2024-1359 IJOI
https://www.ijoi-online.org/

International Journal of Organizational Innovation

DOES CREATIVITY LEAD TO INNOVATION? THE SOCIAL NETWORK EFFECT ON IDEA GENERATION AND ITS IMPLEMENTATION

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Abstract

The paper examines the interplay between individual creativity and firm innovation through social network perspectives. Exploring the process of idea generation through to its implementation, the study argues that individuals' position in their social networks affects both new idea generation and implementation of new ideas. The study investigates this network effect using data from an architecture firm in Finland. The results indicate that brokerage position enhances generating new ideas, while closure will spur the implementation of the ideas. The study addresses the new research direction of how and when individuals' network positions - brokerage and closure, affect creativity and innovation, respectively.

Keywords: Social networks, Network positions, Creativity, and Innovation, Knowledge Firm

Introduction

Creativity at work – the development of novel and useful ideas, processes or solutions (Amabile, 1996) – can provide a critical advantage for individuals' careers. In particular, the ability to come up with novel and useful ideas or solutions can benefit professional workers' career advancement, as their workload oftentimes includes unseen and unobservable inputs, such as intellect (e.g. architects and designers).

In an attempt to addressing the question of why some individuals are more creative than others, psycholo-

gists have emphasized the role of individuals' intellectual capabilities (Sternberg, 1977), personality traits (Nicholas, 1972) and emotional states (Amablie, Barsade, Mueller, & Staw, 2005) on creativity. However, recently, given that many firms reformulate their organizational structure toward more teamwork based one, creativity at work becomes accomplished through interaction and communication among team members. Reflecting such collective process required for creativity at work, social network researchers investigated how and to what extent individuals' structural position in their social networks can spur creativity at work in firms (Perry-Smith, 2006).

Meanwhile, innovation - the process by which the ideas and products are implemented and diffused (Von Hippel, 1988) is one of most important factors determining a firm's survival in highly competitive business environments. In answering why some firms are more innovative than their competitors, prior research has demonstrated that the capability of a firm to come up with successful innovative products or services is a function of its inimitable resources and core competences (Wernerfelt, 1984; Hnn-Hui Hii, 2004). Drawing on a more social network perspective, however, another stream of innovation research examines the effect of employees' social networks on firm-level innovation. For example, research suggests that maintaining close ties with colleagues is key for implementing creative ideas (Kijkuit & Van den Ende, 2007).

Given that both individual creativity and firm innovation are not only the exemplars of firm performance, but also they are interrelated to each other, the study applies social network lens to investigate the relationship between the two. Social network research has argued that two positions in social networks affect firm performance: Closure and brokerage (Coleman, 1988; Granovetter, 1973; Burt, 1992). Closure refers to networks where every individual is strongly interconnected, whereas brokerage denotes networks where individuals are located between otherwise disconnected others. However, there still exists controversy over determining which are driving forces that enhance firm performance, in particular, clarifying the effect of both brokerage and closure on creativity/innovation since substantive evidence has been found supporting both arguments (Burt, 2004; Fleming, Mingo & Chen, 2007). Proponents of closure argue for the benefits of trust, redundant information paths, and cooperation on creativity (Milliken, Bartel, & Kurtzberg, 2003; Kijkuit & Van Den Ende, 2007), whereas those of brokerage emphasize the benefits of the accessibility to knowledge and opportunities, and controlling information (Burt, 2004).

One main reason for the failure to reconcile the controversy is that previous network studies have typically focused on individuals' network position, based solely on the assumption that the two mechanisms - closure and brokerage, are in a rivalry, not in a complementary relationship. Social network research tends to either examine closure or brokerage mechanism separately or to determine empirically which mechanism better explains

creativity at work. However, recently, researchers agree that individuals can possess a mixture of both closure and brokerage, implying that the two mechanisms are complements, rather than substitutes (Ahuja, 2000). Then, individuals can enjoy benefits from access to diverse information and resources located in distant clusters while maintaining the benefits of embedding in local clusters (Reagans & McEvily, 2003).

Another more important reason arises when people define the relations between creativity and innovation: Research has assumed that creativity has been considered as a necessary condition for a firm's innovation (Amabile, 1988), thus little attention has been paid to exploring the links between individual creativity and firm-level innovation. However, the underlying mechanism between the two should be investigated more thoroughly, since the literature has not clearly answered the question about whether increasing creativity always enhances innovation. Although the standard definition of innovation presumes that creativity is a necessary condition for innovation, individual creativity may not always enhance a firm's innovation, implying that too much creativity may hamper innovation.

Borrowing from such social network perspectives, the study examines how individual network position will affect creativity and innovation, respectively. More specifically, by disentangling the process of generating ideas from the process of implementing ideas, the study's main argument is that while brokerage position helps the generation of novel and useful ideas, closure position positively affects the implementation of such creative ideas.

Network Position

Social network researchers have argued that two mechanisms – closure and brokerage affect performance, respectively (Coleman, 1988; Granovetter, 1973). The closure mechanism enables individuals to benefit from group cohesiveness in their social networks. For examples, individuals who have close-knit clusters are more likely to develop reciprocity norms, trust in one another, and a shared identity, all of which lead to a high level of cooperation (Coleman, 1988).

The brokerage mechanism, in contrast, emphasizes the importance of access to diverse information and bridging ties connecting different parts of the network (Burt, 1992). This view highlights the advantages an individual derives from bridging ties that span structural holes – the position between other individuals that are not directly linked in the network (Burt, 1992).

The Benefits of Social Network on Creativity/Innovation

Social network research recognizes the importance of social networks for creativity but disagrees on whether brokerage or closure mechanism enhances creativity (Fleming et al, 2007). Proponents of brokerage have argued that some individuals have positional benefits of connecting with others who have different interests and diverse perspectives through structural holes (Burt, 2004). Given that creativ-

ity starts from being exposed to novel and diverse perspectives, then individuals with many structural holes have better chance to generate novel ideas.

In contrast, proponents of closure have demonstrated that within cohesive groups, individuals tend to facilitate information, since they all have strong relationships based on mutual trust (Coleman, 1988; Milliken et al, 2003). Because creativity benefits from new information, sizable information flow through trust-based relationships can enhance creativity (Milliken et al, 2003). In addition, individuals' cohesive ties can facilitate the exchange of fine-grained information, which tends to be tacit and complex (Uzzi, 1997; Hansen, 1999). Tacit knowledge can flow more easily in cohesive groups based on mutual trust, where individuals have less fear of damage and greater expectations of reciprocity. With substantial evidence of each line of research on creativity, each stream of network research may argue correctly. However, these contradictory results may arise from the fact - treating both creativity and innovation as a single outcome rather than a somewhat complex process: Creativity and innovation takes place in a context where insights and ideas are originated from social networks among individuals. Reflecting the collective process of creativity and innovation, this study investigates whole processes of how the newly generated ideas are implemented through employee' structural position in social networks over time.

Idea Generation Stage

In the idea generation process, individuals who are positioned as brokers are more likely to be exposed to diverse ideas that have not been combined (Burt, 2004) than those who are not. Whereas cohesive groups are more likely to form between individuals who are similar in emotional state and functional backgrounds, structural holes are less contingent on these similarities (Burt, 1992). Especially in terms of functional background similarity, many structural holes individuals have represented a heterogeneous collection of individuals with different functional backgrounds, and being connected to different functional backgrounds will enable individuals to be exposed to and access new perspectives (Perry-Smith & Shalley, 2003). The exposure to diverse perspectives is achieved through brokerage, since through brokerage position, individuals can receive non-redundant information for creativity.

The non-redundant information should facilitate the generation of novel and divergent ideas. Thus:

Hypothesis 1. In the idea generation stage, individuals who are located in the brokerage position are more likely to generate new ideas than those who are not.

Idea Implementation Stage

Within social cohesive groups, information is more or less redundant since information revolves mostly within the groups (Burt, 1992). With limited exposure to new information and resources, closure position may not help generating new ideas. In addition, the emotional intensity garnered

by closure may force members in groups to conform in decision making processes, which will hinder the generation of new ideas and perspectives (Amabile, 1996). But generating creative ideas alone is not sufficient for a firms' success. Even breakthrough ideas may not be a key for firm innovation without the implementation where new ideas garner support forward to their realization.

From a social network perspective, although people in brokerage positions have a better chance to generate novel ideas than people in less brokerage positions, it is not certain whether their novel ideas are well realized through implementation processes. Brokers may tend not to disclose novel ideas and may even tend to conceal information about new ideas since the behavioral orientation of brokers is more leaning toward tertius gaudens – the third party who enjoys, whose value is not based on cooperation, but more on competition (Burt, 1992); Brokers often profit at the expense of others. Given that individuals' possession of new ideas is one of the crucial keys to being creative (Perry-Smith, 2006), and the possession of these ideas may be a key for outperforming others, brokers with many structural holes are hesitant and possibly reluctant to exchange their new ideas with others. Thus, it may be difficult to realize creative ideas through the implementation (Fleming et al, 2007).

However, the implementation of new ideas will be possible only if employees can freely discuss their applicability to the real world. Fruitful discussion of the ideas' usefulness can be achieved through mutual understanding - the ability to understand and build on each individual's ideas (Kurtzberg & Amabile, 2001). Through mutual understanding, individuals can check if the ideas are well suited to the firms' needs and values (Kijkuit & Van Den Ende, 2007). Mutual understanding of ideas can be easily achieved through closure mechanism. Individuals within closure structure are more willing to devote the time and effort to discuss new ideas than those within brokerage. Since people in closure network typically formulate a cooperative atmosphere based on a high level of mutual trust (Coleman, 1988), compared to brokerage, individuals within closure structures are more willing to discuss the feasibility of ideas without the fear that their novel ideas will be realized by others. Therefore, individuals being located in a closure position can easily check the applicability of novel ideas by sharing and discussing those ideas with others than brokers, and they can contribute to implementing creative ideas. Thus:

Hypothesis 2. In the idea implementation stage, individuals who are located in the closure position are more likely to implement new ideas than those who are not.

Methods

Research Site

The research site for this study is an architecture firm in Finland, which requires knowledge - intensive work. The firm's major revenue source is designing architecture based on clients' needs and the nature of the work is

project-based. Various types of architecture projects are assigned to teams. The empirical context is an ideal setting. First, it can encapsulate the whole process including from generating creative ideas to their implementation. Second, since the firm formulates team-based organizational structures, the study can capture how members can collectively work to generate creative ideas at work. In addition, since high level of interaction with their colleagues to complete their task is encouraged in teamwork organizational structure, idea generation and its implementation will take place in a context where insight and ideas are originated from social networks among individuals.

In each team unit, a middle manager is a leader who is responsible for managing certain types of design projects (e.g. retail, sport arenas, interiors, etc.), and both senior and project managers coordinate projects and guide professionals to work accordingly. Professionals participate in designing and drawing architecture. Among a total of six hierarchies of the firm - Top managers, Middle managers, Senior project managers, Project managers, Professionals, and administrative staff, the majority of the individuals are professionals, project managers, or senior project managers, and nearly all of these individuals were educated from architecture or design institutions. Top managers are the founders and owners of the firm, and the administrative staff provides accounting, payroll, Information Technology (IT) support, and front desk service. To examine the collective process of creativity, the study restricted the sample size to middle managers, senior project managers, project managers, and professionals. Also both top managers and administrative staff are exclude from the sample, since their role and education is not directly related to creativity at work.

To test hypotheses, the study gathered data from multiple sources. The study collected network data on individual individuals' structural position through an online survey instrument over one month. The survey had a high response rate of 85 percent (84 out of 93), and 92 percent (77 out of 84) of those respondents completed the entire survey. However, to examine the whole network structure in the firm, a total of 93 respondents were considered in the study. In addition, employees' demographic data were obtained from the human resource department of the firm.

Network Data

The study collected network data by combining the egocentric technique with the sociometric technique (Wasserman & Faust, 1994: P 45-50). In defining an appropriate boundary around the network, the set of individuals who are interconnected is critical (Laumann, Marsden, & Prensky, 1983). Conversely, the sociometric technique provides each respondent within a fixed contact roster and asks him/her to describe his/her relationship with every individual on the roster. A virtue of the sociometric approach is that it provides information about all interactions inside a network. This technique, however, may cause inaccuracies in the network data. To the extent that the network boundary varies

from one person to the next, asking each respondent to report on connections that include infrequent and even nonexistent relationships can be problematic. Individuals tend to provide more accurate network data about those with whom they are familiar. In contrast, in the egocentric technique, each individual responds to a series of questions that generate names, resulting in a roster of contact (Burt, 2002). Next, the respondents are asked to describe their relationships among their contacts. A virtue of the egocentric technique is that it asks an individual to report on his/her network with whom he/she is familiar. Individual responses are aggregated to describe the total network. A network can be constructed based on their reported relationships with each other in the firm. However, a potential drawback of the technique is that it can miss important interactions that lie outside of a respondent's frame of reference.

Combining both the sociometric and egocentric techniques, the survey questionnaires permitted the respondents to define their own networks from a roster of names that included everyone on the same office floor before answering detailed questions about their social networks. To capture everyone's set of informal contacts, as a first step, the study asked respondents - "Name those that you have been communicating with work-related topics during the past year from the roster of names." The study asked this question because an individual may be exposed to concepts that may spark creativity during informal conversations. To reduce measurement errors and enhance reliability (Marsden, 1990), the study used a free choice approach that did not restrict the number of names an individual could select. Moreover, to reduce the information inaccuracy bias (Bernard, Killworth, Kronenfeld, & Sailer, 1984), particularly, differences in perceptions regarding what constitutes an acquaintance or a friend, the study designed survey questions with an ordinal scale. After respondents selected names following the first question, the next question asked respondents - "Add to your list anyone else that you communicate with about work-related topics, even those you interact with less frequently, more informally (e.g. during lunch or coffee breaks)." The study added this question to prime the respondents to include their weaker contacts, since research reveals that respondents tend to stop adding names before including weaker contacts in their responses to the first question (Perry-Smith, 2006). The study ran the survey in 2006 to reveal the social networks among employees in the firm. Only individuals working on the same open office floor were included in the survey. The survey questionnaire was detailed and took around 30-45 minutes for the respondents to answer.

Measures

Dependent Variable.

Idea generation and its implementation - Idea generation is measured based on the number of times an individual was named as a source of ideas. Idea implementation is measured by the number of times an individual was named as a promoter of ideas. Both measurements were based on respondents' perceptions of creative and

idea-promoting individuals, after having participated in the projects over time. The questionnaire mapped the most influential individuals who are both 1) sources of novel ideas, and 2) promoters of those ideas. The study measured the two in 2007, one year after completing the network survey in 2006 and standardizing the two. By using a fixed-choice one-way questionnaire (Wasserman & Faust, 1994), the respondent was not given a roster of names of other colleagues in the firm. Instead, he/she named five colleagues in terms of 1) being as a source of new ideas, and 2) promoting new ideas to the implementation.

Independent Variable.

Network position - After compiling a list of contacts, respondents were asked to describe their relationship with each contact. Although network position should ideally assess the communication frequency, emotional closeness, and duration (Granovetter, 1973), with a few exceptions (Hansen, 1999), researchers have typically used a single measure of network position, such as closeness (e.g. Lin, Ensel, & Vaughn, 1981) or frequency (Nelson, 1989). The study measured closure and brokerage solely based on communication frequency. Since the research site is an architecture firm, social interaction between employees is most likely work-related, and emotionally close relationships such as friendship may not be observed in business settings. Also, due to the relatively high rate of turnover of professionals, tie duration may lack validity in this research setting. To assess frequency, the question of how frequently respondents communicate with the contact on average, using a 5-scale (0 = "never," 1 = "less than once per month," 2 = "once per month," 3 = "weekly," 4 = "daily") was asked. The study defined strong ties as individuals who communicate with each other weekly or more. The study dichotomized the tie strength values so that 1 reflected a strong tie, and 0 reflected weak ties. In addition, the study symmetrized the 93 x 93 matrix of relationships by assuming that a tie exists from the ego to the contact if the ego reports a relationship, since the lack of reciprocity may characterize potential broker positions (Burt, 1976). Each individual's network position was measured through UCINET VI (Borgatti, Everett, & Freeman, 2002).

One of the two explanatory variables is closure. The study measured the degree of closure by calculating ego network density - number of directed ties divided by number of ordered pairs multiplied by 100, where tie denotes the total number of ties in the ego network and pairs describe the total number of pairs of alters in the ego network (e.g. potential ties). The measure denotes what percentage of all possible ties in each ego network is actually present (Hannemann & Riddle, 2005).

The other variable is brokerage. The study measures betweenness centrality, a measure of the extent to which each individual occupied a structurally advantageous positions, connecting otherwise unconnected others in social networks (Freeman, 1979), to measure brokerage (Mehra, Kilduff, & Brass, 2001). The study selected this measure rather than autonomy, such as constraint (Burt, 1992) because

betweenness centrality takes both direct and indirect ties into account, whereas constraint focuses primarily on the direct ties in focal individual's immediate circle of contacts (Brass, 1984).

Control Variables.

Demography - The study considered age, gender and tenure. Neither race nor functional backgrounds is considered since all participants are white, and their majors in schools are either architecture or design.

Educational level - Education level is quite homogeneous – most participants hold master's degrees in the firm, some have bachelor degrees. The study controlled the variable by dividing the individuals into four classes based on their degree (1= vocational school, 2) bachelor's degree, 3) Master's degree, and 4) Ph.D.).

Language skills - Language skills may influence creativity, since the firm participates in architecture projects in regions where multiple languages are spoken. According to the personnel records from the human resource department in the firm, most workers can speak two languages, and a few even speak six. Top management considers language proficiency as a valuable category in recruitment.

Statistical Methods

The study used an ordinary least squares (OLS) regression model to test the hypotheses. Table 1 and 2 presents descriptive statistics and correlations of the variables. For diagnostic check, the study checked the level of autocorrelation through the Durbin-Watson test. The study also checked heteroskedasticity by inspecting the partial scatterplots of residuals. All of the control variables were entered followed by independent variables.

Results

Table 1 displays descriptive statistics and Pearson's correlation matrix for the variables in the analysis. While numerous variable pairs exhibit significant correlations, these correlations are generally moderate.

Table 2 summarizes the OLS regression results for network effect in the idea generation stage. Hypothesis 1 proposes that in the idea generation stage, individuals who are in the brokerage position are more likely to generate new ideas than those who are not. As expected, and as shown in Table 2, the effect of individuals' brokerage position on idea generation was positive and significant ($p<0.01$), supporting Hypothesis.

Table 3 summarizes the OLS regression results for network effect in the idea implementation stage. Hypothesis 2 suggests that in the idea implementation stage, individuals who are in the closure position are more likely to implement generated ideas than those who are not. As expected, and as shown in Table 3, the effect of individuals' closure position on idea implementation was positive and significant ($p<0.01$). Thus, Hypothesis 2 was also supported.

Table 1. Descriptive statistics and correlations

Variables	Mean	Std. Dev	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Idea Generation	2.57	4.27	1								
(2) Idea Implementation	3.3	5.58	0.84	1							
(3) Brokerage	1.59	3.3	0.32	0.34	1						
(4) Closure	63.06	19.04	0.54	0.48	0.37	1					
(5) Age	42.47	9.78	0.13	0.25	0	-0.09	1				
(6) Tenure	7.88	5.95	0.11	0.16	0.19	-0.02	0.45	1			
(7) Gender	0.39	0.49	-0.23	-0.18	-0.17	-0.12	-0.17	-0.17	1		
(8) Language Proficiency	3.16	1.18	0.2	0.13	0.13	0.15	0.16	0.14	0.07	1	
(9) Degree	2.49	0.83	0.27	0.27	0.03	0.07	0.45	0.16	0.16	-0.39	1

Table 2. Results of Regression Analysis for Idea Generation (n=93)

VARIABLES	Idea Generation Beta	t value	P value
Brokerage	0.75***	5.15	<0.01
Age	0.03	0.5	0.62
Tenure	0.03	0.43	0.67
Gender	-0.63	-0.66	0.51
Language Proficiency	0.24	0.65	0.51
Degree	0.81	1.33	0.3

Robust standard errors *** p<0.01, ** p<0.05, * p<0.1

Table 3. Results of Regression Analysis for Idea Implementation (n=93)

VARIABLES	Idea Implementation Beta	t value	P value
Closure	0.10**	2.88	<0.01
Age	0.1	1.24	0.22
Tenure	-0.12	-0.11	0.92
Gender	-0.37	-0.26	0.8
Language Proficiency	0.13	0.24	0.81
Degree	1.1	1.24	0.22

Robust standard errors *** p<0.01, ** p<0.05, * p<0.1

Discussion

The study examines the interplay between individual creativity and firm level innovation through social network perspectives. Exploring the process of idea generation to its implementation, the study proposes how individuals' position in their social networks affects both generating and implementation stages of ideas: Brokerage facilitates generating new ideas for creativity while closure expedites such ideas to be realized. By observing the

process through which social networks influence creativity and implementation, this study proposes that an individual's types of social network is an integral feature for creativity and innovation in addition to the individual's intrinsic characteristics (Nicholas, 1972) and a firm's competitive advantages (Porter, 1980).

By exploring the links between individual creativity and firm-level innovation through social network perspectives, the study tackles the presumption that creativity may not be a necessary condition for innovation. The study suggests that closure mechanism may not enhance the generation of ideas, whereas brokerage mechanism may not facilitate the implementation of generated ideas. By disentangling idea generation process from its implementation one, the study provides a more clear answer for why previous network research has made contradictory conclusions on creativity (Burt, 2004; Uzzi & Spiro, 2005).

Limitations and Directions for Future Research

The study lacks in terms of the validity of creativity measures due to the subjectivity of creativity measures as the study measured dependent variables based on individuals' subjective perceptions of who are sources and promoters of ideas.

Future study will seek more valid creativity measures to clarify both the novelty and usefulness aspects of creativity. Building on the 13-item scale creativity measure (Zhou & George, 2001), future study can disentangle the novelty aspect from the usefulness aspect through factor analysis. Then, the responses to each of the two categories of items will be averaged and Cronbach's alpha will be checked. Moreover, respondents' level of creativity will be evaluated by each employee's supervisor, for example, the middle managers in the study, rather than asking all workers who participate in the survey. On a 5-point scale ranging from 1, "not at all characteristics," to 5, "very characteristic," each employee's supervisor will rate the manner in which his/her subordinates think and behave. Because the meaning of creativity varies across different cultures and domains (Niu & Sternberg, 2002), conducting open-ended interviews from focus groups and top management will shed light on the complexity of the concepts of creativity at work in professional firms (Fleming et al, 2007).

Another limitation of the study is the potential of endogeneity problem. Although the study found that individual position in social networks independently affects both the generation and implementation of ideas, individual tie strength (i.e. strong tie) also affects both processes since individual tie strength and network position are correlated (Reagans & McEvily, 2003). For example, while weak ties positively affect the generation of novel ideas (Burt, 2004), strong ties may significantly affect the implementation of ideas (Kijkuit & Van den Ende, 2007). An interesting further study is to clarify the main driver of creativity and innovation – tie strength or network position.

Furthermore, the study can consider the moderating effects. Although sociologists recently joined the research on creativity, this field has traditionally been the domain of psychologists (Ford, 1996). For example, psychologists have emphasized the effect of personality traits such as 'openness'- one of the Big Five factors, on creativity (Oliver, 1990). Through integrating psychological factors into creativity research, one future avenue is to explore how personality traits are related to constructing individual social networks, and what causal mechanism lies between the two. One potential personality trait to examine is a self-monitoring variable (Synder, 1974). Since high self-monitors tend to occupy positions of high betweenness - centrality – a measure of the extent to which each individual occupied a structurally advantageous positions, connecting otherwise unconnected others in social networks (Freeman, 1979; Mehra, Kilduff, & Brass, 2001), future study can examine the interaction effect of the level of self-monitoring and betweenness - centrality on creativity. For example, in the novelty aspect of creativity, the study can anticipate that high self-monitors who are more located in a "go-between" position are more likely to generate novel ideas through rich information conduits with others than are low self-monitors, who rather tend to maintain a small number of cohesive relationships within their own groups.

References

Ahuja, G. 2000. Collaboration networks, structural holes, and innovation: A longitudinal study. *Administrative Science Quarterly*, 45: 425-455.

Amabile, T. M. 1988. A model of creativity and innovation in organizations. *Research in Organizational Behavior*, 10: 123-146.

Amabile, T. M. 1996. *Creativity in context.* Boulder, CO: Westview Press.

Amabile, T. M., Barsade S. G., Mueller J. S., & Staw B. M. 2005. Affect and creativity at work. *Administrative Science Quarterly*, 50: 367-403.

Bernard, H.R., Killworth, P., Kronenfeld, D., &. Sailer, L. 1984. The problem of informant accuracy: The validity of retrospective data. *Annual Review of Anthropology,* 13: 495 -517.

Borgatti, S. P., Everett, M. G., & Freeman, L. C. 2002. *UCINET 6 for windows: Software For Social Network Analysis.* Harvard, MA: Analytic Technologies.

Brass, D. J. 1984. Being in the right place: A structural analysis of individual influence in an organization. *Administrative Science Quarterly*, 29: 518-539.

Burt, R. 1976. Positions in networks, *Social Forces*, 55: 93-122.

Burt, R. 1992. *Structural Holes: The Social Structure Of Competition.* Cambridge, MA: Harvard University Press.

Burt, R. 2002. Bridge decay. *Social Networks*, 24: 333-363.

Burt, R. 2004. Structural holes and good ideas. *American Journal of Sociology*, 110: 349-399.

Coleman, J. 1988. Social capital in the creation of human capital. *American Journal of Sociology*, 94: 95-120.

Fleming, L., Mingo, S., & Chen, D. 2007. Collaborative brokerage, generative creativity, and creative success. *Administrative Science Quarterly*, 52: 443-475.

Ford, C. M. 1996. A theory of individual creative action in multiple social domains. *Academy of Management Review*, 39: 1112-1142.

Freeman, L. C. 1979. Centrality in social networks: Conceptual clarification. *Socia Networks,*1: 215–239.

Granovetter, M. 1973. The strength of weak ties. *American Journal of Sociology*, 78: 1360-1380.

Hannemann, R. A., & Riddle M. 2005. *Introduction to Social Network Methods.* Riverside, CA: University of California, Riverside.

Hansen, M. T. 1999. The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. *Administrative Science Quarterly*, 44: 82-111.

Hnn Hui, H. 2004. On why some firms are more innovative than others: a firm-level study of Heterogeneity in innovation performance, *International Journal of Entrepreneurship and Innovation Management*, 4: 159-177.

Kijkuit, B., & Van den Ende, J. 2007. The organizational life of an idea: Integrating social network, creativity and decision-making perspectives. *Journal of Management Studies*, 44: 863–882.

Kurtzberg, T. R., & Amabile, T. M. 2001. From Guilford to creative synergy: Opening the Black box of team-level creativity. *Creativity Research Journal,* 13: 285-294.

Laumann, E. O., Marsden, P. V., & Prensky, D. 1983. The boundary specification problem in network analysis. In R.S. Burt & M.J. Minor (Eds.), *Applied Network Analysis*: 18-34. Beverly Hills, CA: Sage.

Lin, N., Ensel, W. M., & Vaughn, J. C. 1981. Social resources and strength of ties: Structural factors in occupational status attainment. *American Sociological Review*, 46: 393-405.

Marsden, P. V. 1990. Network data and measurement. In W.R. Scott & J. Blake (Ed.), *Annual Review of Sociology*, 16: 435-463. Palo Alto, CA: Annual Reviews.

Mehra, A., Kilduff, M., & Brass, D. J. 2001. The social networks of high and now self- monitors: Implication for workplace performance. *Administrative Science Quarterly*, 46: 121-146.

Milliken, F., Bartel, C. and Kurtzberg, T. 2003. Diversity and creativity in work groups: A dynamic perspective on the affective and cognitive processes that link diversity and performance. In P.Paulus and B. Nijstad (Eds.), *Group Creativity: Innovation Through Collaboration,* 32-62. New York, NY: Oxford University Press.

Nelson, R. E. 1989. The strength of strong ties: Social networks and intergroup conflict in organizations. *Academy of Management Journal*, 32: 377-401.

Nicholls, J. 1972. Creativity in the person who will never produce anything original and useful: The concept of creativity as a normally distributed trait. *American Psychologist,* 27: 517-527.

Niu, W., & Sternberg, R. 2002. Contemporary studies on the concept of creativity: The East and the West. *The Journal of Creative Behavior,* 36: 269-288.

Oliver, J. 1990. The Big Five taxonomy: Dimensions of personality in the natural language and in questionnaires. In L.A. Pervin (Ed.), *Handbook of Personality Theory and Research*, New York: Guilford Press

Perry-Smith, J. E., & Shalley, C. H. 2003. The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review*, 28: 89-106.

Perry-Smith, J. E. 2006. Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal*, 49: 85-101.

Porter, M. E. 1980. *Competitive Strategy*, New York, NY: Free Press.

Reagans, R., & McEvily, B. 2003. Network structure and knowledge transfer: The effect of cohesion and range. *Administrative Science Quarterly*, 48: 240-267.

Synder, M. 1974. Self-monitoring of expressive behavior. *Journal of Personality and Social Psychology*, 30: 526-537.

Sternberg, R. 1977. Component processes in analogical reasoning. *Psychological Review,* 84: 353-378.

Uzzi, B 1997. Social structure and competition in interfirm networks, *Administrative Science Quarterly*, 42: 35-67

Uzzi, B., & Spiro, J. 2005. Collaboration and creativity: The small world problem. *American Journal of Sociology*, 111: 447-504.

Von Hippel, E. 1988 *The Source of Innovation*, New York, NY: Oxford University Press.

Wasserman, S., & Faust, K. 1994. *Social Network Analysis: Methods and Applications*, Harvard, MA: Cambridge University Press.

Wernerfelt, B. 1984. A resource-based view of the firm". *Strategic Management Journal*, 5: 171 - 180.

Zhou, J., & George, J. M. 2001. When job dissatisfaction leads to creativity: Encouraging the expression of voice. *Academy of Management Journal*, 44: 682-696.