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Completed Research Paper

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Abstract

Given the nested nature of work teams, this study distinguishes social capital between team-levels and individual-levels to investigate their effects on individual knowledge sharing in work teams. A survey was conducted to test the hypotheses involving 343 participants who were nested in 47 knowledge-intensive teams across 9 Chinese organizations. Our results reveal that social capital at different levels conjointly influences individuals' sharing of their explicit and tacit knowledge and also plays distinct roles on the individuals' sharing behavior in work team context. The results also demonstrate that an optimal social network configuration maximizes team members' knowledge sharing. Our investigation from a multilevel approach articulates how social capital at different levels in conjunction influences individual sharing behavior, contributing to the existing social capital and social network theories as well as the literature of knowledge management.

Keywords: *Knowledge sharing, social capital, social network, multilevel*

Introduction

Since the knowledge based view (Grant, 1996), knowledge sharing has been increasingly recognized as a crucial source of competitive advantage. Knowledge sharing provides individuals, work teams and organizations with the opportunity to improve the work performance and further develop new ideas and innovation (Cumming, 2004). Nonaka (1994) has postulated knowledge sharing in organizations screws up from an individual level to a group level, then from a group level to an organizational level. In practice, modern organizations intend to flatten the structures by adopting work team settings to facilitate knowledge sharing among individuals who is the fundamental knowledge holders. The merits of team-based organizational design stems from its flexible social structure (Argote et al., 2003). This merits should thank to the information and communication technologies that are widely adopted in modern organizations, since the technologies extend the social boundary of the formal structure of the teams and make the structure become virtual and fuzzy. More importantly, this extended, virtual, fuzzy social network of a team offers it great social capital that enhances knowledge sharing within the team. However, seldom has research documented the effect of such social network and capital on team members' sharing behavior.

Regarding the social nature of knowledge sharing, enormous studies have examined individuals' knowledge sharing behavior under the umbrella of social capital theory. Most prior research, however, has limited the study of social capital to discrete levels of analysis, including individuals (Kankanhalli et al., 2005), groups (Oh et al., 2004; Reagans and McEvily, 2003), organizations (Yli-Renko et al., 2001), communities (Wasko and Faraj, 2005), and industries (Stam and Elfring, 2008). The micro-, meso- or macro-only research that neglects the influences across levels presents several limitations. First, the single level research only provides us a partial understanding of individual knowledge sharing in a certain context while not disclosing what is the effect of the context at a higher level on the individuals' sharing of knowledge at a lower level and how. Joshi et al. (2009) recently invest efforts to investigate the conjoint effects of the contextual factors at higher level with those determinants at a lower level, but their research is still at a conceptual stage thus lack of empirical evidence. Second, such research that conceptualizes and operates social capital at a single level to investigate its effect on individual knowledge sharing has led us to a contradictory perception on the social capital theories, e.g., the opposite logic of assertions of structural holes versus closure social structures (Burt, 1992; Coleman, 1990). Reagan and McEvily (2008) recently point out that such a long debate could be due to that the theories themselves stand at different levels while attempting to explain the same phenomena.

In fact, social capital can be processed by the units in different levels. Individuals' social capital is shaped upon the foundations of their advantageous positions in their situated network, and having mutual understanding and trusting relationships with their colleagues. Social capital is simultaneously possessed by the overall network, e.g., a work group, an organization, even a society with a broader boundary. Accordingly, social capital can be partitioned into individual levels, team levels or higher institutional levels, according to the hierarchical nature of the contexts. However, seldom has research attempted to conceptually distinguish social capital into various levels. Empirical evidence of the effects of the combination of the social capital at different levels on individual behavior is thus glaringly absent in the literature. It is necessary to revisit the role of social capital on knowledge sharing from a multilevel approach.

Given the nested nature of work teams that are aggregations of individual members, it is more appropriate to account for both individual and team level factors in examining the individual knowledge sharing behavior in teams. Using a multilevel lens and methodology, this research aims to extend social capital and social network theories by clarifying 1) how social capital distinguishes itself between different levels, and 2) what the distinct role of social capital is at different levels for individuals' sharing of knowledge, including explicit and tacit knowledge, in organizational team contexts. In this way, we seek to obtain a deeper and richer portrait of team life, acknowledging the influences of individuals' structural positions, cognitions, and affections on their knowledge sharing, as well as the influences of team social capital on individuals' actions (Klein et al., 1999). The multilevel modeling of social capital advances social capital and social network theories through bridging the gap between the micro and meso/macro approaches. Such an approach provides a more comprehensive and precise understanding of how social capital at different levels in conjunction influence individuals' social actions in general, and knowledge sharing in particular.

Theoretical Foundation and Hypotheses

Social Capital and Social Network Theories

Social capital is "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" (Nahapiet and Ghoshal, 1998, p243). Strong interpersonal relationships in a social network developed through over-time interactions provide the foundation for shared understanding perception and construction, trust, identification, commitment and the formation of cooperative norms. As Nahapiet and Ghoshal (1998) have observed, social capital is comprised of both the structure of network and the potential resources that may be mobilized through the network. Accordingly, social capital, as a set of resources rooted in networking relationships, can be decomposed into three distinct facets: structural capital, cognitive capital, and relationship capital (Nahapiet and Ghoshal, 1998). Structure capital describes the impersonal configuration of linkages among a social group of people; cognitive capital is derived from the shared representations, interpretations, and meaning among the members who are located in the social group; and relational capital refers to the affective nature of the networking relationships where the situated members have a strong identification towards this particular social group, perceive an obligation of participation, and abide by cooperative norms (Putnam, 1993). Intuitively, the three-dimensional social capital constitutes a valuable resource for the situated individuals to conduct collective actions in general, and knowledge sharing in particular. Since knowledge has been identified with two types, i.e., explicit and tacit (Polanyi, 1966), the knowledge sharing behavior in a team is correspondingly divided into explicit knowledge sharing and tacit knowledge sharing.

A number of studies has relied on social capital and social network theories to examine individuals' pro-social behavior in organizations, e.g., knowledge sharing (Hansen, 2002), knowledge contribution (Kankanhalli et al., 2005), learning (Gibson and Vermeulen, 2003), boundary-spanning or brokerage (Xiao and Tsui, 2007), and mobility (Podolny and Baron, 1997). These studies provide insightful empirical findings from different cultures, highlighting the substantial influence of social capital on individual behavior. The analytical unit in such research is, however, limited to a single level, either micro-level (e.g., individual level) or meso/macro-level (e.g., team, organization, and industry level). As a collection of resources, social capital resides in both individuals and the whole collective that individuals form into (Nahapiet and Ghoshal, 1998). But little multilevel research has been conducted on social capital, linking individual social capital and collective capital together and examining how both can simultaneously affect individual behavior within the collective.

To account for the nested nature of work teams, this study uses a multilevel approach to examine the influences of social capital residing in individual members and the whole team. Individuals' social interactions form the social capital which in turn influences individual behavior. The social capital of a team is derived from an emerging network that covers a broader structure, which is defined by the social boundary of this team instead of by its formal boundary. This emerging network includes not only team members' network ties within the team but also their external ties with other members outside of the team but in the same organization (Oh et al., 2006). Such a broaden network based on the social boundary is indeed an important social capital of a team because it offers opportunities of acquiring new knowledge from outside sources as well as allows to maintain a necessary internal cooperation. In the bottom-up process of social capital formation, individuals possess certain positions in the emerging team network, construct shared cognition with other members, seek to transmit the team identity into an individual identity and establish an emotional attachment to the particular work team. The centrality in a network shaping an advantageous network position, the developed shared cognition and affective commitment together constitute an individual's social capital. Consistent with prior research (e.g., Reagans and McEvily, 2003; Wasko and Faraj, 2005), we stipulate that individually held social capital will supply crucial stimuli for people to engage in knowledge sharing within their work teams. According to the nested structuration theory (Perlow et al., 2004), the circumstance at a team level, which emerges from individuals' interaction, directly influences the individuals' actions in turn. At a higher level, team social capital as an aggregate of the compositions (team members) can exert important impacts on individual behavior over and beyond the individual social capital. We view this as a top-down influential process. Team social capital is reflected by the overall connectivity of an emerging network of team members' ties and the emergence of cooperative norms within the teams.

Structural Capital and Knowledge Sharing

The structure of social capital provides conditions and opportunities for individual members to share their knowledge with other members. The positions of people in a network allow them different scales of opportunities and abilities to provide knowledge to, as well as receive knowledge from, others. In the social network literature, two main network configurations are suggested: closure relationships (Coleman, 1990) and bridging relationships with structural holes (Burt, 1992). In closure network mechanism, individuals connected by strong ties benefit from the embeddedness of the relationships in their closed social group, whereas in bridging network mechanism, bridging ties that connect otherwise disconnected individuals enjoy the information and control benefits. The gaps between the disconnected individuals are referred to as structural holes (Burt, 1992). We believe that the fundamental difference between the two mechanisms of social networks is rooted in their focus at different levels. As Adler and Kwon (2002) observe, the closure network mechanism emphasizes the overall connections among individuals in a collective that give the collective cohesiveness, thereby facilitating the pursuit of collective goals. In contrast, the bridging network mechanism highlights a focal actor's advantageous position in a collective that leads to individual benefits. Reagan and McEvily (2008) also postulate that the opposite logic of the two social structures is caused by their operationalization at different levels. To distinguish the structural capital at different levels, we argue that the individual-level structural capital is implicitly shaped by individuals' betweenness centrality, whereas the team-level structural capital is reflected by the density of the emerging team network.

Individual structural capital and knowledge sharing. Betweenness centrality refers to the extent to which other actors lie on the geodesic path (shortened distance) between pairs of unconnected actors in the network (Wasserman and Faust, 1994), reflecting the intermediary location of a team member along indirect relationships that link other members. Individual betweenness centrality in a network implies the ability of a member to bridge the gaps between otherwise unconnected members. It is similar to Burt's constraint to measure structural holes (Burt, 1992). But the constraint, a more local measure, is primarily focused on the direct ties in one's immediate circle of contacts, while betweenness centrality takes both direct and indirect ties into account (Mehra et al., 2001). Team members can establish bridges between the unconnected members within the team, as well as bridges between the internal members and external members in the organization; Oh et al. (2006) categorize such bridging ties as intra-team bridging ties and inter-team bridging ties, respectively. No matter which bridging role a team member plays in, the betweenness centrality in the emerging team network provides an advantageous position through which people obtain both informational and control benefits (Burt, 1992).

From the bridging view of social network, people with exclusive relation to otherwise disconnected people tend to gain greater benefits (Mehra et al., 2001). Central individuals have a high proportion of ties to other members, and therefore have more relationships to draw upon in obtaining knowledge and resources. Also, it is easier for central people to deliver knowledge and resources to others. Intra-team bridging members who are aware of the structural holes within the team are more likely to recognize the need for discussion and therefore are more likely to share knowledge with the team members to address the knowledge gaps. Inter-team bridging members in a broader network range are more likely to import non-redundant knowledge to the internal members. Additionally, (Reagans and McEvily, 2003) posit that the individuals' engagement in boundary spanning improves their ability to convey complex ideas across distinct bodies of knowledge; thus, bridging members may have a higher level of self-efficacy of knowledge sharing. Intuitively, we stipulate that individual members with a certain level of betweenness centrality in an emerging team network have a greater capacity to transmit knowledge to one another, resulting in a smooth knowledge flow within the team.

Further, we argue for an inverted U-shaped relationship of individual betweenness centrality and their knowledge sharing, different from Oh et al.'s (2006) proposition that bridging ties always bring positive social capital resources. Extremely high betweenness centrality of individuals mainly arises from individual members' enthusiasm in external boundary spanning and results in many sparse sub-networks. Boundary spanners might be particularly susceptible to role conflict that arises from differing and inconsistent expectations among multiple constituencies (Podolny and Baron, 1997). Such a diverse and disconnected network exposes the highly betweenness-centered members to conflicting preferences and allegiances (Coleman, 1990), with the result that the individuals are not only less able to develop a coherent team identity, but also show less intention to contribute knowledge in the team. Meanwhile, the members who stay at the boundary of many teams tend to be distrusted by the internal members of their own team, as well as by members in the counterpart teams (Xiao and Tsui, 2007); as a result, they are less likely to receive the relevant knowledge from others.

Excessive betweenness centralities among team members leading to the emerging network full of structural holes may increase the individuals' instrumental benefits (e.g., controlling powers), but the sacrificed necessary internal cohesiveness and trusting relationships may, in the long run, not allow central members to search for knowledge and transfer it to one another, especially for tacit knowledge sharing. Xiao and Tsui (2007) have shown that employees with many structural holes find themselves in trouble, and are not able to achieve good career performance. Moreover, an excessive betweenness centrality implies that the individual has an overloaded boundary spanning responsibility. Given the goodwill of central members, a knowledge transmission jam is still likely to appear due to the role overload among the minority of members. Marrone et al. (2007) have empirically demonstrated that more team members engaging in boundary spanning would decrease each individual's role overload. Thus, the network in which more members with a certain level of betweenness centrality (however, not the network in which a minority of members with excessive betweenness centralities for controlling the majority of structural holes) will facilitate the individuals' knowledge sharing with one another. The above justifies the following hypothesis:

> *Hypothesis 1. An individual member's betweenness centrality in the emerging network has an inverted U-shaped relationship with the individual's sharing of knowledge, explicit and tacit.*

Team structural capital and knowledge sharing. Density describes the overall connectivity in a social network. In a closure social network with high density, the bounded solidarity, strong trust and reciprocity, and sanctions against self-serving behaviors are expected (Coleman, 1990). Social cohesion should have a positive effect on knowledge sharing, primarily through influencing the willingness of individuals to devote time and effort to assisting others and learning from others (Reagans and McEvily, 2003). The nurtured strong reciprocity could be one remedy of social loafing, and the bounded solidarity of closure relationships could lead to more efficient and effective self sanctioning, thus reducing opportunistic behavior. Hence, a closure team network with more trust, but less uncertainty between leads them to become more willing to share their knowledge within the team.

Despite the positive consequences of the closure networking mechanism, we do not suggest a simple positive linear relationship between the team closure and individual members' knowledge sharing behavior. On the contrary, the excessive density of a team constrains its extroversion, and may therefore result in a negative effect on the knowledge sharing among individual members. Excessive density of the emerging network reduces the possibility for out-team bridging relationships and valuable knowledge inflow into the team. Ultimately, the intra-team knowledge sharing would decrease, owing to the redundancy of knowledge. In this sense, an excessively dense team network negatively influences individual members' knowledge sharing with other members. To account for the effect of the structure of a whole team network on its situated individual members' knowledge sharing, we argue for an inverted U-shaped relationship between the team-level structural capital, i.e., network density and team members' sharing of knowledge.

As Oh et al. (2006) assert, team social capital needs to be understood from an optimal configuration perspective: it is the overall balance of relationships that leads to the peak of team social capital resources flow. A desirable sharing environment requires a relatively open social network, because more diverse resources and valuable knowledge are located beyond a particular team. In fact, most productive teams are internally cohesive and also have external networks with a certain number of structural holes (Reagans and McEvily, 2003). Oh et al. (2004) have also demonstrated the curvilinear relationship between the team closure and the team effectiveness. Accordingly, we present the following hypothesis:

> *Hypothesis 2. The density of an emerging network solicited by team members has an inverted U-shaped relationship with the individual members' sharing of knowledge, explicit and tacit.*

Cognitive Capital and Knowledge Sharing

Individual shared cognition and knowledge sharing. Individual shared cognition refers to the perceived similarity of the cognitive structure, including task- and team- related knowledge, values, philosophies, and problem-solving approaches, between an individual member and other teammates. The perception of interpersonal similarity produces individuals' homophily behavior, i.e., the tendency to interact with similar others (Makela et al., 2007). According to the social categorization theory (Turner et al., 1987), the perceived similarity creates opportunities for attraction from one another and arouses the cognitive categorization. People are more willing to share knowledge with those who hold a similar attitude, philosophy, and experience and tend to agree with them (Darr and Kurtzberg, 2000). Previous studies show that the similarity-based connections which nourish team members' active interaction smoothen the knowledge flow within the team (Borgatti and Cross, 2003; Brass et al., 2004; Makela et al., 2007). In

contrast, humans will experience internal conflict and cognitive dissonance when they are faced with information that is not consistent with their own reality (Nelson and Cooprider, 1996). The lack of perceived shared cognition by individuals will lead to reluctance to share knowledge with their counterparts. Hence, individual members are more likely to share their knowledge with one another when they display shared cognition of the work.

Furthermore, the shared cognition reduces individuals' cognitive load to share knowledge with their team members. Meaningful knowledge sharing requires at least some level of shared understanding, e.g., shared language, methodology, as well as mutual awareness of dealing with tasks (Nahapiet and Ghoshal, 1998). The perception of shared cognition allows individual members to create an effective heuristic which not only decreases individuals' cognitive effort to understand the needs of other members and to represent the knowledge, but also reduces their effort to internalize the received knowledge (Darr and Kurtzberg, 2000). The likelihood of individuals' knowledge sharing within their situated team increases when they feel free from putting in much cognitive effort. Accordingly, we propose the following hypothesis:

> *Hypothesis 3. An individually perceived shared cognition with other members has a positive impact on the individual's sharing of knowledge, explicit and tacit.*

Team cognitive commonality and knowledge sharing. As opposed to the individual perceived shared cognition, team shared cognition refers to the overlap or commonality of all team members' cognitive structures, and is called as team cognitive commonality in this study. The cognitive commonality is an aggregation of individuals' shared cognitions to the team level, indicated by the agreement of the perceived shared cognition in a group, regarding the task- and team-related knowledge, values, philosophy, methodology, and so forth. Makela et al. (2007) also have identified the effect of homophily-driven clustering at a higher level, i.e., when similar individuals all have a tendency to interact with like others, it may produce an aggregate effect of informal clustering in a broader network such as a team or even an organization. They further find that knowledge flows better within the aggregate clusters than between them. Individual homophily is based on the perceived cognition similarity, and the aggregate cluster homophily is depended on the cognitive commonality at a higher level, in particular at a team level in this study.

The cognitive commonality and sharedness in a team allows individual members to predict the needs of the task and team, to anticipate the expectation and behavior of others, to adapt to changing demands, and to coordinate activities with one another successfully (Klimoski and Mohammed, 1994; Mohammed and Dumville, 2003). When there is a lack of shared knowledge base, expectations, and realities of individual members at the team level, the commonality of team goals will be lost, and therefore individual members will become more distant from one another and less willing to share their knowledge. Thus, the commonality of individuals' cognition with regard to the task- and team-related knowledge will produce an additive effect on promoting individuals' knowledge sharing engagement within groups. The agreement of individually perceived shared cognition indicates the viability of the common knowledge within a group. Accordingly, we hypothesize that:

> *Hypothesis 4. The cognitive commonality within a team has a positive impact on the situated individual members' sharing of knowledge, explicit and tacit.*

Relational Capital and Knowledge Sharing

Individual affective commitment and knowledge sharing. Affective commitment is defined as the emotional significance that individual members attach to the membership in their work teams (Van Der Vegt and Bunderson, 2005). It is a result of identification (Turner et al., 1987) and represents a duty or obligation to engage in future action (Coleman, 1990). Team identification is the merger of the self and the team, with people defining themselves in terms of their group membership. Social identification nurtures one's motivation to share knowledge; in contrast, distinct and contradictory identities within communities set up barriers to knowledge sharing (Nahapiet and Ghoshal, 1998). Regarding the human natural tendency of hoarding knowledge, people do not contribute knowledge unless they recognize themselves as being part of the team and perceive their contribution to be conducive to their welfare. The affective commitment, as an emotional involvement with a particular team, fosters loyalty and citizenship behaviors (Ellemers et al., 1999; van der Vegt and Janssen, 2003). Individual affection resulting from identification leads a person to maintain a positive trusting relationship with other in-group members, and therefore elevates his/her activeness of knowledge sharing within the particular team. Indeed, the emotional attachment to a collective has been shown the most clearly to supply the motivational force that leads individuals to collective actions or the readiness to engage in interaction (Bergami and Bagozzi, 2000, p563). But, the arduous relationships in which situated people feel emotionally laborious and distant to a social group not only suppress their motivations

to contribute knowledge but also freeze their motives of learning (Szulanski, 1996). The above justifies the following hypothesis:

Hypothesis 5. An individual member's affective commitment to the team has a positive impact on the individual's sharing of knowledge, explicit and tacit.

Team cooperative norms and knowledge sharing. Team cooperative norms represent a shared value of cooperation among team members. Cooperative norms in a team usually include the willingness to value and respond to diversity, the openness to critical thoughts, and the expectation of reciprocity and cooperation (Leonard-Barton, 1995). Team cooperative norms affect individual sharing behavior in two ways: 1) normatively motivating individuals to adhere to the team expectation; and 2) diminishing the potential competition resulting from knowledge sharing *per se*.

First, team norms guide individual behavior by defining what is considered to be appropriate and what should be avoided, and by providing an organized, interpretable set of informational cues that creates order for individual members. The appearance of a norm goes with the shift of socially defined right controlling an action from the individual self to others (Coleman, 1990). Individuals often perceive the intensive normative pressures to conform to the team norms because such conformations will satisfy their need for social approval by the team, as well as their need to achieve and maintain harmony with their environment (Dragoni, 2005). Team cooperative norms not only open up access to parties for sharing, but also ensure the motivation to engage in the sharing behavior (Putnam, 1993). The shared value of cooperation in the team will lead to salient subjective norms regarding cooperation, i.e., the individuals' perception of the expectation of other members in respect to the knowledge sharing with one another (Ajzen and Fishbein, 1980; Bock et al., 2005). Furthermore, the reciprocity embedded in cooperative norms provides team members with some assurance that their knowledge sharing could be rewarded from someone else in the long run, although such a reward may not be immediate and straightforward (Blau, 1964).

Second, team cooperative norms can limit the potential competition resulting from knowledge sharing *per se*. Knowledge sharing may then result in an emergence of knowledge redundancy and the consequent substitutable points of exchange in the knowledge network, i.e., competition (Reagans and McEvily, 2003). Further, the perception of an increasing level of hidden competitions may inhibit people from further sharing their knowing, especially when such knowing is vital for sustaining their competences. The hidden competitions might not be avoidable; however, cooperative norms in a team can act to mitigate potential conflicts and competitions, thereby promoting knowledge sharing (Ingram and Roberts, 2000). The above justifies the following hypothesis:

Hypothesis 6. Cooperative norms within a team have a positive impact on the individual members' sharing of knowledge, explicit and tacit.

Methodology

Data Collection

We conducted a survey involving 9 Chinese organizations. The survey instrument, originally developed in English, was translated into Chinese using Brislin's (1986) conventional back-translation method. The instrument was translated back and forth between English and Chinese by a group of bilingual researchers. Before administering the main study, we conducted two pilot tests followed by in-depth interviews in another two organizations to determine the face validity, clarity and relevance of the questionnaire.

The main study was facilitated by senior managers in the targeted nine organizations. The participating senior managers helped to identify the potential respondents and to clarify the boundaries of the work teams in their organizations. Respondents had the option to fill out the questionnaire either via paper and pencil or an online system. Both included a cover letter introducing the purpose of the study and guidance for completing the survey. To make the respondents feel free to provide their network data, we assured them that their responses would not be shared with their supervisors.

We collected 473 individual observations nested in 65 work teams. These teams were knowledge intensive, engaged in engineering and design, software development, telecommunication services and information services. Following the practice of prior research on network properties of organizational teams (e.g., Oh et al., 2004), 18 teams with less than 80% group response rate on the questions about network ties were excluded in order to improve the reliability

of network data solicited from the team members. The final sample was reduced to 343 team members from 47 work teams with an average team response rate of 94.2%. The team size ranged from 3 to 21 members. 68.3% of the respondents were male and 31.7% were female. Their mean age was 35.5 years (s.d. = 10.8) and the mean of their job tenure was 10.3 years (s.d. = 11.2).

Measures

Network data and indices. Among the various types of social networks, this study focused on the advice-network. The network data were collected using a modified ego-centric approach (Wasserman and Faust, 1994). Although each work team had a formal boundary, the interactions of team members may not be limited within this particular team in reality. Constraining a respondent's connections within a respective team did not allow us to know how he or she would interact with members within the same team, nor could we ascertain the interaction with people beyond the formal boundary of this team, albeit in the same organization. We acknowledged the virtues of the socio-metric approach that allowed getting information on all interactions inside a network (Reagans and McEvily, 2003); however, such a method, providing a fixed contact roster, did not suit our research purposes. The difficulty of defining the social boundary of an appropriate network would also have introduced inaccuracies into the network data. Therefore, we adapted the ego-centric approach that was in line with several other studies (e.g., Hansen et al., 2005; Obstfeld, 2005). Each team member was asked a series of questions to list up to 20 names in total in the same organization. The name generator questions were adapted from Obsttfeld (2005): looking back over the last year, 1) to whom they turned to for advice; 2) with whom they communicated to get work done; 3) with whom they discussed important matters; and 4) who had been influential in getting their work approved. The resulting roster of contacts for each work team was the emerging network of this team, including intra-team ties and external ties. Based on the solicited networks by team members, we calculated each team member's *betweenness centrality* in the corresponding network, and the *network density* of each work team. These indices were computed by the widely-used UCINET 6 software (Borgatti et al., 2002).

Betweenness centrality. According to Wasserman and Faust (1994), we used Freeman's standardized betweenness centrality to measure the extent to which each individual member occupied a structurally advantageous position, connecting otherwise unconnected others in the emerging network. The networks were treated as directed ones, taking both egos' and alters' evaluations into account.

Network density. Network density describes the overall level of interaction of various kinds of relations reported by team members. We computed the density of the emerging network for each work team as the number of existing relations divided by the number of all possible asymmetric relations (Wasserman and Faust, 1994).

Knowledge sharing. Knowledge sharing in this study is defined as team members providing and receiving knowledge with other members within the same work team through multiple channels. Polanyi (1966) has identified two types of knowledge: explicit and tacit. Explicit knowledge is highly codified and is transmittable in a formal, systematic language, while tacit knowledge is abstract and is communicated through individuals' active involvement. Individually possessed explicit knowledge is typically available to individuals in the form of facts, concepts, and frameworks that can be stored and retrieved from memory. In contrast, individual tacit knowledge may take many different forms of tacit knowing, for instance, theoretical and practical knowledge of people, task performing experiences, technical skills, etc. Based on the content of knowledge, we distinguish explicit knowledge sharing from tacit knowledge sharing. The measures for the two dimensions of knowledge sharing were adapted from Bock et al. (2005). Specifically, explicit knowledge sharing was measured by the sharing of work reports, manuals, methodologies, etc., while tacit knowledge sharing was measured by the sharing of know-how, know-why, know-whom or know-where, work experiences and expertise from education or training (1 = never; 7 = every often).

Individual shared cognition. 4 items adapted from Ko et al. (2005) and Nelson and Cooprider (1996) were used to measure individual shared cognition. Sample statements include "I agree on what's important to the work with my team members" and "My team members and I solve problems in a similar way" (1 = strongly disagree; 7 = strongly agree).

Team cognitive commonality. The conceptualization and operationalization of cognitive commonality at a team level is based on the dispersion-composition model in multilevel research (Chan, 1998). The cognition commonality in a team was operationalized as James's (1984) interrater agreement index (R_{wg}) of team members' perceptions of the shared cognition between themselves and other members in the same team. The value of R_{wg} reflects the degree

of within-group consensus in terms of the shared cognition among team members. The mean of R_{wg} for team shared cognition was 0.93, ranging from 0.79 to 1.

Individual affective commitment. 5 items were adapted from previous studies to measure individuals' affective commitment to the team (Van der Vegt and Bunderson, 2005; Wasko and Faraj, 2005). A sample statement is "I feel a strong sense of belonging to my team" (1 = strongly disagree; 7 = strongly agree).

Team cooperative norms. 6 items accompanied by a 7-point scale (1 = strongly disagree; 7 = strongly agree) were used to measure the cooperative norms. The items included the willingness to value and respond to diversity, the openness to critical thoughts, teamwork spirits, *etc.* (Bock et al., 2005; Kankanhalli et al., 2005). Different from the dispersion-composition model for measuring the team cognitive commonality which assumed a dispersion of individual members' cognitive models, a degree of consensus among individual members' ratings to their team environment was expected for assessing the cooperative norms. Thus we followed the direct consensus composition model to measure team cooperative norms by aggregating individuals' ratings to the team level (Chan, 1998). The viability of the aggregation measure was assessed with R_{wg} (James, 1984), intraclass correlation (ICC[1]) and the reliability of group mean (ICC[2]) (Bliese, 2000). The median R_{wg} was 0.95, ranging from 0.78 to 0.99, indicating high within-group homogeneity. The value of ICC[1] and ICC[2] were 0.21 and 0.66, respectively, indicating sufficient between-groups variability. Jointly, the statistics of within-group homogeneity and between-groups variability justified the warrant aggregation of measures for team cooperative norms.

Control variables. Previous research shows that team size (e.g., Oh et al., 2004; Reagans and McEvily, 2003) and physical distance/proximity (e.g., Darr and Kurtzberg, 2000) of a group of people has influence on their knowledge sharing behavior. Hence, team size and physical distance (1 = co-locate in the same office, 2 = disperse across a work block; 3 = disperse across a city; 4 = disperse across the country), indicated by team leaders, were included as controls at the group level.

Data Analysis

Our research model is hierarchical, with individual knowledge sharing behavior, and social capital spanning the individual and team levels. The data is also nested, i.e., individuals are nested in work teams. Thus, we adopted the Hierarchical Linear Modeling (HLM6) technique to examine relationships across multiple levels (Bryk and Raudenbus, 1992). We tested the effects of social capital on explicit knowledge sharing and tacit knowledge sharing separately. Each testing included three models step by step: a null model, a random coefficient model with only level-1 predictors and an intercept-as-outcome model with both level-1 and level-2 predictors. We also calculated the R^2 within-group, the R^2 between-groups and the total R^2.

Results

Before HLM tests, we assessed the reliability, convergent and discriminant validities for the latent variables. The result of a confirmatory factor analysis by including all latent variables indicated a goodness of fit of our measurement model ($\chi^2 = 606.17$, df = 179, GFI (goodness of fit index) = 0.84, CFI (comparative fit index) = 0.915, RMSEA (root mean square error of approximation) = 0.08). The composite reliability scores of the latent variables ranged from 0.86 to 0.93, exceeding the recommended threshold value of 0.70 (Nunnally, (1978) and thus indicating adequate reliability and convergent validity of the measures for those latent variables. Furthermore, a series of pairwised chi-square difference tests were also conducted to assess the discriminant validity. The significant chi-square differences (range: 5.22~41.55, $p < 0.001$) between the unconstrained pair models (the pair variables freely correlated) and that of the constrained models (covariance between the pair variables set equal to 1) indicated discriminant validities of our instruments (Bagozzi et al., 1991).

We also checked the multicollinearity among the predictive variables at both levels separately before estimating the HLM models. The condition index for individual-level predictors was 14, less than the recommended critical value of 30, while the condition index for the team level predictors was 50, above the recommended limit (Belsley et al., 1980). According to Ang et al. (2002), we grand mean centered the variables. The condition indices were reduced to 9 and 7 for the individual level and team level predictors, respectively, which mitigated the multicollinearity substantially. Table 1 presents the descriptive statistics and bivariate correlations of variables at individual and team levels.

Table 1. Descriptive Statistics and Correlations							
Variables	**Mean**	**s.d.**	**1**	**2**	**3**	**4**	**5**
Individual level (n = 343)							
1. Explicit knowledge sharing	4.34	1.19	**0.86**				
2. Tacit knowledge sharing	4.61	1.12	.66***	**0.90**			
3. Betweenness centrality	0.04	0.08	.12*	.05	-		
4. Shared cognition	5.01	0.93	.45***	.48***	.13*	**0.89**	
5. Affective commitment	5.56	1.04	.36***	.52***	.10†	.51***	**0.95**
Group level (n = 47)	**Mean**	**s.d.**	**1**	**2**	**3**	**4**	**5**
1. Team size	8.02	4.23	-				
2. Physical distance	1.53	0.58	-.15	-			
3. Density	0.13	0.01	-.18	-.17	-		
4. Cognitive commonality	0.93	0.06	-.13	.34*	-.12	-	
5. Cooperative norms	5.28	0.63	.15	.07	-.06	.33*	**0.93**

Note: Values on the diagonal are composite reliability of latent variables.
† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, two-tailed tests

HLM null models

HLM null models were run separately for the two individual level dependent variables of interest. Resulting ICC[1] values and associated chi-square tests revealed that 7.6% ($\chi^2 = 74.09$, df = 46, $p = 0.006$) and 18.2% ($\chi^2 = 124.4$, df = 46, $p < 0.001$) of the variance in team member explicit knowledge sharing and tacit knowledge sharing resided between teams, respectively. Furthermore, regarding the sampling teams being nested in 9 organizations, another two HLM null models for the dependent variables were run at the organizational level. The variances existing across organizations were less than one percentage, indicating that the major between-groups variances were derived from the difference across teams, instead of across organizations.

HLM results

To test the different effects of multilevel social capital on individual knowledge sharing (explicit versus tacit), we twice ran random coefficient models. Only level-1 predictors tested the effects of individual social capital on their knowledge sharing. Intercepts-as-outcomes models added level-2 predictors to test the effects of team social capital on individual knowledge sharing. According to Hofmann and Gavin (1998), both level-1 and level-2 variables were grand-mean centered for HLM analyses. This mean centering approach is recommended when the focused multilevel effects are on an incremental perspective. This centering approach facilitates the interpretation of the HLM results and ensures that the individual level effects are controlled for testing of the incremental effects of group level variables. It also lessens multicollinearity in group level estimation by reducing the correlation between the group level intercept and slope estimates (Hofmann and Gavin, 1998; Raudenbus, 1989). Furthermore, to manifest the influences of group social capital on individuals' knowledge sharing, the effects of other contextual features, such as group size and physical distance, were controlled during the analyses. Table 2 summarizes the results of HLM analyses testing our hypotheses.

Our results demonstrate that the social capital held by individual members has significant impact on their knowledge sharing within the teams, explaining 28.12% and 41.76% of the within-group variance of explicit and tacit knowledge sharing, respectively. As hypothesized, a team member's betweenness centrality in an emerging team network posits an inverted U-shaped influence on individuals' sharing of their explicit and tacit knowledge within teams; thus hypothesis 1 is supported.

The individual members' perception of the shared cognition with other members regarding the team tasks, values, and problem-solving methods are demonstrated as supplying strong cognitive attraction for the within-group sharing of their explicit ($\gamma = 0.46$, $p < 0.001$) and tacit knowledge ($\gamma = 0.32$, $p < 0.001$); thus, hypothesis 3 is also supported. As an emotional attachment to a particular team, individual affective commitment is shown to be significantly, positively associated with individuals' sharing of explicit knowledge ($\gamma = 0.21$, $p < 0.001$) and tacit knowledge sharing ($\gamma = 0.43$, $p < 0.001$), showing support for hypothesis 5. It is interesting to find that individuals' perceived shared cognition over affective commitment exhibits a stronger influence on their sharing of explicit knowledge,

whereas individuals' affective commitment over the perception of shared cognition presents a stronger impact on their tacit knowledge sharing.

Table 2. Hierarchical Linear Modeling Results for Team Member Knowledge Sharing [a]				
	Explicit knowledge sharing		Tacit knowledge sharing	
Levels and Variables	M1a	M2a	M1b	M2b
Level 1 predictors				
Intercept	4.34^{***}	4.37^{***}	4.64^{***}	4.66^{***}
(Betweenness centrality)^2	-10.82	-12.82^{*}	-12.37^{*}	-11.78^{*}
Betweenness centrality	4.75^{*}	4.93^{**}	4.38^{*}	3.96^{*}
Shared cognition	0.46^{***}	0.43^{***}	0.32^{***}	0.32^{***}
Affective commitment	0.21^{***}	0.19^{***}	0.43^{***}	0.41^{***}
Level 2 predictors				
Team size		-0.04^{**}		-0.04^{*}
Physical distance		*0.15*		0.22^{*}
(Density)^2		$-8.90^{\dagger}$		-8.50^{*}
Density		$3.16^{\dagger}$		2.63
Cognitive commonality		0.49		$-1.30^{\dagger}$
Cooperative norm		0.15		0.26^{**}
Deviance [b]	988.99	977.01	863.05	849.38
$R^2_{within-group}$	28.12%		41.76%	
$R^2_{between-groups}$		89.50%		51.49%
R^2_{total} [c]		**32.76%**		**43.53%**

a. Team members n=343, Teams n=47. All models are grand-mean centered. Entries are estimations of the fixed effects (γs) with robust standard errors. The italic are control variables.

b. Deviance is a measure of model fit; the smaller the deviance is, the better the model fits. Deviance=-2* log likelihood of the full maximum likelihood estimate.

c. $R^2_{total} = R^2_{within-group} * (1\text{-ICC}[1]) + R^2_{between-groups} * \text{ICC}[1]$
   $^{\dagger} p < 0.10, \; ^{*} p < 0.05, \; ^{**} p < 0.01, \; ^{***} p < 0.001$

The intercepts-as-outcomes models for the two types of knowledge sharing reveal that the team social capital are more likely to affect individuals' tacit knowledge sharing than their explicit knowledge sharing. As shown in Table 2, level-2 predictors explain 89.50% of available 7.2% of the between-groups variance in explicit knowledge sharing, and 51.49% of the available 18.32% of between-group variance in tacit knowledge sharing. The emerging team's network density has a curvilinear relationship with individuals' sharing of explicit and tacit knowledge, providing support for Hypothesis 2. Considering the level of significance, we found that individuals' tacit knowledge sharing within groups required more optimal network configuration, i.e., a moderately dense network, compared with their explicit knowledge sharing.

Team cognitive capital, indicated by the commonality and sharedness of team members' cognitions, is shown to have an insignificant impact on individuals' explicit knowledge sharing, and surprisingly exhibiting a negative, although marginally significant, impact on the tacit knowledge sharing within teams. There is thus no convincing evidence to support Hypothesis 4. With regard to the negative effect, two plausible reasons may explain such a result. First, tacit knowledge sharing could be regarded as the phenomena of "blind or no-look pass basketball" (Cannon-Bowers and Eduardo, 2001). The team cognitive commonality helps individual members to coordinate in an implicit while effective way, and therefore the explicit communication becomes unnecessary. Second, team cognitive commonality to some extent presents the identical knowledge structures among team members. Such knowledge redundancy would hamper knowledge sharing from each other. Hence, team cognitive capital at a higher level has non-significant effect on individuals' knowledge sharing, and may even decrease the their sharing of tacit knowledge in teams.

Team cooperative norms exhibit a significant, positive impact on individual members' tacit knowledge sharing ($\gamma = 0.26$, $p < 0.01$) while present an insignificant relationship with their explicit knowledge sharing ($\gamma = 0.15$, $p = 0.161$). The results provide a partial support to Hypothesis 6 and reveal an interesting finding by chance. Plausibly, sharing explicit knowledge, such as work reports, manuals and progress reports, is a base line for the teams to complete team works; however, the sharing of the personally held tacit knowledge cannot be formalized and routinized. Rather, individuals' tacit knowledge sharing behavior would be guided and motivated by the social norms. The norms could facilitate individuals' sense-making of the cooperative environment and the expectations of sharing from others. They could also reduce hidden competition, owing to the tacit knowledge sharing *per se*.

As for the control variables, our results demonstrate the negative relationships of team size and knowledge sharing, regardless of the type of knowledge. In larger teams, individuals may perceive less cohesiveness of the team and less similarity with other members. They may also feel a less intensive normative force from the team; thus, free-riding is more likely to occur in larger teams. These will impede individuals' intention to share their knowledge. We controlled the team dispersion during the survey manipulation. As shown in Table 1, the distance of participating teams was short (mean = 1.53, s.d. = 0.58, range = [1, 3]). The insignificant relationship with individuals' explicit knowledge sharing, to some extent, implies the success of our manipulation control. Surprisingly, however, the physical distance is significantly positively associated with individuals' tacit knowledge sharing. This informs us that a short distance sometimes might not always be an advantage for individuals to share knowledge.

Discussion

Differentiated from previous studies on social capital at single levels, this study applies a multilevel approach to fragment social capital into an individual and team level to examine their impacts on individual knowledge sharing behavior within work teams. The multilevel analyses reveal that the social capital at different levels exerts distinct influences on individuals' sharing of their explicit and tacit knowledge. Our results confirm the importance of individually held social capital for motivating individuals' engagement in collective actions in general, and knowledge sharing in particular. More importantly, this study demonstrates that the cross level effects of team social capital at a higher level on individual knowledge sharing behavior at a lower level are not identical and depend on the content of knowledge. Team social capital is more important for promoting individual members' sharing of tacit knowledge than explicit knowledge in teams.

We use social network analysis to quantify the structural capital at the individual level and the team level with betweenness centrality and network density, respectively. Our results illustrate that the structural capital at both levels has an inverted U-shaped relationship with team members' knowledge sharing. Such results provide strong evidence of the notion of optimal network configuration. Oh et al. (2006) have postulated that an optimal network is a network retaining various bridging ties linking internal people to external sources as well as to a moderate level of network density of the whole team. However, we would argue that the optimal social network configuration is founded on the individuals' structural equivalence and the overall network balance. An emerging team network with an excessive individual betweenness centrality will damage the internal cohesion, while a network with an excessive network density will lead to knowledge redundancy and infertility. Both of these extreme network configurations will hamper individuals' engagement in knowledge sharing in their teams. Instead, individual members who possess positions with moderate betweenness centralities can receive new knowledge from external sources while freeing themselves from suffering the information traffic jam during the knowledge transferring, and thus they can share more knowledge. Also, the overall network with a moderate density will reduce the in-group bias while allowing individual members to maintain a certain degree of internal cohesion, therefore facilitating the knowledge sharing in teams.

This study distinguishes tacit knowledge sharing from explicit knowledge sharing and reveals that social capital at different levels plays differential roles in motivating individuals' sharing of different types of knowledge. Individually held social capital supplies the necessary motives for team members to engage in both explicit and tacit knowledge sharing within teams. In spite of the difference in magnitudes, their effects are substantial, confirming the findings in previous research (e.g., Van den Bossche et al., 2007; Van der Vegt and Bunderson, 2005). However, team social capital may not always exhibit the additive effects on individual knowledge sharing behavior in teams, depending on the content of knowledge. Team social capital at a higher level creates opportunities and normative forces for individuals to engage in the tricky tacit knowledge sharing. Tacit knowledge sharing requires a certain degree of team cohesiveness and the cooperative norms to reduce the uncertainty and competitiveness that are derived from the sharing *per se*. Also, tacit knowledge sharing is more likely to occur when there is a moderate

overlap as well as diversity in team members' cognitive structures. As for the explicit knowledge sharing, individual members still favor the condition with an optimal network configuration, but they may not be so sensitive to the presence of cognitive commonality and cooperative norms in the teams.

Implications

Social capital does not merely belong to individuals in a social network, but to the network as a whole. Our conceptualization of social capital at both individual and team level with empirical testing of their effects on intra-team knowledge sharing behavior through a multilevel approach constitutes the most important theoretical contributions to social capital theory. As work teams have a multilevel nature -- individual members nested in teams -- a single level research ignoring multilevel nested structures will lead to numerous erroneous conclusions (Klein et al., 1994). Our multilevel research linking individual and team factors fills up this gap in prior single level studies. The finding that individual social capital and team social capital play different roles in elevating team members' sharing of different types of knowledge offers precise understanding of the influences of social capital on individuals' collective behavior.

Second, this study sheds light on the appropriateness of an optimal social network configuration for collective actions, contributing to the social network research. A network configuration, in which individuals stand on positions with a moderate betweenness centrality while the overall team network is moderately dense, is able to provide a better social environment for individuals to behave collectively and share their knowledge. Indeed, there is a trade-off between the individual networks and the team network. As with prior social network research (e.g., Burt, 1992; Granovetter, 1973), we acknowledge the value of bridging ties that link otherwise unconnected people, especially those that link external sources with internal members. But, we further pinpoint the importance for individuals of balancing the proportion of connections with internal and external ties. Such a balance is not only beneficial for individuals themselves but also for the team as a whole. Our optimal social network configuration view, to some extent, accommodates the conflict between structural holes theory (Burt, 1992) and Coleman's (1990) closure view of social capital.

Despite the balance in social network, this study also teases out the noteworthy balance between cognitive similarity and diversity, pointing toward the third implication. The results demonstrate that individuals' perceptions of shared cognition with others will facilitate knowledge sharing. A high degree of cognitive commonality and sharedness in a team is not helpful to individuals' knowledge sharing, and it might even impede tacit knowledge sharing. This is consistent with Makela et al.'s (2007) notion of "paradox of homophily": on the one hand, interpersonal homophily that is based on the perceived similarity facilitates knowledge sharing between individuals and within clusters; on the other hand, such homophily also functions as a barrier to knowledge sharing because it can restrict the acquisition of new knowledge and may instigate entry barriers to those who do not share similar characteristics. Prior studies have noted the trade-off between cognitive similarity and diversity for knowledge sharing (Reagans et al., 2004). Our results enrich this notion, revealing that the cognitive structure in different levels requires different levels of homogeneity and the sequent homophily. At the individual level, team members need to psychologically perceive the cognitive similarity, which seeds motivations of knowledge sharing. A lack of common knowledge is likely to frustrate attempts to share knowledge (Reagans and McEvily, 2003). But, the factual high convergence of cognitive structures at the team level may not be a good signal for individual knowledge sharing in the team and may be even worse for the knowledge sharing in the organization.

Practically, the results in our study entail important implications for the teams that are engage in knowledge intensive work such as in the industry of information technology (IT), regarding our research context. Knowledge sharing is always an important theme for IT people. The first implication is related to the network configuration of such teams. Team leaders or managers should assess the health of their emergent team network through our optimal network view. By checking the network density and individuals' bridging ties, they can advocate an appropriate networking strategy for team members. Encouraging active internal interactions is one way through which team leaders can foster the network cohesion. Encouraging more members to engage in boundary-spanning is a tactic for team leaders to reduce the risk of knowledge redundancy and maintain continuous rich knowledge sharing in their teams.

Second, IT people tend to use the state-of-arts of technologies to share knowledge, especially in the physically distributed teams. Our results show that the more distance of a team, the more knowledge sharing in the team. This implies the importance of information and communication technologies that play in enhancing intra-team knowledge

sharing. The technologies augment the capacity of knowledge sharing among people. More importantly, the technologies extend and virtualize the team network for knowledge sharing. In such context, individuals are more likely to feel freedom and have autonomy to decide their social behavior, thus are more willing to share knowledge (Gargiulo et al., 2009).

The sequent third managerial implication is associated with the approach of satisfying the internal needs of IT people. We believe this concern is prevalent in the knowledge intensive industries. Team leaders or managers should pay more attention to the human ingredients over and beyond the network structures, in order to motivate individuals for knowledge sharing, especially for tacit knowledge sharing. The pure network structure is not the only reason why individuals behave collectively. In fact, the individually perceived shared cognition perception and their affective commitment provide the immediate motivation and ability for them to share knowledge. The soft managerial skills (such as cultivating individuals' cognitive and affective identification with the teams, creating cooperative environments, controlling the balance of knowledge similarity and diversity among team members, and so forth) are more in demand for promoting individuals' tacit knowledge sharing. Thus, our findings provide new insight for team design and management with respect to prioritizing social resources on enhancing different types of knowledge sharing behavior.

Limitations and Future Directions

This study has several potential limitations necessitating future research. The first concerns the cross-sectional design that limits determination of causality. Although we have argued that the optimal social network configuration, team cognition and norms would lead to individual knowledge sharing, the fact that knowledge sharing and network building are both ongoing processes make it likely that there is a reverse-causality or a structuration effect (Giddens, 1984). It is possible that individuals' sharing behavior fosters the network cohesion, cognitive sharedness among team members and cooperative norms. It is also possible that there is an iterative relationship between social capital and knowledge sharing behavior. Thus, conducting a longitudinal study in the future would help determine the causality and trace their dynamic interplay.

Second, the Chinese sample may limit the generalizability of our findings to different cultures. It has been agreed that the national culture in China is collectivist oriented (Hofstede, 1980). In the specific Chinese context, individuals with a high betweenness centrality are often regarded as "standing on two boats" and are not welcomed (Xiao and Tsui, 2007). The sampling might facilitate us to detect the significant curvilinear relationships of the social network measures and individual sharing behavior, which may not be the case in the individualist Western culture. This is not just our concern, for other studies have also expressed a similar concern with using the Eastern sample. In fact, several recent studies, in which the findings are in sharp contrast to the results using Western sample, were all conducted in Eastern countries, e.g., China (Xiao and Tsui, 2007) and Korea (Oh et al., 2004). Thus, this observation provides an interesting direction to conduct cross-cultural research, which will either help confirm the existing results or identify the culture orientation as an important contingency.

Third, the organizational and industrial factors were not taken into account, although they are probable to have some impact on individual behavior in the contexts. The nested structure of a team points to the fact that individuals reside in a team, the teams reside in an organization, even the organizations reside in an industry or a particular society. However, we are aware that the team properties have the most direct impact on individual behavior, according to the nested structuration theory (Perlow et al., 2004). Therefore, we focus on the relationships between the two-level (individual and team level) social capital and the individual knowledge sharing within a team. Furthermore, we checked the variances of the latent variables at the organizational level, and the results show less than one percentage of variances across the nine organizations that shared some commonality. In a way, this indicates the appropriateness of constraining the social capital to the team level at the upper side for analysis in our sample.

The fourth limitation stems from our modified ego-centric network gathering. We acknowledge the merit of the ego-centric method which provides an opportunity to systemically capture the network ties outside of a given team and depict the social boundary of the emerging team network. However, this method automatically brings with it the potential subjective bias and the sequent inaccuracy. After all, the social boundary of a formal team is hard to define. Thus, although we got spontaneous networks that configure the social boundary of the teams in some senses, we simultaneously sacrificed the accuracy which can be approached by other network data gathering methods such as the socio-metric method.

Finally, we must point out the problem of the between-groups variance existing in explicit knowledge sharing. The significance of the variance allows us to continue the HLM analysis. However, the small portion of the variance potentially affects the HLM results. Most of the insignificant effects of team social capital on knowledge sharing are associated with explicit knowledge. Such results could be due to the nature of knowledge as we described in the discussion, yet we could not exclude other potential intervention. Thus, the related results should be interpreted with caution.

Conclusion

This study, using a multilevel lens and methodology, examined the effects of individually held social capital and team social capital on individual knowledge sharing behavior. The empirical results give evidence for the distinct role of social capital between levels: individual social capital provides abilities and motives for individual knowledge sharing, while team social capital generates the top-down influences to adjust for individual behavior. Our results demonstrate that both individuals' betweenness centrality and the network density of an emerging team have a curvilinear relationship with individuals' knowledge sharing within the team. This illuminates the appropriateness of an optimal social network configuration for team networking. We advise management to consider this optimal social network view to their work teams, i.e., being open to external sources, while simultaneously being careful to maintain the necessary network density of the teams. Our results also underscore the strong influence of individually perceived shared cognition, affective commitment and team norms on team members' knowledge sharing. We suggest that management pay more attention to the ingredients related to humans themselves, e.g., humans' perceptions on peer members, the team identity, and the work environment. Humanized management to nurture favored norms would evoke human intrinsic motivation of knowledge sharing, especially for tacit knowledge sharing.

Acknowledgement

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