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Social Networks, Personal Values, and Creativity: Evidence for Curvilinear and Interaction Effects

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Taking an interactional perspective on creativity, the authors examined the influence of social networks and conformity value on employees' creativity. They theorized and found a curvilinear relationship between number of weak ties and creativity such that employees exhibited greater creativity when their number of weak ties was at intermediate levels rather than at lower or higher levels. In addition, employees' conformity value moderated the curvilinear relationship between number of weak ties and creativity such that employees exhibited greater creativity at intermediate levels of number of weak ties when conformity was low than when it was high. A proper match between personal values and network ties is critical for understanding creativity.

Keywords: social networks, personal values, creativity

Fueled by the notion that creativity in organizations often involves the synthesis or recombination of different ideas or perspectives, researchers have begun to look beyond individual cognitive processes for social sources of diverse knowledge (Amabile, 1988; Glynn, 1996; Perry-Smith, 2006; Perry-Smith & Shalley, 2003; Simonton, 1984). Acknowledging that cognitive limits and biases may constrain creativity (Cialdini, 1989), researchers have begun examining employees' social networks as possible sources of diverse knowledge and consequent creativity (e.g., Brass, 1995b; Burt, 2004; Perry-Smith, 2006). Indeed, a recent meta-analysis highlights the contribution of communicating with others to creativity and innovation (Hulsheger, Anderson, & Salgado, in press). Social networks may provide access to others with differing ideas and perspectives, or they may limit perspectives when composed of similar, closely connected others (Burt, 2004). Thus, social networks provide the opportunities and constraints that affect individual attitudes and behaviors (Brass, Galaskiewicz, Greve, & Tsai, 2004).

However, social network scholars have seldom considered how individual characteristics may interact with structural "opportunities and constraints" (Mehra, Kilduff, & Brass, 2001). The focus of social network research has been on the relationships rather than the attributes of the actors; one result is a lack of attention by social network researchers to personal characteristics. Individuals are typically assumed to respond appropriately to a particular network configuration, and little regard is given to individual difference. However, an individual who is not open to new ideas may miss the creative opportunities provided by a social network of diverse contacts. Alternatively, an individual who wants to explore novel ideas may be constrained by closely connected relations composed of similar others.

In this article, we adopt an interactional perspective (Shalley, Zhou, & Oldham, 2004; Woodman, Sawyer, & Griffin, 1993) and build on the previous network research (Brass, 1995b; Burt, 2004; Perry-Smith, 2006; Perry-Smith & Shalley, 2003) in hypothesizing that weak tie networks will create the opportunities for diverse knowledge and resulting creativity. We extend that work by investigating a previously untested curvilinear relation between weak ties and creativity: Too few or too many weak ties may not result in creativity. We focus on advice networks, as they are instrumental networks—which are essential for coming up with ideas that solve work-related problems—instead of expressive networks (cf. Krackhardt, 1990). Though previous research suggests that advice networks provide information, which is key for problem solving and creativity (e.g., Ibarra & Andrews, 1993), few prior studies have investigated effects of advice networks on

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creativity. Further, we propose that creativity will result from an interaction effect between social networks and an individual's personal values. Individuals who value conformity will not be able to take advantage of weak tie diversity.

Although prior studies have focused on environmental factors (e.g., Oldham & Cummings, 1996; Shin & Zhou, 2003; Tierney, Farmer, & Graen, 1999) and relations with others (Farmer, Tierney, & Kung-McIntyre, 2003; Scott & Bruce, 1994; Zhou, 2003), they have not addressed social networks or the interaction between networks and personal factors. Focusing on the result rather than the mental process, we define creativity as employees' generation of novel and useful ideas, both necessary conditions (Amabile, 1996; Ford, 1996; Mumford & Gustafson, 1988; Oldham & Cummings, 1996; Shalley, 1991). We distinguish creativity from the process of innovation (e.g., Obstfeld, 2005), which typically focuses on implementation of creative ideas.

Network Opportunities and Constraints

Weak Ties

Although human capital—an individual's cognitive skills and abilities—has traditionally been the focus of creativity research (Barron & Harrington, 1981; Torrance, 1974), scholars have recently coined the term *social capital* to refer to potential benefits for individuals derived from relationships with others (Adler & Kwon, 2002; Burt, 1992; Coleman, 1990; Lin, 1990; Nahapeit & Ghoshal, 1998). One such benefit is the diversity of information and perspectives provided by others. At the heart of the social capital notion is social network analysis (Brass et al., 2004), which begins with the assumption that individuals do not exist in isolation but are embedded in a network of social relationships. A social network refers to a set of actors (in this case, individuals) and ties representing some relationship, or lack of relationship, among the actors. The focal individual is referred to as "ego," and other individuals with whom the focal individual has relationships ("ties") are called "alters."

Ties between ego and alters are often characterized as strong or weak. The strength of ties is a function of frequency of interaction, duration, emotional intensity, and reciprocity (Granovetter, 1973). Thus, strong ties are often characterized as close friends, whereas acquaintances are considered weak ties. In proposing his "strength of weak ties" theory, Granovetter (1973) suggested that weak ties are more likely to connect to different social circles and to be the source of nonredundant information, whereas strong-tie alters likely are connected themselves and thus provide ego with redundant information. Our friends are likely to know each other and to be part of the same "clique," whereas our acquaintances are not as likely to interact with each other or to be part of the same social circle. Granovetter's strength of weak ties theory was supported by research from Friedkin (1980) and Hansen (1999), who found that weak ties tended to connect different groups and that strong ties were likely to be connected. Thus, weak-tie acquaintances may provide more novel, diverse, and nonredundant information. Brass (1995a) applied the same reasoning to suggest that weak ties would provide more diverse, potentially creative information. Subsequently, Perry-Smith (2006) found that weak ties were positively related to creativity but strong ties were not related to creativity.

In addition, we argue that ego's potential for creativity is enhanced when ego is exposed to perspectives and information that are different from ego's own, regardless of whether that information from alters is redundant or nonredundant. We focus on similarity between ego and alter, adopting a homophily explanation. Homophily, the preference for interacting with similar others (Byrne, 1971; Lakin & Chartrand, 2003), has been demonstrated with respect to gender, age, social status, race, education, religion, occupation, and other demographics (see McPherson, Smith-Lovin, & Cook, 2001, for a review). Explanations for homophily include ease of communication, similarity of experiences, and feelings that you can trust someone who is similar to you. Similarity increases interpersonal interaction, which in turn leads to more similarity (Erickson, 1988) as similar opinions and perspectives are mutually reinforced and mutual affect builds. Thus, we argue that strong ties, regardless of connections to other alters, will be more similar to ego than will weak ties. Weak ties are more likely to be dissimilar to ego and, hence, are more likely to expose ego to dissimilar knowledge and perspectives and to present opportunities to be creative.

As a singular relationship, a weak tie should provide different perspectives. More weak ties should provide more sources of novel ideas and therefore increase the probability of creativity (Campbell, 1960; Simonton, 1999). But, there may be a point of diminishing returns on the number of weak ties. There are at least three reasons for predicting a curvilinear relation between the number of weak ties and creativity. One, the amount of time the individual can devote to fruitful discussions with each contact decreases as the number of contacts increases beyond some optimal level. Thus, an excessive number of weak ties means very little involvement, to the point that diverse ideas and different perspectives are unlikely to surface. Discussions become superficially short, and weak ties become meaningless (Perry-Smith & Shalley, 2003). Two, developing and maintaining a large number of ties, at least to some minimal level of meaningfulness, may distract from the time the individual can devote to creatively developing new ideas (Perry-Smith & Shalley, 2003). Creativity requires focus, attention, and mental energy (Ward, Smith, & Finke, 1999); maintaining a large number of ties may distract from that activity and hinder making sense of it (Weick, 1995). Three, when the number of weak ties is too large, individuals are likely to experience information overload: They may be unable to sort through the voluminous, discordant information. Too many divergent perspectives may be cognitively taxing to the point of confusion and overload and thereby hinder rather than enhance creativity. Individuals may be unable to mix such a large amount of dissimilar information to create new synergistic and meaningful combinations (Ward et al., 1999). However, when the number of weak ties is few, individuals do not have sufficient dissimilar information and diverse perspective with which to produce ideas that are novel and useful.

> *Hypothesis 1:* There is a curvilinear relationship between number of weak ties and creativity such that employees exhibit greater creativity when their number of weak ties is at intermediate levels than when it is at lower or higher levels.

Our focus here is on exposure to diverse, novel ideas that may be integrated with existing knowledge to formulate creative solutions. We are not suggesting that weak ties involve the exchange of tacit, complex knowledge. Research at the group level has shown that the transfer of complex knowledge is better accom-

plished via strong ties with similar others (Hansen, 1999). Knowledge may be only loosely related, or even detrimental, to creativity, although some studies have suggested that accumulated knowledge over time is necessary for creativity (Weisberg, 1999). However, our hypothesis does not address the issue of whether "too much knowledge" is possible (see Weisberg, 1999, for a discussion on acquired knowledge and creativity).

Strong Ties

Strong ties may provide the positive affect and social support hypothesized to enhance creativity (Isen, Daubman, & Nowicki, 1987; Madjar, Oldham, & Pratt, 2002). However, strong ties may create pressures toward conformity. In addition, we note the homophily arguments described above. Friends are more likely to be similar to each other and therefore provide little in terms of diverse and novel information. Although we acknowledge the social support argument, we argue that the homophily tendency characterizing friendships will constrain differing perspectives and creativity.

> *Hypothesis 2:* The number of strong ties will be negatively related to creativity.

Density

Social capital benefits have also been hypothesized to result from densely tied networks. For example, Coleman (1990) noted that a dense network of closely tied individuals provides trust, development of norms around acceptable behavior and reciprocity, and monitoring of behavior and sanctions for inappropriate behavior. A densely connected cluster of individuals may be more motivated to provide reciprocal exchange of information and may provide an easily accessible network that can facilitate creativity and innovation.

Noting that not all weak ties connect to different cliques and that some strong ties may not be connected themselves, Burt (1992) proposed that a better measure of nonredundant information might be "structural holes." When ego has ties to two alters who are not themselves connected, a structural hole exists. Rather than use of weak ties as a proxy for disconnected alters, Burt suggested a direct, structural measure of nonredundant information: structural holes. Suggesting the same structural explanation as did Granovetter (1973), Burt argued that structural holes provided nonredundant information to ego. Burt (2004) found that ideas produced by managers with more structural holes were judged as more valuable than those produced by managers with fewer structural holes, in contradiction to Coleman's (1990) arguments.

In evaluating these contradictory arguments, we focus on Krackhardt's (1998) notion that third party ties are important. For example, a single tie may provide the social support for a creative idea, but when the direct ties of alters are also tied to each other, cliques of similar others develop along with corresponding norms for conformity to group pressures. Although it is possible that the group has a norm supporting creativity, the similarity in perspectives within the group provides little in the way of diverse ideas. Ego-network density represents an index of structural holes in an employee's network (Podolny & Baron, 1997). When density is high, there are few structural holes. To the extent that structural holes represent diverse ideas, we made the following prediction:

> *Hypothesis 3:* Ego-network density will be negatively related to creativity.

Differences in Individuals' Conformity Value

Although social network research traditionally focused on structural relationships, more recent studies have showed the value of examining attributes of individuals together with network structures (e.g., Klein, Lim, Saltz, & Mayer, 2004; Mehra et al., 2001). We contribute to this new line of research with our theory that personal values will moderate the relation between the network opportunities (i.e., weak ties) and creativity.

Among individual attributes, values have gained increasing attention in the creativity literature. Only a small number of values are fundamental human values (e.g., Schwartz, 1992). They are guiding principles in people's lives (Kluckhohn, 1951; Rokeach, 1973) and are essential in people's existence and functioning, regardless of where people live. Once formed, they tend to remain stable across time and situation and can distinguish individuals from each other. Among fundamental values, conformity is the value guiding attitudes and behavior in situations involving novel responses and change; thus, it is likely to influence relations between networks and creativity. Schwartz (1992) defined the conformity value as individuals' preferences for "restraint of actions, inclinations, and impulses that may upset or harm others, and violate social expectations or norms" (p. 89). Individuals who endorse this value consider obedience, self-discipline, politeness, and honoring parents and elders to be highly important and desirable. It is an etic dimension designed to capture values recognized across cultures, and cross-cultural studies have showed that it exists in different parts of the world (Schwartz, 1992).

Thus, we examined how conformity value interacts with the network opportunities. The extent to which employees hold the conformity value is likely to influence whether they can fully take advantage of the diverse information and resources embedded in the appropriate number of weak ties. Employees who have high levels of conformity are not likely to actively seek and extract dissimilar knowledge and novel perspectives from those with whom they have weak ties, because dissimilar or novel information and ideas, by definition, do not match existing expectations and norms. Those high on conformity value tend to restrain their cognitive attention to the ideas that do not comply with (or even violate) their existing expectations and norms. They will also have greater difficulty in combining and synthesizing diverse and dissimilar information to form novel responses and produce creative ideas, again because of their tendency to restrain their actions and to conform to the status quo and established ways of doing things. Hence, for employees high on conformity value, the potential opportunity provided by weak ties is not likely to result in production of creative ideas. Rather, the employees are likely to conform to existing structures and procedures in the organization.

In contrast, employees who value low levels of conformity are open to unfamiliar, dissimilar, and diverse information from those with whom they have weak ties. Not being constrained by existing norms and expectations, they can explore new and alternative ways of doing things when encountering differing perspectives. Consequently, they are more likely to combine diverse perspectives and to produce new and useful ways of doing things. Thus, although employees with low levels of conformity value are able to take

effective advantage of the diverse information and perspectives provided by appropriate number of weak ties (i.e., not too few, not too many), those with high levels of conformity value are unlikely to benefit from the opportunity afforded in their weak ties. Thus, we made the following prediction:

> *Hypothesis 4:* Individuals' conformity value will moderate the curvilinear relation between number of weak ties and creativity: Employees will exhibit greater creativity at intermediate levels of number of weak ties when conformity is low than when conformity is high.

Method

Sample and Procedure

We collected data from all 151 employees (100% response rate) and their 17 supervisors in a high-technology company in China. Of the employees, 76% were male, 79% had college degrees, and 19% had above-college degrees. Average age was 28.4 years, and average company tenure was 2.5 years.

Measures

We created Chinese versions of all measures by following the commonly used translation–back translation procedure (Brislin, 1980).

Creativity. We measured creativity by adapting a 13-item scale used in previous studies (Zhou & George, 2001). On a five-point scale ranging from 1 (*not at all characteristic*) to 5 (*very characteristic*), each employee's supervisor rated the extent to which each of the 13 behaviors was characteristic of the employee being rated. Supervisor ratings are widely used and are accepted in the creativity and innovation literature (Van der Vegt & Janssen, 2003; Zhou & Shalley, 2003). Sample items are "Comes up with new and practical ideas to improve performance" and "Comes up with creative solutions to problems." We averaged responses to the 13 items to create the creativity measure (Cronbach's $\alpha = .95$).

Number of weak/strong ties. To obtain social network measures, we gave each respondent a questionnaire containing a roster of the names of all employees in the company. This roster method of collecting network data helps recall and has been shown to be accurate and reliable (Marsden, 1990). This is particularly important when attempting to measure weak ties, as strong ties are more easily recalled in the absence of a roster of all employees. For each of the employees listed on the roster, the respondent was asked to indicate "to what degree is this person an important source of professional advice when you have a work-related problem?" by checking one of five choices: "not at all," "a little bit," "somewhat," "to a large degree," and "extremely." In a manner consistent with past research, each employee's number of weak ties was measured by counting the total number of persons a focal employee checked as "a little bit" or "somewhat" (Perry-Smith, 2006; Seibert, Kraimer, & Liden, 2001). We focused on advice ties (rather than, e.g., friendship or communication) because we felt that advice is a particularly important source of new ideas. We focused on internal network because previous research suggests that individuals, especially those not working in research and development functions, tend to discuss ideas that solve work-related problems only with other individuals who work in the same organization or unit (e.g., Burt, 2004). Hence, it is appropriate to focus on mapping out the internal network of an entire organization (e.g., Ibarra & Andrews, 1993). Further, to get a precise picture of the social network in the whole company, we surveyed everyone in the company, and many employees had neither opportunity nor need to communicate with individuals outside of the company due to their work roles. We used the square of the mean-centered (Aiken & West, 1991) number of weak ties to test our curvilinear hypothesis (Hypothesis 1). The number of strong ties was calculated as the number of persons a focal employee rated as "to a large degree" or "extremely."

Density. Using UCInet 6 (Borgatti, Everett, & Freeman, 2002), we calculated ego-network density by counting the number of ties between ego's direct-tie alters. This sum was then divided by the total number of possible ties, $n(n - 1)/2$. The maximum score occurs when every alter in ego's direct-tie network is connected. Density is sensitive to network size, but we effectively controlled for size by including both weak and strong ties in the regression.

Conformity. We measured conformity by using Schwartz's four-item conformity scale (Schwartz, 1992). On a seven-point scale ranging from 0 (*not important*) to 6 (*of supreme importance*), the employees reported how important each item was as a guiding principle in their lives. We averaged the responses to the four items to create the conformity measure (Cronbach's $\alpha = .65$).

Control variables. We controlled for variables that have been shown to be related to networks or creativity: organizational tenure, three different education levels (below-college diploma, college degree, and above-college degree), and tasks (three dummy variables representing different work titles; Oldham & Cummings, 1996).

Results

Means, standard deviations, and correlation coefficients for all measures are in Table 1. Because the number of weak ties and the number of strong ties were right skewed, we checked the normality of the residual distribution and found the residuals to follow a normal distribution (Kolmogorov-Smirov and Shapiro-Wilk tests were both insignificant; the normal Q-Q plot was almost a straight line). As expected, number of weak ties was significantly correlated with density, the measure of structural holes in this study. Although it is possible that people with a low value on conformity seek out weak ties or structural holes, the insignificant relation between conformity and weak ties (or density) in Table 1 suggests this is not the case. Conformity was also not significantly related to creativity.

We ran hierarchical regressions to test the hypotheses. To minimize any potential problems of multicollinearity and to better interpret the results, we centered the predictor variables before calculating the cross-product terms (Aiken & West, 1991). The variance inflation factors were below 2 for all variables with the exception of number of weak ties, the squared terms, and the three-way interaction term. Because the multicollinearity resulted from the creation of the polynomial term and the interaction term (not from high correlations between different main-effect variables), there is no problem in practice in the interpretation of the regression results (Cohen, Cohen, West, & Aiken, 2003; Neter, Kutner, Nachtsheim, & Wasserman, 1996). We entered the vari-

Table 1
Means, Standard Deviations, and Intercorrelations Between All Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Creativity	2.99	0.67										
2. Weak ties	25.67	31.48	−.03									
3. Conformity	4.16	0.92	.02	−.11								
4. Strong ties	6.36	10.25	.01	.12	.16*							
5. Density	43.60	17.56	.06	−.49**	−.03	−.32**						
6. Tenure	29.74	16.27	.14	−.05	.03	.03	−.04					
7. ed1[a]	0.79	0.41	.05	−.03	.04	.08	.01	.02				
8. ed2[a]	0.19	0.40	−.06	.05	−.09	−.06	−.01	.00	−.94**			
9. wt1[b]	0.05	0.16	.05	−.10	.15	−.11	.20*	.06	−.17*	.04		
10. wt2[b]	0.72	0.11	.13	.06	−.08	−.15	.05	−.11	.00	.04	−.38**	
11. wt3[b]	0.07	0.50	.09	−.12	−.02	−.02	−.08	.17*	.07	−.06	−.06	−.43**

Note. $N = 151$. Correlations greater than .16 are significant at the .05 level.
[a] Dummy variable for education level. [b] Dummy variable for work titles.
* $p < .05$. ** $p < .01$.

ables into the regression analysis at five hierarchical steps: (a) the control variables; (b) density, number of weak and strong ties, and conformity; (c) the two-way interaction between number of weak ties and conformity; (d) the curvilinear measure (i.e., number of weak ties squared); and (e) the Curvilinear × Linear interaction involving number of weak ties squared and conformity. Table 2 summarizes the results. To guard against potentially unstable regression coefficients caused by multicollinearity, we emphasized the interpretation of the ΔR^2 associated with a particular step at which a term testing a certain hypothesis was entered instead of interpreting the regression coefficients obtained at the final step of the regression analysis (e.g., Cohen et al., 2003; Pedhazur, 1982).

In keeping with the curvilinear prediction of Hypothesis 1, the ΔR^2 associated with the step at which the quadratic number of weak ties term entered was statistically significant ($\Delta R^2 = .04$, $p < .05$). As shown in Figure 1, the shape of the relationship is consistent with the hypothesis. We plotted this curvilinear relationship (inverted *U* shape, number of weak ties for the maximum point of curve = 49) by following the commonly used procedure of Aiken and West (1991). Thus, Hypothesis 1 received strong support.

Hypothesis 2 predicted that the number of strong ties was negatively related to creativity. It was not supported. We found no curvilinear effects for strong ties and no interactions between strong ties and conformity value, though they were not hypothesized. Nor was there support for Hypothesis 3 relating structural holes (density) to creativity. We tested Burt's (2004) constraint measure and a whole-network measure of structural holes (betweenness centrality) used by Perry-Smith (2006) and found no significant linear or curvilinear relations with creativity.

To test Hypothesis 4, we entered the three-way interaction at Step 5, as shown in Table 2. The ΔR^2 associated with Step 5 was statistically significant ($\Delta R^2 = .03$, $p < .05$); thus, Hypothesis 4 was supported. Following Aiken and West (1991), we estimated simple slopes at three different levels of weak ties: low (1 standard deviation below the maximum value of the regression curve), intermediate (the maximum value of the regression curve), and high (1 standard deviation above the maximum value of the regression curve). As indicated in Figure 2, the results showed that when employees had low conformity, the simple slope of the regression curve had a significant and positive value for low number of weak ties ($\beta = .04$, $p < .01$), had a value not significantly different from zero for intermediate number of weak ties ($\beta = .00$, $p > .10$), and had a significant and negative value for high number of weak ties ($\beta = -.01$, $p < .01$). When employees had high conformity, the simple slopes of the line were not significantly different from zero at low, intermediate, and high levels of weak ties, respectively. These simple slope tests provide further support for Hypothesis 4.

Discussion

Our results support our basic premise that individual values interact with the opportunities and constraints of social networks to affect creativity. With this study, we extend the research on the social side of creativity while recognizing the importance of individual attributes. Few social network studies have included personal attributes, as the emphasis has typically been on relationships and patterns of relationships rather than the attributes of actors (Brass et al., 2004). Those that have (e.g., Klein et al., 2004; Mehra et al., 2001) have focused on personality as an antecedent to network positions rather than take the interaction perspective adopted in our study. Although the weak ties provided the structural opportunity for creativity, only employees with low conformity value were able to take advantage of intermediate levels of weak ties. Even for those with low conformity value, the relationship between number of weak ties and creativity was curvilinear.

Unlike Burt (2004) but similar to Perry-Smith (2006), we did not find results for structural holes (density) and creativity. Having reviewed the findings and explanatory mechanisms, we conclude that weak ties and structural holes are correlated, but they are not the same. The nonredundancy of structural holes refers to information differences between alters but does not tap the information difference between ego and alters. Two alters may provide nonredundant information, but that information may be similar to ego's. Alternatively, two connected alters both may provide the same information to ego, but that information may be different from the information possessed by ego. Indeed, the redundancy of a dissimilar perspective from two alters may provide the needed repetition that draws ego's attention. By including both weak ties

Table 2
Summary of Regression Analysis Results

Model	β	*t*	ΔR^2
Step 1			.09*
ed1[a]	.16	0.49	
ed2[a]	.09	0.29	
Tenure	.13	1.55	
wt1[b]	.20	1.94	
wt2[b]	.30**	3.02	
wt3[b]	.21*	2.24	
Step 2			.01
ed1[a]	.14	0.41	
ed2[a]	.08	0.23	
Tenure	.13	1.53	
wt1[b]	.20	1.90	
wt2[b]	.32**	3.11	
wt3[b]	.23*	2.39	
Strong ties	.10	1.16	
Density	.07	0.71	
Weak ties	.03	0.29	
Conformity	.00	0.00	
Step 3			.00
ed1[a]	.14	0.41	
ed2[a]	.08	0.23	
Tenure	.13	1.50	
wt1[b]	.21	1.91	
wt2[b]	.32**	3.11	
wt3[b]	.23*	2.40	
Strong ties	.10	1.12	
Density	.07	0.69	
Weak ties	.04	0.37	
Conformity	−.01	−0.06	
Weak Ties × Conformity	.03	0.33	
Step 4			.04*
ed1[a]	.14	0.44	
ed2[a]	.06	0.18	
Tenure	.14	1.69	
wt1[b]	.21*	2.03	
wt2[b]	.33**	3.21	
wt3[b]	.27*	2.84	
Strong ties	.11	1.28	
Density	.16	1.51	
Weak ties	.52[c]	2.50	
Conformity	−.01	−0.17	
Weak Ties × Conformity	−.03	−0.31	
Weak ties^2	−.51*	−2.62	
Step 5			.03*
ed1[a]	.14	0.43	
ed2[a]	.06	0.18	
Tenure	.11	1.41	
wt1[b]	.21*	2.01	
wt2[b]	.35**	3.43	
wt3[b]	.28**	2.92	
Strong ties	.09	1.07	
Density	.16	1.57	
Weak ties	.50[c]	2.43	
Conformity	−.13	−1.29	
Weak Ties × Conformity	−.49[c]	−2.08	
Weak ties^2	−.44*	−2.24	
Weak Ties^2 × Conformity	.55*	2.11	
R^2 for total equation			.17*

Note. $N = 151$. Standardized coefficients are reported.
[a] Dummy variable for education levels. [b] Dummy variable for work titles. [c] The sudden change of the coefficient at the final step may indicate some degree of multicollinearity. This might be caused by the creation of the interaction terms with weak ties whose distribution was right skewed. One should focus on interpreting the significance of the ΔR^2 associated with each step rather than on interpreting the regression coefficients at the final step.
* $p < .05$. ** $p < .01$.

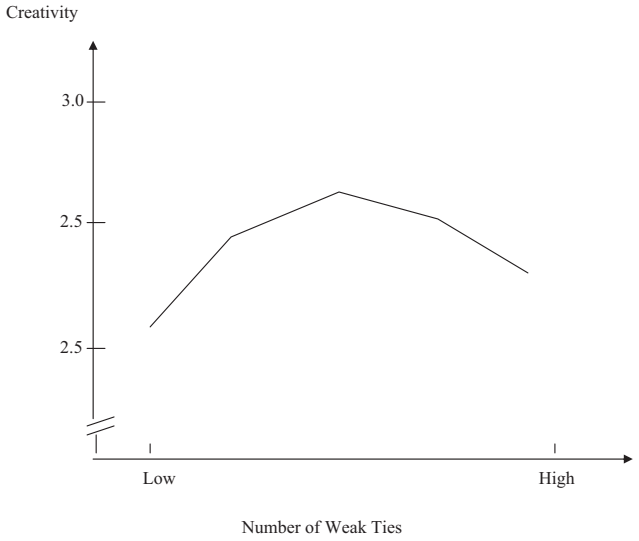

Figure 1. Curvilinear relationship between number of weak ties and creativity.

and density in our analyses, we attempted to separate nonredundancy between alters from similarity between ego and alters. Our results suggest that the homophily explanation for weak ties is more accurate than the nonredundant explanation that weak ties tend to connect nonconnected alters. Supporting this conclusion is our additional analysis of strong ties to different departments in the organization, which yielded nonsignificant results. Taken together, our data showed that weak/strong ties is the best proxy for novel information and that homophily is a better explanation than disconnection. The lack of results for structural holes when controlling for weak ties suggests that the explanation is more a matter of similarity between ego and alter than of nonredundancy between disconnected alters. Our results thus shed further light on how and why weak ties influence creativity.

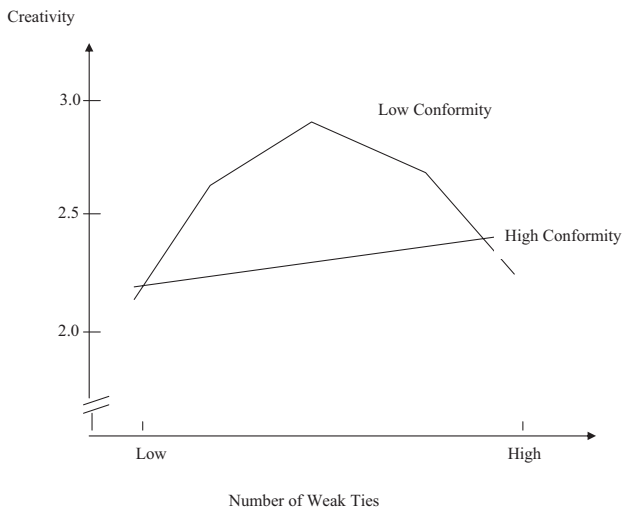

Figure 2. Curvilinear by linear relationship between number of weak ties, conformity, and creativity.

Few studies have examined the creativity of employees in China, and an alternative explanation for our results is the Chinese context of our study. For example, Xiao and Tsui (2007) found that structural holes did not have the same positive effect in Chinese as in Western samples. They suggested that connecting to disconnected alters represents the socially disparaging behavior of "standing on two boats" (p. 5). However, Perry-Smith (2006) also found no relationship between structural holes and creativity in her U.S. sample. In addition, Schwartz (1999) reported that the mean values on conservatism (similar to conformity) for the United States and China are very similar (3.90 and 3.97, respectively), with China ranking 23rd and the United States 25th among 39 countries. Although we do not mean to suggest that Chinese and Western cultures are the same, our major finding, that personal attributes affect whether people can take advantage of structural opportunities, seems culture free. However, it remains to be seen whether our results can be replicated in a Western country.

Although we hypothesized strong ties and density as constraints, we found no significant relationships between them and creativity. It is possible that they have both positive and negative effects on creativity. Strong ties may provide the personal support that enhances creativity (e.g., Madjar et al., 2002) but also the similar perspective, a view of the world that inhibits creativity. Dense networks may also inhibit creativity by reinforcing homophily among alters but may help in implementing creative ideas (Obstfeld, 2005). Future research may more fully explain whether strong ties are positively related to absorption and implementation of creative ideas (i.e., the innovation stage) via trust and affective and substantive support (e.g., mobilizing resources for implementing news ideas and practices). Further understanding can be gained by more specific measurement of idea generation and implementation and of underlying explanatory mechanisms.

Our cross-sectional design could not allow us to determine the direction of causality. For example, it is possible that people with a low value on conformity seek out weak ties and dissimilar perspectives. However, the nonsignificant relationship between conformity and weak ties (or density) suggests this is not the case. Still, it is possible that creative success makes one a more attractive partner, someone who is sought out by similarly creative alters who are otherwise dissimilar. Future research with a longitudinal or experimental design is needed to demonstrate the direction of causality. It is possible that social networks, personal values, and creativity are mutually causal, or that an additional unmeasured variable may have a common effect on all of them. For example, it is possible that creative success modifies one's conformity value and also leads to a more diverse social network, thereby providing more opportunities to be creative and a greater propensity to take advantage of those opportunities. Another very serious limitation is the possibility that another, unmeasured variable, such as positive affectivity or proactive personality (Seibert, Crant, & Kraimer, 1999), affects both networks and creativity. For example, employees high on positive affect may have more weak ties because it may be more enjoyable to interact with them, and, under certain conditions, positive affect may be conducive to creativity (e.g., George & Zhou, 2007).

Finally, we did not measure ties to people outside the organization, another possible source of divergent information, or types of ties other than advice. Prior research suggests that employees not in research and development usually get only information that leads to solutions to work-related problems and, hence, creativity from others working in the same organization or unit (e.g., Burt, 2004). The company at which we conducted the present study supplied application software (e.g., software for billing) to one industry (due to our confidentiality agreement with the company, we do not identify the industry), and this is not cutting-edge research. Prior theory suggests that there could be different predictors for different types of creativity (Shalley et al., 2004; Unsworth, 2001). It is possible that an internal network is sufficient for everyday creativity, whereas creativity in cutting-edge research would benefit from both internal and external networks. Future research should examine this possibility.

Managerial implications include structuring formal task assignments (committees, training programs) and informal activities (e.g., organizationally sponsored team sports) to promote weak ties and expose employees to others with differing perspectives. Creativity training should include the "social side" in addition to exercises focusing on cognitive process. Simple awareness of the results of this and other research may provide motivated employees with actions (building weak ties to dissimilar others) that they can initiate. As our curvilinear results suggest, employees with low conformity value can benefit from the right mix of "not too few/not too many" weak ties.

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