand which *type* of social capital their employees need. Recognizing that employees have different cognitive styles would also help managers to escape easy solutions that may have unexpectedly negative consequences. Let us imagine, for example, that a manager needs to foster out-of-the-box thinking to refresh the company's existing product line and therefore hires a highly innovative person. This manager may have learned from executive education, or through managerial books, that fostering novelty and creative thinking requires embedding the newly hired person within a brokering social network that spans structural holes. Our results suggest that, by nurturing such a network around the newly hired employee, the manager would inadvertently, but severely, hamper the new employee's performance. Knowing that innovators perform best within closed networks, while structural holes benefit adaptors, will allow the manager to avoid these kinds of misjudgments and help him or her to maximize the firm's innovativeness.

Similarly, the theory and findings presented in this paper provide guidance to employees seeking to boost their own innovative performance. Because different cognitive styles benefit from different kinds of social networks, gaining awareness of his or her idiosyncratic cognitive style is a necessary first step if an employee is seeking to develop an effective networking strategy. Our study suggests that employees should aim at developing a brokering or a closed social network depending on whether they have an adaptive or an innovative cognitive style, respectively. While the results we documented show that doing so would enhance employees' innovativeness, they also suggest that it may be a difficult goal to achieve. Within the research site analyzed by the present paper, for example, people's cognitive style had no discernible influence on the structure of their social networks. This might reflect different causes: People may not be aware of their own cognitive style, they may not be aware of the benefits deriving from developing a social network matching their cognitive style, or they may not be able to map and manipulate the structure of their network. Countering these causes likely requires specialized training. While research found that people often fail to identify structural holes among their contacts (Janicik & Larrick, 2005), for example, Burt and Ronchi (2007) showed that training employees about the advantages of structural holes leads them to develop a more brokering social network. In addition to training, building a social network that matches one's own cognitive style likely requires different socializing strategies. For example, company party mixers have become an established way by which individuals try to develop bridging connections with colleagues who are far from their own existing network (Ingram & Morris, 2007). Our results suggest that these kinds of events are likely to be especially beneficial for adaptors, because they may aid them in expanding the range of structural holes that they broker. Conversely, innovators should benefit from investing in team-building activities and *tertius iungens* ("third who joins") tactics aimed at creating cohesion between their contacts (Obstfeld, 2005), because these may help them to build closure within their social networks.

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APPENDIX

We conducted several analyses to account for possible unobserved differences across departments, as well as across supervisors. The results of these analyses are

TABLE A1
Results of Robustness Checks Accounting for Nested Data[a]

Variable	Model 1[b]	Model 2[c]	Model 3	Model 4[d]	Model 5[e]	Model 6[f]	Model 7[g]
Constant	12.84	12.84	8.80	10.20	11.20	8.80	8.80
	(2.37)	(3.62)	(3.28)	(3.18)	(3.09)	(2.84)	(2.84)
Controls							
Gender	0.31	0.31	0.34	0.34	0.52	0.34	0.34
	(0.33)	(0.59)	(0.53)	(0.47)	(0.46)	(0.46)	(0.46)
Education	1.05**	1.05**	0.28	0.25	0.34	0.28	0.28
	(0.28)	(0.30)	(0.36)	(0.30)	(0.30)	(0.31)	(0.31)
Age	0.05	0.05	0.04	0.03	0.02	0.04	0.04
	(0.07)	(0.08)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)
Job tenure	0.29	0.29	0.49*	0.61**	0.61**	0.49**	0.49**
	(0.22)	(0.24)	(0.21)	(0.22)	(0.22)	(0.18)	(0.18)
Hierarchical position	−0.68	−0.68	0.24	−0.15	−0.22	0.24	0.24
	(0.61)	(0.59)	(0.59)	(0.52)	(0.53)	(0.51)	(0.51)
Self-monitoring	0.15*	0.15*	0.01	0.03	0.05	0.01	0.01
	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)
Collectivism	0.13	0.13	0.07	0.14*	0.14*	0.07	0.07
	(0.08)	(0.11)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)
Departments							
Marketing & Communication			4.43**			4.43**	4.43**
			(1.15)			(0.99)	(0.99)
Information Systems			3.28**			3.28**	3.28**
			(0.98)			(0.85)	(0.85)
Logistics			−2.74**			−2.74**	−2.74**
			(0.68)			(0.59)	(0.59)
Network structure							
Number of friends	0.09	0.09	0.06	0.13	0.12	0.06	0.06
	(0.10)	(0.13)	(0.13)	(0.12)	(0.12)	(0.11)	(0.11)
Collaboration from supervisor	−1.63*	−1.63*	−0.05	−0.27	−0.54	−0.05	−0.05
	(0.68)	(0.72)	(0.83)	(0.81)	(0.80)	(0.72)	(0.72)
Friendship from supervisor	−0.35	−0.35	−0.10	−0.08	−0.11	−0.10	−0.10
	(0.34)	(0.37)	(0.28)	(0.25)	(0.25)	(0.24)	(0.24)
Brokerage	5.67†	5.67†	4.30*	4.00*	3.92*	4.30*	4.30*
	(2.58)	(2.86)	(2.03)	(1.87)	(1.97)	(1.75)	(1.75)
Cognitive style							
Innovator	0.17*	0.17*	0.01	0.03	0.05	0.01	0.01
	(0.07)	(0.07)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)
Interaction							
Innovator–brokerage interaction	−1.78*	−1.78**	−1.30**	−1.17**	−1.44**	−1.30**	−1.30**
	(0.63)	(0.61)	(0.39)	(0.33)	(0.45)	(0.34)	(0.34)
R^2	0.53	0.53	0.74				
Adj. R^2			0.65				
F		8.48**	8.74**				
N	67	67	67	67	67	67	67

[a] Figures in parentheses are the standard errors of the coefficients.
[b] Figures in parentheses are robust standard errors at the department level.
[c] Figures in parentheses are robust standard errors at the supervisor level.
[d] Random-intercept model with department as the higher level.
[e] Random-coefficient model with department as the higher level.
[f] Random-intercept model with supervisor as the higher level.
[g] Random-coefficient model with supervisor as the higher level.
† $p < .10$
* $p < .05$
** $p < .01$ (two-tailed tests)

reported in Table A1. First, we ran models with robust standard errors using the Huber–White Sandwich estimator, assuming error clustering at (a) the department level (Model 1), and (b) the supervisor level (Model 2). Second, we constructed three dummy variables for the three departments with significantly different performance ratings (Model 3). Third, we examined random-intercept and random-coefficient models with department as the higher level (Models 4 and 5). Fourth, we fitted both random-intercept (Model 6) and random-coefficients (Model 7) models at the supervisor level *in addition to* introducing the three department-level dummies.

We note that the results of these analyses should be treated with caution, because multiple scholars warn against running multilevel analyses when the number of higher level groups and/or the size of these groups is relatively small (e.g., Maas & Hox, 2005). This is certainly the case with our data: the number of groups is small (with a total of 25 supervisors and 11 departments), as is the size of these groups (on average, there are only 2.7 subordinates per supervisor and 6.1 employees per department). With this caveat in mind, the results indicate that both our central hypothesis (Hypothesis 3) and Hypothesis 1 are supported in all models, while there is weak or no support for Hypothesis 2. These results align with the premise that certain departments may attract and select individuals with a specific cognitive style, leading to a differential selection process. This appears to be the case within ItalianSofa's marketing and communication department, in which we observed a concentration of individuals with an *innovative* cognitive style (average KAI score: 101.2). Insofar as controlling for the effect of "marketing and communication" washes away the main effect of *innovator*, these results suggest that the benefits of an innovative cognitive style are limited in contexts in which most peers have that same cognitive style.