

**WHAT DO WE KNOW ABOUT THE IMPACT OF INTERPERSONAL  
EXCHANGE NETWORKS ON THE KNOWLEDGE CREATION  
PROCESS?**

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## **ABSTRACT**

Interpersonal exchange relationships have been recently positioned as a key factor in understanding the knowledge creation process. The purpose of the study is to synthesize the extant research conducted on the relationship between interpersonal exchange networks and the knowledge creation process. The study organizes the review of the literature on the relationship between the three phases of the knowledge creation process (transfer, absorption and creation) as well as along the three dimensions of the interpersonal exchange networks – structural, relational and cognitive (Nahapiet & Ghoshal, 1998).

## WHAT WE KNOW ABOUT THE IMPACT OF INTERPERSONAL EXCHANGE NETWORKS ON THE KNOWLEDGE CREATION PROCESS

“The most important, and indeed the truly unique, contribution of management in the 20<sup>th</sup> century was the fifty-fold increase in the productivity of the *manual workers* in manufacturing. The most important contribution management needs to make in the 21<sup>st</sup> century is similarly to increase the productivity of *knowledge work* and *knowledge workers*. The most valuable assets of a 20<sup>th</sup> – century company was its *production equipment*. The most valuable asset of a 21<sup>st</sup> – century institution (whether business or non-business) will be its *knowledge workers* and their *productivity*”. Peter Drucker, 1999: page 79

Knowledge is one of the most important resources of an organization (Drucker, 1993; Grant, 1996; Nonaka & Takeuchi, 1995; Spender, 1996), and may be “the only meaningful resource” of an organization (Drucker, 1993:42). Knowledge and knowledge creating skills in particular are important, as these capabilities are essential in the creation of new products or processes and or enhancement of existing ones (Nonaka, 1994). In order to compete in knowledge intense industries an organization must continuously acquire, absorb and create new knowledge (Cohen & Levinthal, 1990). D’Aveni (1994) reasoned that given the dynamic environments faced by most organizations, those that are capable of producing a continuous stream of new knowledge are better positioned to achieve a competitive advantage.

Literature examining knowledge as a resource to the firm has received increasing attention over the last decade (Drucker, 1993). Many have examined knowledge transfer and acquisition between organizations (see for example, Ahuja, 2000; Gupta & Govindarajan, 2000; Rosenkopf & Nerkar, 2001; Steensma & Corley, 2000; Zahra, Ireland, & Hitt, 2000). Knowledge researchers have also begun to explore the capability of absorbing and retaining knowledge (Cockburn & Henderson, 1998; Cohen & Levinthal, 1990; Tsai, 2001; Van den Bosch, Volberda, & De Boer, 1999) as well as

knowledge creation (Grant, 1996; Nahapiet & Ghoshal, 1998; Nonaka, 1994; Nonaka, Toyama, & Nagata, 2000; Spender & Grant, 1996).

Researchers have recently positioned interpersonal exchange networks as a key factor in understanding the knowledge creation process. Interpersonal exchange networks represent not only the exchange partners but also the knowledge or resources that may be acquired through the network (Lin, 2001). Theory suggests that knowledge creation and interpersonal exchange networks are inextricably linked (Bouty, 2000; Tsai & Ghoshal, 1998), and that a positive relationship exists between the two (Nahapiet & Ghoshal, 1998). In effect, an interpersonal exchange network facilitates the knowledge creation process because it directly affects the conditions of the combine and exchange process.

Organizations cannot create knowledge without the actions and interactions of individuals because knowledge is created by and resides within individuals (Nonaka & Takeuchi, 1995; Simon, 1991). New knowledge is created when individuals solve problems by combining and exchanging information and know-how with others (Cohen & Levinthal, 1990; Nonaka, 1994). Individuals must first exchange information and know-how; then, recombine newly acquired information and know-how with existing information and know-how to create new knowledge. Who an individual knows, impacts with whom they exchange information and know-how and their knowledge creating capabilities (Nahapiet & Ghoshal, 1998). As Nonaka and colleagues suggest “knowledge is created through the dynamic interactions among individuals” (2000: 3).

The purpose of this study is to synthesize the extant research conducted on the relationship between interpersonal exchange networks and the knowledge creation

process. The study is important for several reasons. First, knowledge and knowledge creating skills are considered key to providing firm-level competitive advantage. Nonaka and colleagues even suggest that knowledge creation is a firm's primary reason for being. Second, while the belief of the importance of knowledge worker management is widely held, knowledge is not visible and thus difficult manage (Soo, Devinney, Midgley, & Deering, 2002). Understanding what is known about the interpersonal exchange relationships between individuals should extend our understanding of the productivity of knowledge workers and insight into management of knowledge workers. Finally, the study provides a holistic view of research on the knowledge creation process in that it synthesizes our understanding of knowledge transfer, knowledge absorption and new knowledge creation.

The study begins with a brief overview of the knowledge creation process and the importance of interpersonal exchange relationships in that process. This study organizes the review of the literature on the relationship between the three phases of the knowledge creation process (transfer, absorption and creation) as well as along the three dimensions of the interpersonal exchange networks – structural, relational and cognitive as outlined by Nahapiet and Ghosal (1998).

### **KNOWLEDGE CREATION PROCESS**

New knowledge is generated through a process through which individuals combine and share diverse and similar information and know-how to solve previously created and defined problems (Cohen & Levinthal, 1990; Nonaka, 1994). Individuals must be able to acquire, absorb required inputs in order to generate new knowledge. The know-how and information that individuals gain over time becomes their knowledge

stock. Because individuals' current knowledge stocks shapes the scope and direction of their search for flows of new information and know-how, knowledge creation is a path-dependent process (Dosi, 1982).

Relationships between individuals are developed over time through interpersonal exchanges of information and know-how. An individual forms relationships with others for two primary purposes – to maintain and secure resources held by members and to seek and obtain new resources (Lin, 2001). The strength of the interpersonal exchange networks impacts the resources that may be accessed and developed through the relationships.

It is important to note that the knowledge creation process often relies upon interactions with others outside as well as within the organization. Organizations act as “social communities” to provide the setting in which individuals interact to create, replicate and transfer knowledge (Kogut & Zander, 1996). Within organizations, individuals seek out others with whom to exchange and combine knowledge in the pursuit of developing new knowledge. One organization, however, rarely holds all the needed knowledge. Often in their search for unique know-how and information, individuals who have the freedom to choose with whom to work, will go beyond the organization's boundaries in search for exchange partners in order to generate new knowledge for the organization (Kogut & Zander, 1996).

The study examines three steps of the knowledge creation process: transfer, absorption and creation. ***Transfer*** refers to moving *existing* information and know-how from one group to another. ***Absorption*** refers to the ability to *absorb and integrate*

previously acquired knowledge. **Creation** refers to producing *new* knowledge or discoveries about phenomena that were not known previously.

Knowledge is created when individuals combine and exchange explicit or tacit knowledge (Grant, 1996; Nonaka, 1994). Information (explicit knowledge) can be codified, is easily transferable, and may be acquired and or transferred with or without inter-personal contact. Know-how is the tacit skill of how to use information, and generally requires shared experience and social interaction between individuals to acquire or transfer.

The examination of interpersonal exchange relationships is organized along three dimensions: structural, relational, and cognitive (Nahapiet & Ghoshal, 1998). The **structural** dimension of a person's interpersonal exchange network characterizes *how* network members know one another. In other words, the structure of the network examines if all members of a network directly know one another, or if network members indirectly know one another through a distant party. Specifically, this dimension captures the **potential** connections of an established network (Boissevain, 1974) and describes the location of the resources held within the network (Tsai & Ghoshal, 1998). Understanding the structural dimension of interpersonal networks provides insight into the range of and access to resources (Nahapiet & Ghoshal, 1998).

The **relational** dimension characterizes an interpersonal exchange network in terms of the **actual history** of interactions between network members (Boissevain, 1974) and reflects *how well* the members know one another (Granovetter, 1973). Through interactions over time, shared narratives, codes and languages are developed, especially among the directly-tied members of a network (Coleman, 1988). It is through repeated

interactions and investments made in one another over time that trust, shared norms, common goals and values are developed among the members of the network. The relational dimension provides insight into the actual resources held by network members (Tsai & Ghoshal, 1998)

The *cognitive* dimension is particularly important to the knowledge creation process as it encompasses shared language, meaning and interpretation among members of the network (Nahapiet & Ghoshal, 1998). The cognitive dimension provides insight into the capabilities of the exchange partners to exchange information and know-how. This dimension captures the shared vision and common values of network members (Tsai & Ghoshal, 1998).

Integrating the three steps of the knowledge creation process with the three dimensions of interpersonal exchange networks provides an overview of what we know about networks and knowledge creation process as well as direction for future research.

## **KNOWLEDGE TRANSFER**

Individuals must have access to needed inputs in order to create new knowledge and thus seek exchange partners to obtain these resources. The knowledge transfer stage of the creation process examines how information and know-how is moved from where it is known to where it is not. The three dimensions of the networks have various impacts on the transfer stage.

### **Structural Dimension**

Examining the structural dimension provides insight into how an individual is connected to others and the movement of know-how and information. The structural dimension characterizes the strength of ties *among* a person's direct exchange partners

(how closely tied the person's direct exchange partners are to each other). For example, a person's network is characterized as strong structural if all of the individuals that the person knows, know one another. Conversely, the network is characterized as weak structural if an individual's exchange partners do not know one another (A knows B, C, and D, however, B, C, and D only know A).

The types of resource transferred as well as the efficiency of the transfer are impacted by the structure of the network (Burt, 1992; Granovetter, 1973). An individual's structural dimension is considered strong or redundant if all of an individual's exchange partners know one another (A, B, C, and D all know one another). Because everyone knows one another, network members may achieve convergence – a situation in which most or all the members know one another and therefore potentially know what all other members know. Strong structural dimension networks are well equipped to transfer complex intangible resources such as know-how and embedded knowledge (Hansen, 1999; Nadler, Thompson, & Boven, 2003; Uzzi & Lancaster, 2003) because the overlapping ties among network members improve communication (Coleman, 1988). Importantly, individuals can realize the value of resources held among network partners with redundant ties (Burt, 2001).

In addition, Uzzi and Lancaster (2003) found strong structural dimension to facilitate the transfer of private knowledge, that knowledge that is held within an organization and not widely available nor published. Strong structural dimension networks, however, provide little access to new or unique information because the closed network composition holds few links to others outside the closely tied members (Uzzi, 1997). An interesting finding of strong structural networks is that individuals rarely

make use of the unique idiosyncratic knowledge held by others within the network; rather, they tend to concentrate on sharing commonly held knowledge (Stasser & Titus, 1985).

Weak structural dimension has proved to be an efficient configuration for the transfer of information or tangible codifiable knowledge (Hansen, 1999). Weak ties provide access to diverse resources as few partners know one another and thus are unlikely to know what the others know (Granovetter, 1973). Research also provides evidence that weak structural dimensions are instrumental in the diffusion of ideas and innovation (Granovetter, 1982; Rogers, 1983) and public knowledge (Uzzi & Lancaster, 2003). Several studies have provided evidence that weak structural dimensions in which an individual is tied to others with diverse or heterogeneous backgrounds are found to be more conducive to transferring knowledge than others whose networks are made up of others with similar backgrounds (Lant, Milliken, & Batra, 1992; Lapre & van Wassenhove, 2001; Williams & O'Reilly, 1998). Notably, specialists (individuals who specialize in a particular field or area of work) benefit more from maintaining contacts with diverse others than individuals who are generalists (Haunschild & Sullivan, forthcoming).

The ability to obtain diverse inputs is positively related to weak structural dimensions. Diverse inputs are particularly important to the knowledge creation process, as some of the most valued discoveries have been made when individuals from diverse fields collaborate (Hargadon & Sutton, 2000; Tripsas, 1997). Firm innovation increased when individuals were able to bridge diverse knowledge sets (Gittelman & Kogut, 2003; Reagans & McEvily, 2003).

Researchers have further developed the definition of heterogeneous exchange partners. Transfer activities are positively impacted with partners who are more similar in terms of experiences, attitudes and values (O'Reilly, 1983). More recent research has provided evidence that similarity in terms of strategic goals is most important between exchange partners (Darr & Kurtzberg, 2000).

The perceived status of the exchange partner also impacts the kind of information that is transferred. Socially isolated individuals were found to participate more and emphasize the uniqueness of their knowledge in the transfer process than individuals who were more socially connected (Thomas-Hunt, Ogden, & Neale, 2003). Not only the status of the individual, but also, the status of the organization of the network member plays an important part in the knowledge transfer process. For example, knowledge created by a high-status institution was found to be more likely transferred than knowledge created by low-status institutions, regardless of the actual value of the knowledge being transferred (Sine, Shane, & DiGregorio, 2003).

Finally, proximity of network partners plays an important role in strong structural networks as proximity provides individuals the opportunity to develop an understanding of who knows what, which aids information transfer (Borgatti & Cross, 2003). Close proximity allows for serendipitous interactions (Monge, Rothman, Eisenberg, Miller, & Kirste, 1985) increasing the likelihood that individuals will obtain needed inputs. In general, evidence exists that organizations benefit from knowledge spillovers as a result of close proximity of others (Bernstein & Nadiri, 1988; Henderson & Cockburn, 1996; Griliches, 1992; Jaffe, 1986; Jaffe, Trajtenberg, & Henderson, 1993).

### **Relational Dimension**

The relational dimension examines how well individuals know their direct contacts. Research examining the relational dimension and knowledge transfer process provides evidence that the transfer of tacit know-how is facilitated when the individual knows others within the network well. Moreover, observation and face-to-face contact are required to transfer tacit knowledge (Nadler, Thompson, & Boven, 2003; Polanyi, 1966). Tacit knowledge is difficult to transfer, even more difficult the more casual ambiguity associated with the knowledge (Szulanski, 1996; Zander & Kogut, 1995).

Whether the exchange partner is affiliated with the organization tends to impact the perceived value of transferred inputs. Mennon and Pfeffer (2003) found that managers place higher value on knowledge obtained from outside sources more than that from within the organizations. This preference results partially from the notion that outside information is scarcer than internal information making it appear unusual. Inside information is more readily available and under more scrutiny (Menon & Pfeffer, 2003). They interpret this finding to suggest that valuing knowledge from outside the organization elevates the organizational members' status.

However, Darr, Argote, & Epple (1995) found that knowledge coming from within the organization is more likely to be transferred and improve the performance of the organization, than that coming from external sources. Darr, Argote, and Epple (1995) propose that trust is developed with others within the organization; trusting the exchange partner impacts the value of the knowledge transferred. Trust also reduces some of the uncertainty inherent in the knowledge creation process. To be sure, McEvily, Peronne, & Zaheer (2003) found that the better the exchange partners knew one another the higher the trust.

Trust is important to the knowledge creation process as trusting partners are more willing to disclose and share information (Bouty, 2000). Exchange between trusting partners aided in alleviating concerns regarding the accuracy of the knowledge transferred. In an enduring relationship, or strong relational dimension networks, parties are more willing and more able to exchange information and know-how and thus have more efficient exchanges than those who have not developed long-term relationships (Bouty, 2000). As a researcher maintains the same exchange partners over time, exchanges become more efficient. Through repeated interactions, researchers and their exchange partners, however, become more analogous and develop similar knowledge stocks (Coleman, 1988) thus the transfer of diverse knowledge may be limited when length of time that individuals spend with the same partners increases.

Borgatti & Cross (2003) emphasize the importance of examining the relational dimension when studying knowledge transfer as they find evidence that the properties of an individual's exchange relationships impact that individual's ability to leverage the inputs gained from the partnerships. Their study provided evidence that knowledge transfer is benefited not only by proximity to the exchange partners but also by the extent to which a person knows and values the expertise of the exchange partner, as well as the ability of the individual to access the exchange partner.

### **Cognitive Dimension**

Cognition facilitates combination capabilities of exchange partners through shared languages and codes and collective narratives (Nahapiet & Ghoshal, 1998). Knowledge transfer is more efficient when exchange partners share common languages or common short-hands (Grant, 1996; Weber & Camerer, 2003). Indeed, the more individuals have

in common, the more successful the transfer of information (Song, Almeida, & Wu, 2003). Hansen (2002) studied the existence of related knowledge in an organization and the interpersonal exchange networks. He found that units within the organization that had established short path links to exchange relationships with others within the organization (few intermediaries needed to connect the unit with others within the organization) performed better than those with long path lengths. Longer paths increased the probability of distortion in the transfer process. Hansen (2002) also found that establishing direct relationships with others resulted in mixed findings. Direct relationships provide immediate access to knowledge resources and were found to be most beneficial when the units needed to transfer tacit or intangible information and know-how. However, when explicit or codified information was required, the cost of maintaining direct access to needed information outweighed the benefit of direct and immediate access.

### **ABSORPTION**

An individual's ability to acquire, assimilate and integrate new knowledge is an important step in the knowledge creation process (Cohen & Levinthal, 1990). Put differently, an individual must be able to absorb the knowledge to which he has access. In essence, the possession of prior knowledge facilitates the creation of new knowledge. The absorption phase of the knowledge creation process explores the individual's ability to draw upon stored knowledge or his absorptive capacity.

#### **Structural Dimension**

Tsai (2001) argues that network position and absorptive capacity must be studied together as without absorptive capacity, the individual may not be able to transfer the

knowledge to which he had access. In other words, absorptive capacity moderates the effect of being central on innovation and performance. The more centrally located the individual is in a network, the more access that person has to the needed input. Tsai (2001) provided evidence that the more central the unit in an intra-organizational network, the broader the knowledge resources to which the unit had access and the higher the absorptive capacity required to transfer and utilize the knowledge. While centrality provides better access to needed inputs, it is the combination of both centrality and the ability to absorb and utilize the inputs that is needed to realize an impact on innovation.

Hargadon & Sutton (1997) and Hargadon (1998) studied Edison's lab to understand the importance of absorptive capacity. They contend that scientists and engineers in the lab transferred knowledge between groups. Perhaps more importantly, they acquired, stored, and retrieved information to recombine old ideas. The research points to the importance of network position in understanding absorptive capacity, in that the scientists and inventors in the lab spanned multiple diverse network domains increasing their ability to recognize and transfer knowledge later used in the creation of new knowledge. In addition, the two studies emphasized the impact of knowledge sharing and recombining within the organization to the creation of new knowledge.

Others examining how the structural dimension impacts absorption maintain that the relative similarity between exchange partners facilitates the development of absorptive capacity (Lane & Lubatkin, 1998). Van den Bosch, Volberda, & De Boer (1999) have recently extended this view and provided evidence that prior possessed knowledge may actually negatively affect absorptive capacity, and that the structure of

the network as well as capabilities of the network members mediates the relationship between prior knowledge and the ability to create new knowledge.

### **Relational Dimension**

Cockburn & Henderson (1998) explored the importance of absorptive capacity in the knowledge creation process in terms of the relational dimension. Their findings emphasize the importance of what they termed “connectiveness” to the outside community. To be successful in the creation of new knowledge, organizations must collaborate with diverse others. In the biotechnology industry, for example, firms whose scientists collaborated with academic scientists on scholarly publications were better able to create new knowledge that lead to patentable discoveries and commercializable products. The importance of being connected to and developing a deep understanding of basic research were key drivers in the scientist’s success to recognize and use these developments when producing applied research. Importantly, absorptive capacity is more than developing basic research in-house, it is the connectedness with others outside the organization that leads to higher knowledge creating capabilities.

### **Cognitive Dimension**

Anand, Glick, & Manz (2002) examined the importance of obtaining knowledge from others beyond the organizational boundaries. They propose that in order to benefit from the acquired knowledge, individuals within the organization must possess sufficient common knowledge and understanding of the area in which the knowledge was acquired in order to integrate and use it in subsequent knowledge creating activities (Anand, Glick, & Manz, 2002).

## KNOWLEDGE CREATION

New knowledge is generated through a process by which individuals combine and exchange previously acquired and retained information and know-how to solve previously identified problems (Cohen & Levinthal, 1990; Nonaka, 1994). The knowledge creation phase depends on redundancy as well as diversity of information and know-how as well as shared experiences and autonomy (Nonaka, 1994).

### **Structural Dimension**

Tsai & Ghoshal (1998) found that the position of the unit within the organization impacted knowledge creation. Specifically, the more central an intra organizational unit was within the organization, the more positive the impact on the creation of new knowledge. In other words, the more that the unit within the organization interacts with and gains information and know-how from other units within the organization, the more positive impact the unit has on innovation. The unit becomes central in that it is the common link between other units within the organization. Dense networks, or networks in which all members know one another, produce higher amounts of knowledge than teams whose members are loosely connected (Reagans & Zuckerman, 2001). This finding emphasizes the need for redundancy of knowledge within the network to validate and reach consensus to create new knowledge.

Results of the limited empirical research to date examining the impact of the location of the interpersonal exchange relationships and the knowledge creation stage have been mixed. Allen (1977) for example, found a negative correlation between interactions with others from outside the organization and knowledge creation productivity. Conversely, in a recent qualitative study, Bouty (2000) provided evidence

that establishing long-term relationships with others outside the organizational boundaries was critical to the exchange of know-how and information. Further, evidence exists that obtaining knowledge from others outside the organization is not only positively related to knowledge creation process but essentially a requirement to create new knowledge (Anand, Glick, & Manz, 2002). Anand, Glick, & Manz (2002) argue that organizations need to cautiously monitor relationships with others outside the organization to insure that the exchanges continue to benefit the organization's knowledge creating activities. Organizations must strike a balance between acquiring inputs from others beyond the organizational boundaries and maintaining unique proprietary knowledge within the organization.

Recently, McFadyen & Cannella (working paper) found that it is the combination of diverse and redundant resources as well as the opportunity to work in close proximity that impacts new knowledge creation. The study indicates that working with others within a specialized research unit produces a positive influence on the value of knowledge created. However, when an individual chooses to go beyond the research unit boundaries, the impact of obtaining diverse information and know-how has a higher marginal positive impact to the creation of new knowledge than the working with others outside but in close proximity of the organizational boundaries.

### **Relational Dimension**

A repeated theme throughout the research on knowledge creation and the relational dimension is that relationships develop over time. Individuals will engage in repeated interactions of the results of the interactions prove mutually beneficial (Bouty, 2000). Over time, trust develops over time through repeated exchange interactions with

the same partnerships (Bouty, 2000). Trust is a key element in knowledge creation stage. A strong relational dimension network brings mutual trust, not only in terms of the value of the exchange partners' resources, but also confidentiality (Bouty, 2000).

In addition, both observation and shared experiences have been found to be required to combine and exchange tacit knowledge (Nadler, Thompson, & Boven, 2003; Uzzi & Lancaster, 2003). Individuals who engage in shared experiences and observe others outperform those that only engage in shared experiences (Nadler, Thompson, & Boven, 2003). It is through repeated interactions and investments made in one another over time that trust, shared norms, common goals and values are developed among the members of the network. However, while a strong relational dimension may promote maintaining resources within the network (Lin, 2001), exchange partners may be too similar to one another and removed from perspectives outside the network.

McFadyen & Cannella (forthcoming) studied the duration of interpersonal exchange relationships. Their study indicated that individuals must manage the amount of time spent with the same others. Over time, repeated interactions with the same others lead to diminishing returns to knowledge creation. Similarly, increasing the number of exchange partners, while initially positive, also, over time, lead to diminishing returns. Moreover, the positive resources gained from increasing shared experiences (i.e. trust, common language, and bonds of friendship) have a higher positive marginal effect on knowledge creation than increasing the opportunity to access resources. However, the negative implications of continuing to increase shared experiences (i.e. group norms, obligations and expectations) have a higher negative marginal effect on knowledge creation than do the negative implications of continuing to increase the number of direct

ties (i.e. increased costs related to identifying, establishing and maintaining new direct ties).

### **Cognitive Dimension**

Much debate continues to exist regarding the demographic diversity of a team and its affect on knowledge creation. Evidence exists that homogeneous teams are expected to perform higher due to shared identity, low coordination efforts and face-to-face contact (O'Reilly, Caldwell, & Barnett, 1989; Zenger & Lawrence, 1989). Conversely, others challenge that diverse exchange partners improve knowledge creating capabilities.

Researchers argue that drawing teams from different cohorts results in higher performance (Ancona & Caldwell, 1992). Recently, Reagans & Zuckerman (2001) found support for both views. First, they found that teams in which all exchange partners know one another and frequently interact had higher levels of productivity than teams whose members did not know one another. Upon further decomposition of the diversity issue, however, teams whose members had frequent contact with others of similar tenure were less productive than teams whose members had entered the organization at different times. They interpret this finding to support the need for diversity among network exchange partners (Reagans & Zuckerman, 2001). Furthermore, the greater demographic diversity provides diversity in terms of contacts, skills, information and experience to team members, thus enhancing the team's knowledge creating capacity.

## **DISCUSSION**

Increasing emphasis is being placed on the importance of knowledge and knowledge creating skills. Importantly, the focus has incorporated the importance of interpersonal exchange networks to the knowledge creation process. Yet our

understanding of the relationship between the two is somewhat limited. Linking interpersonal exchange relationships and the knowledge creation process is in its infancy, providing fertile ground for future research. The purpose of this study was to provide an overview of what we know about the relationship between interpersonal exchange relationships and the knowledge creation process. The study was organized by examining three steps of the knowledge creation process – knowledge transfer, absorption, and creation, along three network dimensions – structural, relational and cognitive. The knowledge creation process relies upon the acquisition, absorption and creation of new knowledge. Inputs to this process include the combination and exchange of explicit and tacit, diverse and redundant knowledge.

A review of the research has highlighted the complexities associated with this process. Much of the current and recent work in the knowledge theory arena has focused on knowledge transfer and the structural dimensions of interpersonal exchange networks. A review of the research highlights the importance of strong structural networks for the exchange and combination of tacit knowledge and emphasizes the benefits of weak structural networks for the efficient exchange of explicit codified knowledge.

Insight has been gained into the importance of strong structural and strong relational networks from the limited work done on the creation process. Strong structural networks allow for the realization of the value held by network members. Strong structural networks however, may restrict the availability of diverse inputs. Strong relational networks facilitate the creation of trust between exchange partners; however, due to group norms, sanctions and expectations, over time may limit knowledge creating opportunities. Shared experiences produce both a positive and a negative impact to

knowledge creation (McFadyen & Cannella, forthcoming). It is through shared experiences that individuals develop and exchange tacit knowledge, a resource that is key to the creation process; however, interacting with the same others increases the probability of developing similar resources, thus constraining the creation process. In other words, collaborative efforts with the same others, while most critical, may also be most limiting to the creation process.

Interestingly, the focus of research on absorptive capacity or retention has provided evidence as to the importance of diversity among network exchange partners. Diverse inputs impacts an individual's ability to make novel linkages and associations, which have shown to be important in the creative process (Amabile, 1988; Cohen & Levinthal, 1990). Related to this notion is the importance of network centrality to the transfer and absorption phases. The more an individual or unit is centrally located, the more opportunity that individual or unit has access to the needed diverse inputs (Tsai, 2001).

A review of the literature indicates that because different inputs are embedded in the various types of networks, no one network is most conducive to the knowledge creation process. Notably, while this study has provided an overview of the three dimensions of interpersonal exchange networks in relation to three steps of the knowledge creation process, future research is needed to integrate all three dimensions within the overall knowledge creation process.

Nahapiet & Ghosal (1998) present a model that simultaneously examines the three dimensions and present propositions about the relationship between each dimension and the creation process. Tsai & Ghoshal (1998) extended this research and found

empirical evidence that a positive direct relationship existed between the relational dimension and knowledge creation and that both a direct and indirect existed between the structural and knowledge creation. Interestingly, no direct relationship was found between the cognitive dimension and knowledge creation; however, a direct relationship was found between the cognitive dimension and the relational dimension.

Perry-Smith & Shalley (2003) more recently, proposed that a spiral relationship between creativity and network position, in that network position impacts creativity, and creativity impacts networks. Further, they proposed that weak structural ties are more important than strong structural ties to stimulate creativity, the more the number of weak ties the more creativity will be stimulated. However, weak structural ties must also be examined in conjunction with the position within the network. They suggest that rather than a central position that being on the peripheral coupled with boundary-spanning activities is the optimal position for creativity productivity. Furthermore, they proposed that network position changes over time. The changes to network position impact knowledge creation activities.

McFadyen, Semadeni, & Cannella (working paper-a) recently provided strong evidence of the importance of simultaneously examining multiple dimensions of networks when considering tie strength. Their findings show that both strong and weak relational and structural ties impact the knowledge created and that the amount of knowledge creation hinges upon the nature of those ties. Simply put, knowledge creation was highest when individuals were strongly tied to others (strong relational) who are only weakly tied to each other (weak structural).

Additional research is needed to examine the dynamic nature of knowledge and networks, because different resources are obtained through different network structures, as individual's resource needs change, so should their networks. Bouty (2000) and McFadyen, Semadeni, & Cannella (working paper-b) have provided empirical evidence of that individuals need to alter their network composition; however, these alterations are not to be made haphazardly. Specifically, McFadyen, Semadeni, & Cannella (working paper-b) found that individuals with weak structural and weak relational ties will experience an increase in the value of knowledge created if they increase the strength of the structural ties while maintaining weak relational ties. Alternatively, individuals with weak structural and weak relational ties who increase the strength of their relational ties while maintaining weak structural ties will also experience an increase in the value of knowledge creation. Individuals with weak structural and strong relational ties should strengthen their structural ties allowing for diverse knowledge inputs and reducing their relational ties offering freedom from group norms and sanctions. Strong structural ties are needed as they contain redundant knowledge, which reduces the uncertainty and risk inherent in the knowledge creation process. Individuals should then consider strengthening their relational ties again and operating in a network comprised of both strong relational and structural ties. Strong relational ties are needed for shared experiences. The caveat is that initially operating in such a network leads to a decrease in the value of knowledge created due to the time commitments of developing relationships.

Individuals should be encouraged to change network partners and configuration over time to extend and continue knowledge creating capabilities. Further insight is

needed into how networks change and the impact of the sequence of changes to the creation process over time.

**TABLE I**

Strength		Transfer	Retention	Creation
Structural Dimension	Strong	<ul style="list-style-type: none"> <li>• Access to redundant resources, convergence</li> <li>• Realize value of resources held by members</li> <li>• Efficient transfer of information</li> <li>• Lacks diverse resources</li> <li>• Members rarely make use of unique idiosyncratic knowledge held by members</li> <li>• Coupled with close proximity aids in transfer of private knowledge and in serendipitous interactions</li> </ul>	<ul style="list-style-type: none"> <li>• Relative similarity between exchange partners increases development of absorptive capacity</li> </ul>	<ul style="list-style-type: none"> <li>• The more a unit interacts and gains inputs from other units the higher the amount of knowledge created (unit centrality)</li> <li>• Produce higher amounts of knowledge than weak structural networks</li> <li>• Increases redundancy of knowledge, increases validation and consensus</li> <li>• Close proximity aids in serendipitous interactions</li> <li>• Increasing the number of direct exchange partners initially leads to positive impact on knowledge creation, however, eventually leads to diminishing returns</li> </ul>
	Weak	<ul style="list-style-type: none"> <li>• Increased access to diverse information and know-how and perspectives</li> <li>• Instrumental in diffusion of ideas and innovation</li> <li>• More beneficial to specialists than to generalists</li> <li>• Social isolates more likely to share unique knowledge than more socially connected others</li> </ul>	<ul style="list-style-type: none"> <li>• Combination of centrality in network and ability to absorb/retain inputs positively impacts knowledge creation process</li> <li>• Spanning several diverse boundaries increases retention and subsequently creation abilities</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of access to intangible resources</li> <li>• Lacks closure to realize the value of resources</li> <li>• Distant proximity critical to creation as aids in access to diverse resources</li> </ul>

**TABLE I (CONTINUED)**

	Strength	Transfer	Absorption	Creation
Relational Dimension	Strong	<ul style="list-style-type: none"> <li>• Required for transfer and combination of tacit knowledge</li> <li>• Increases likelihood of developing trust, which increases quality and quantity of exchanges and combinations</li> <li>• Increases likelihood of homogenous knowledge among network members</li> <li>• Access to redundant resources</li> <li>• Facilitates exchange process as members know and value the expertise of the exchange partner</li> <li>• Inefficient for transfer of codified knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Connectedness to others outside of organization increases ability to acquire, retain and utilize resources, particularly connectedness to basic researchers</li> </ul>	<ul style="list-style-type: none"> <li>• Provides opportunity to develop trust between exchange partners, trust positively impacts knowledge creation</li> <li>• Lack of access to diverse resources</li> <li>• Provides observation and shared experiences</li> <li>• Diminishing returns found with interactions with same others over time</li> <li>• Group norms, sanctions, expectations constrain behavior and thought</li> <li>• Exchange partners may become too similar over time</li> <li>• Increasing shared experiences leads to a higher marginal impact on knowledge creation as well as a higher negative impact to knowledge creation</li> </ul>
	Weak	<ul style="list-style-type: none"> <li>• Difficult to assess the value of knowledge held by members</li> <li>• Lacks trust, limiting exchange and combination process</li> <li>• Increases autonomy and independent thinking</li> </ul>	<ul style="list-style-type: none"> <li>• No studies found</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of trust inhibits the transfer of new knowledge, for fear of expropriation</li> </ul>
Cognitive Dimension	Strong	<ul style="list-style-type: none"> <li>• Facilitates transfer as partners share language, codes and collective narratives</li> </ul>	<ul style="list-style-type: none"> <li>• Organizations must possess sufficient common knowledge to adequately use acquired knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Homogeneous teams expected to perform higher due to shared identity, low coordination efforts and face-to-face contact</li> <li>• Interacting with others of similar tenure less productive</li> </ul>
	Weak	<ul style="list-style-type: none"> <li>• Inefficient for transfer of codified knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• No studies found</li> </ul>	<ul style="list-style-type: none"> <li>• Diverse exchange partners in terms of contacts, skills, information and experiences improve knowledge creativity abilities</li> </ul>

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