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Knowledge Management Research Based on Social Network Theories: A Review with Future Directions

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ABSTRACT

This review aims to synthesize social network theories by drawing on the importance of social network perspectives in understanding knowledge management with technology in organizations. I provide an overview of prior social network research with the following core ideas: the primacy of relations between organizational actors, the utility of actors' embeddedness in social fields, the social utility of network connections, and the structural patterning of social life. On top of that, I summarize critical social perspectives (the social capital theory, the structural hole theory, the embeddedness perspective, the social exchange theory, the organizational learning theory, and the innovation diffusion theory) to suggest potential research questions for future studies in social network research in the knowledge management discipline.

Keywords: Social Network, Knowledge Management, Organizational Technology, Social Media

Ⅰ. Introduction

Organizational networks can be considered complex adaptive systems that exhibit persistence and change (Kilduff et al., 2006). This idea infers that small investments in social ties can produce significant benefits of social capital, and organizational networks can exhibit persistence in core structural properties even in the force of nonlinear dynamics. Thus, the structural features of social networks[1] in organizations need to be explained to understand the business competence of organizations and the task performance of their members (Hwang et al., 2015; Lu et al., 2017).

The purpose of this review is to synthesize social network-related studies in the context of technology usage to suggest critical research questions in technology-relevant disciplines, specifically regarding

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knowledge management (KM) with the use of social media. To do so, I attempt to understand such organizational capabilities from a social network perspective emerging in various information systems and KM disciplines. Knowledge-intensive firms refer to organizations that consist of their knowledge, knowledgeable workers, and knowledge-oriented tasks (Blackler, 1995). Given such knowledge-intensive features based on the current knowledge-oriented economics, *how effectively and efficiently knowledgeable workers manage valuable knowledge for their knowledge-intensive firms* is an essential strategic issue in terms of competitive advantages. The strategic issue requires the causal link between successful KM (Kim et al., 2014) and organizational performance improvement (Kim et al., 2021), as the literature based on the knowledge-based view (KBV) of the firm has argued (Kim et al., 2012). Organizational capabilities through effective KM practice are crucial factors that activate KM processes and explain organizational success (Sambamurthy and Subramani, 2005). Technology-mediated knowledge networks (both within and beyond organizational boundaries) enable knowledge providers and seekers (both are knowledge workers in organizations or experts in specific knowledge domains) to share their knowledge using technology. With the advent and popularity of various social media available on the web, in particular, KM studies need to understand and explain information/knowledge diffusion/transfer in the web-based context of social networks, in which actors are connected to share valuable information and knowledge (Agichtein et al., 2008). In the current reality of workplaces, individual workers (in this paper, mainly knowledge workers in organizations) are formally/informally connected to both internal/external knowledge sources in the virtual communities for knowledge sharing and learning through web-based social media (Hwang et al., 2015; Lu et al., 2017).

I first raise the need for KM studies to rely on a social network perspective in observing and explaining the organizational phenomena. Second, this paper provides an overview of crucial prior works in social network research to understand the core ideas from such studies: the primacy of relations between organizational actors, the utility of actors' embeddedness in social fields, the social utility of network connections, and the structural patterning of social life (Hagedoorn, 2006; Kim et al., 2006; Oh et al., 2006). Next, I explain several critical social perspectives, such as social capital theory, structural hole theory, embeddedness perspective, social exchange theory, organizational learning theory, and innovation diffusion theory. These theories can suggest theoretical directions for social network understanding in the KM field. In doing so, I concentrate on the research scope of technology-mediated knowledge-transfer/-sharing activities. These activities will help seek/provide and learn knowledge using social media for formal/informal communications between knowledgeable workers interacting with each other in social networks within and beyond organizational boundaries. Lastly, I suggest several research questions for future studies in social network research in the KM discipline.

1) In this paper, a social network refers to a broad concept of technology-mediated networks available to organizational workers. Across the digital networks, contemporary workers are connected to each other by using technology in organizations. The workers are connected not only formally with the typical organizational technology within their internal organizational boundaries but also informally with the various social media beyond the boundaries. Such emerging social media platforms (both public and corporate social media), the workers are embedded in the social media-oriented networks as knowledge sources in addition to the traditional technology-mediated networks.

Ⅱ. Research Motivation

Prior studies based on social network theory infer that the individual properties of social network structure, *how individuals are embedded in social networks*, influence the effectiveness of their knowledge behaviors in workplaces (Burt, 1992; Sparrowe and Liden, 1997). For example, the concept of personal centrality degree in social networks is significantly associated with task-related knowledge outcomes (Friedkin, 1993; Ibarra, 1993). In this sense, technology-mediated knowledge transfer can be analyzed at three different levels: the nodal (focus on the behavior of a knowledge-providing or -seeking party), dyadic (focus on the joint behavior of a paired knowledge provider and seeker), and systemic (focus on the behavior of a system used by multiple knowledge providers and seekers levels (Gupta and Govindarajan, 2000). However, earlier studies have focused on only one of the three levels. They have thus been unable to suggest a deep understanding at a multilevel perspective of technology-mediated knowledge transfer. For example, Lin et al. (2005) concentrated on a dyadic-level view of knowledge transfer without strategic implications and direction for the nodal and systemic levels.

The KBV considers organizational knowledge a key source of sustainable competitive advantage because such knowledge allows organizations to accurately predict the nature and commercial potential of changes in the environment and the appropriateness of strategic directions (Cohen and Levinthal, 1990). Without organizational knowledge, firms are less capable of discovering and exploiting new opportunities in their markets. However, KBV mainly focuses on the positive impacts of organizational knowledge on organizational performance, thus ignoring what organizational knowledge is in nature. For example, one KBV research stream focused on organizational members' activities and behaviors at the individual level without consideration of collective knowledge because the agents who create, transfer, share, and apply knowledge are individuals (e.g., Teigland and Wasko, 2003). The other KBV stream has considered organizational knowledge as a collective set of individuals' knowledge at the group or organization level by aggregating individual knowledge-related activities into higher-level (the team- or firm-level) organizational behaviors (e.g., Lee and Choi, 2003).

These two separate approaches to KBV-oriented studies cannot correctly explain how organizations manage their knowledgeable workers' expertise in tasks and business and whether the collective knowledge-managing behaviors enhance group- and organization-wide outcomes. A multilevel perspective based on social network thinking of organizational knowledge might explain the complex KM process amid the individual knowledge-managing behaviors and collective knowledge characteristics in organizations. Thus, multilevel social insights might be required in understanding multiple KM efforts and their impact on organizational performance at different levels. KM can be observed within the social context of organizations, in which not only individuals manage their knowledge but also organizations collect and manage the set of such knowledge through organization-wide KM processes (Robinson and O'Leary-Kelly, 1998) in knowledge networks. In managing organizational knowledge, multilevel KM units and their network-based capabilities should be simultaneously considered in the social context of organizations.

Organizational technology is a broad concept that specifically explains internal organizational capabilities. It determines how information/knowledge flows are

designed to meet organizational needs. Its crucial function is to channelize and utilize knowledge within and outside an organization (Kim et al., 2018). In addition, how individual members use given technology and participate in systems determines their capability to manage necessary knowledge and their social capital to access the suitable knowledge sources at the right time for various specific tasks in organizations. Given such supporting role of technology, KM activities and processes must adequately align with the individual use of technology (on which people rely to organize existing knowledge) and with the group- and organization-wide collective practice (in which people participate to interact with others for new knowledge). Thus, technology usage and practice are critical internal factors for organizations forming human technology fit for the successful KM. Several KBV theoretical grounds have supported the supporting role of individual technology usage and collective practice in KM.

Drawing on the organizational capabilities perspective, KBV implies that organizations internally leverage their existing knowledge and create new knowledge, thus favorably positioning in their own external conditions (Gold et al., 2001). In this sense, organizational technology enhances the absorptive capacity (Cohen and Levinthal, 1990), the organizational abilities to use prior knowledge, recognize the value of new information, and assimilate organizational knowledge. These aspects are emergent from individual abilities to apply existing knowledge to create new knowledge and capabilities through technology usage. In addition, organization-wide technology (e.g., intelligence systems, communications systems, management information systems, decision support systems, and administrative control systems) are fundamentals of organizational functioning (Huber, 1982). Such corporate technology is a decisive factor in how the organizational members effectively use organizational knowledge as a unit. The reason is that technology usage supports personal capabilities to accumulate and connect internal strategic assets at the individual level; technology-mediated practice helps organizations understand the industrial structure, seek environmental opportunities, and create business value at the organization level (Kim et al., 2018). Knowledge combination and socialization through technology-mediated interactions at the group level demand social capital to create valuable knowledge (Nahapiet and Ghoshal, 1998; Nonaka, 1994). Group members can effectively attain social capital through task-oriented interactions (e.g., community of practice) when the interactions are activated by their technology usage. Gold et al. (2001) suggested that the social capital needs to be maximized by technical, structural, and cultural infrastructures. These infrastructures must be leveraged for KM processes to store, transform, and transport knowledge throughout the organization. Based on this concept, I focus on the use of social media at multilevel units in organizations because various functions of public and enterprise social media mainly support social activities and provide social benefits.

Ⅲ. Literature Review in Social Network Research

"Social network analysis is one of the few social science endeavors in which people influence one another…to build a cumulative body of knowledge…a "normal" science in the sense described by Thomas Kuhn…[one] that both generates puzzles and solves them" (Freeman, 2004, p. 6). Prior social network research has contributed to the puzzle-solving, used "paradigm" as a mark of approval, and advanced

claims that network research has achieved the status of a self-contained school with its own theories and methods (Kilduff et al., 2006). According to Leinhardt (1977), social network research represents "a developing paradigm." A mature paradigm had been established, such that the field has achieved "normal science" status (Hummon and Carley, 1993). Following such an idea, researchers have continuously kept the paradigmatic status in social network research outside the field of organizational management (Degenne and Forsé, 1999) and within it (Borgatti and Foster, 2003). Organizational studies have emphasized the importance of social network research. Kilduff et al. (2006) argued that the success of organizational network studies (social network research in the field of organizational management) is evidenced by the volume of work exploring diverse topics: e.g., social capital (Tsai and Ghoshal, 1998), leadership and networks (Balkundi and Kilduff, 2006), networks of individuals versus collectivities (Ibarra et al., 2005), network ties (Nohria and Eccles, 1992), knowledge transfer networks (Tsai, 2001), inter-firm alliances (Nooteboom, 1999), and network methods (Degenne and Forsé, 1999; Wasserman and Faust, 1994).

In this sense, the following summarizes a literature review in social network research.[2] The review first provides an overview of prior social network research in terms of the core ideas: the primacy of relations between organizational actors, the utility of actors' embeddedness in social fields, the social utility of network connections, and the structural patterning of social life. In addition, the review identifies the critical social perspectives: the social capital theory, the structural hole theory, the embeddedness perspective, the social exchange theory, the organizational learning theory, and the innovation diffusion theory.

3.1. Core Network Concepts

Prior studies have mainly focused on classifying categories of ties (e.g., Wasserman and Faust, 1994) and identifying analytical and empirical procedures (e.g., Freeman, 2004). Future social network studies should be compatible with but beyond such prior attempts. From a sociological perspective, this means defining the intellectual underpinnings of structural analytic research (Wellman and Berkowitz, 1988). Kilduff et al. (2006) specified four core network research. The four interrelated core ideas are the primacy of relations between organizational actors (Labianca and Brass, 2006), the utility of actors' embeddedness in social fields (Hagedoorn, 2006), the social utility of network connections (Oh et al., 2006), and the structural patterning of social life (Kim et al., 2006). In addition, Kilduff et al. (2006) mentioned that two streams of studies concerning the four core ideas are used in organizational social network research. One set of the prior studies is based on the structural configuration of the network system itself; the other set has focused on individual actors or the members of the network system. This calls for the multilevel perspective to the core social network ideas by incorporating both structural complexity and individual-level differences into the new theoretical ideas.

Primacy of relations. This idea is considered a critical difference between network research and conventional social science. According to Tichy et al. (1979), "the social network approach views organ-

2) My strategy to identify prior studies in the literature review is a selective approach, i.e., selecting the papers to review based on the key network concepts defined and social network theories proposed in the related literature. Such a selective approach to the literature review is feasible rather than a holistic approach, given a tremendous amount of literature in social networks and related areas.

izations in society as a system of objects (e.g., people, groups, organizations) joined by a variety of relationships" (p. 507). This idea represents social network research as part of a general movement from individualist, essentialist, and atomistic explanations toward relational, contextual, and systemic understandings (Borgatti and Foster, 2003). The systems of relations between actors have been emphasized as a core belief of modern social network analysis (Freeman, 2004). The primacy of relations underlies both structural configuration and actor-central perspectives (Kilduff et al., 2006): the structural configuration perspective consider relations between actors as essential properties of the whole system; on the other hand, the individual view assumes that individuals engage in social relationships with others to strategically rearrange their relationships to maximize advantage (Burt, 1992).

Ubiquity of embeddedness. Embeddedness, an ambiguous concept, has been considered an important emerging concept by institutional economics (Krippner, 2001) and organizational network research (Granovetter, 1985). Economic behavior is thus suggested to be embedded in the networks of interpersonal relationships (Uzzi, 1996). According to Schweizer (1997), the concept of embeddedness is "central to the social networks perspective" (p. 739). Regarding embeddedness, the main implication of prior studies is that actors' behaviors are embedded to the extent that the actors show a preference for interacting not with strangers but with acquaintances, personal friends, and family members (Kilduff et al., 2006). Therefore, the more an actor tends to transact with a particular exchange partner, the more they tend to transact with each other. Although such a tendency of embeddedness increases to the extent that markets are inefficient (Burt, 1992), actors' embeddedness in friendship networks creates and validates choice criteria in relatively perfect markets (Kilduff, 1990). In a similar vein, the concept of embeddedness also refers to "the nesting of social ties within other social ties" (Kilduff et al., 2006, p. 1034). This notion indicates that actors are more embedded with social ties forged within a community with few ties to the outside. The structural configuration perspective provides an understanding of the path dependence of the embeddedness principle: as a network system grows, an actor, who has more social ties than the average number of ties in the network, is more likely to attract relations with new actors (Barabási and Albert, 1999). The individual perspective suggests that the optimal structural embeddedness is related to leaving no holes in an actor's own critical personal networks but discovering gaps to exploit in others' networks (Burt, 1992).

Social utility of network connections. Individual actors, who comprise organizational units, can realize economic returns as the utility of social connection from the strategic exploitation of positions in networks (Burt, 2000). However, the communal utility can also be regarded as a kind of social institution (e.g., voluntary associations) at the system level (Kilduff et al., 2006). The communal utility promotes trust and interdependence among collective actors engaged in social institutions (Coleman, 1990), which is the utility of social connections understood as a pervasive kind of "civic spirit" (Portes, 2000) promoting economic well-being (Putnam, 1993). The social utility principle has also been explained by both structural configuration and individual perspectives (Kilduff et al., 2006). Structural configuration research suggests that the social utility gained from network connections improves the efficiency of the whole network (Kilduff et al., 2006). According to Watts (2003), the entire network's efficiency can be drastically improved by randomly reallocating a

small number of ties among actors. In actor centrality research, individuals can gain utility from their entrepreneurial exploitation of social network positions of centrality (Burt, 1992).

Structural patterning of social life. According to Kilduff et al. (2006), one of the assumptions of organizational network research is that the apparent complexity of social life can be understood by a pattern of connectivity and cleavage (Wellman and Berkowitz, 1988), a set of structural positions (DiMaggio, 1986), structural dynamics (Carley, 1999), or some other representation that provides both a parsimonious model and a generative explanation of the emergence of complexity (Barley, 1990). In this sense, one contribution of network studies is that they have attempted to understand social structural factors that improve outcomes (Burt, 1992), thus searching for a generative, structural form underlying interactions (Kilduff et al., 2006). An example can be the "small world" effect: within some highly complex networks, how actors can reach each other through a small number of intermediaries is emphasized (Kogut and Walker, 2001). Structural configuration research suggests that structural form consists of emergent characteristics (Kilduff et al., 2006). Individual perspective on the patterns of closed or open ties surrounding a particular actor is more localized than the structural form (Burt, 1992).

3.2. Social Network Theories

Defining core network concepts is inadequate to suggest new directions for social network research in KM. In this sense, I need to appreciate Neurath's prescient boat metaphor, which captures the challenges and limitations of theory construction (Kilduff et al., 2006): "we are like sailors who have to rebuild their ship on the open sea, without ever being able to dismantle it in dry-dock and reconstruct it from the best components" (Neurath on theory building quoted in Honderich, 1995, p. 97).

This statement indicates that no solid foundation of "fact" exists on which theory can be constructed, despite the early claims of the logical positivists (Ayer, 1936). Core network ideas mutually support each other to the extent that they constitute a coherent world view (Kilduff et al., 2006). Thus, I explain several fundamental theories in social network research, such as social capital theory, structural hole theory, embeddedness perspective, social exchange theory, organizational learning theory, and innovation diffusion theory. These theoretical perspectives have accumulatively contributed to the task of reconstructing theory step by step.

Social capital theory. "The two arguments are grounded in the same social capital metaphor, so it is useful to begin with the metaphor as a frame of reference…social capital is a metaphor about advantage. Society can be viewed as a market in which people exchange all variety of goods and ideas in pursuit of their interests. Certain people, or certain groups of people, do better in the sense of receiving higher returns to their efforts" (Burt, 2001, p. 31). This defines the concept of social capital as the contextual complement to human capital. The definition indicates that those who do better are somehow better connected. "Certain people or certain groups are connected to certain others, trusting certain others, obligated to support certain others, dependent on exchange with certain others" (Burt, 2001, p. 32). Social capital is thus an asset of location effects in differentiated markets. In a similar vein, the concept of social capital can be defined as the resources that result from social structure: "social capital is the sum of the resources, actual or virtual, that accrue to an individual or group by virtue of possessing a du-

rable network more or less institutionalized relationships of mutual acquaintance and recognition" (Bourdieu and Wacquant, 1992, p. 119). Another often-cited definition of social capital is a function of social structure producing advantage: "social capital is defined by its function. It is not a single entity but a variety of different entities having two characteristics in common: They all consist of some aspect of a social structure, and they facilitate certain actions of individuals who are within the structure. Like other forms of capital, social capital is productive, marking possible the achievement of certain ends that would not be attainable in its absence" (Coleman, 1990, p. 302). Drawing on Coleman's metaphor, Putnam (1993) strictly focused on action facilitated by social structure: "social capital here refers to features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated action" (p. 167). Burt (1992) also supported the idea that social capital is related to the competitive advantage of structural holes. The consensus on a social-capital metaphor suggests that social structure is a kind of capital that generates competitive advantages for specific individuals or groups in achieving their ends: "better connected people enjoy higher returns" (Burt, 2001, p. 32).

Structural hole theory. According to Burt (2001), "participation in, and control of, information diffusion underlies the social capital of structural holes" (p. 34). This indicates that social capital is a function of brokerage opportunities, such as the strength of weak ties (Granovetter, 1973), the betweenness centrality (Freeman, 1977), the benefits of having exclusive exchange partners (Cook and Emerson, 1978), and the structural autonomy created by complex networks (Burt, 1980). Regarding the concept of autonomy generated by conflicting affiliations, sociological ideas are mixed in the hole argument with traditional economic ideas of monopoly power and oligopoly to produce network models of competitive advantage (Merton, 1968; Simmel, 1955). Burt (2001) perfectly explained the concept of structural holes as social capital, as follows: "Structural holes separate nonredundant sources of information, sources that are more additive than overlapping. There are two indicators of redundancy: cohesion and equivalence. Cohesive contacts (contacts strongly connected to each other) are likely to have similar information and therefore provide redundant information benefits. Structurally equivalent contracts (contacts who link a manager to the same third parties) have the same sources of information and therefore provide redundant information benefits" (p. 35).

Embeddedness perspective. Actors are embedded in their social networks of cooperative relationships that influence the flow of resources (e.g., assets, information, status, etc.) among the network members. In this sense, resource asymmetries occur due to the differential flow of resources among network members and their differential ability to control such flows (Gnyawali and Madhavan, 2001). I consider an embeddedness perspective in understanding cooperative linkages and competitive dynamics among network members (Granovetter, 1985). The theory suggests that "competitors, far from being atomistic entities free to undertake any competitive action within their own resource constraints, are embedded in a network of relationships that influences their competitive behavior" (Gnyawali and Madhavan, 2001, p. 431).

In the KM context, the concept of social embeddedness is also related to the social capital theory (Kim and Benbasat, 2012). Nahapiet and Ghoshal (1998) defined social capital as "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" (p. 243). As a social unit, an individual seeks and attains knowledge by relying on his/her social relations (social capital, which provides available sources of knowledge). In other words, individuals are connected to potential knowledge sources by participating in various social networks. Kim and Benbasat (2012) defined individual embeddedness as how an individual relies on knowledge networks by connecting himself/herself to external or internal knowledge sources with formal or informal ties through different social media. Kim and Benbasat (2012) posited that individual embeddedness could be understood based on two perspectives: multimodal network and ego network approaches. The multimodal network perspective focuses on an individual's relationships with multiple technology-mediated networks (the relationships between individuals and system-mediated networks), not with other individual actors in the networks (the dyadic relationships between individuals) (Kane and Alavi, 2008). The perspective of ego networks, in which "ego" is an individual "focal" node (Hanneman and Riddle, 2005), indicates that how a focal individual is embedded within social networks can be understood by the individual's characteristics, not by the whole structure of the networks.

Social exchange theory. The social exchange theory explains human behavior in social exchanges (Blau, 1964). In such exchanges, people do others a favor with a general expectation of some future return but no clear expectation of the exact future return. Therefore, social exchange assumes the existence of relatively long-term relationships of interest, as opposed to one-off exchanges (Molm, 1997). The social exchange theory suggests that knowledge transfer between knowledge providers and seekers (both entities are key actors in social networks, in which they contribute to knowledge sharing or access knowledge sources) can be identified by their perceived costs and benefits—their negative and positive expectations of outcomes from knowledge transfers (Bock et al., 2006). Like rational choice theories, the social exchange theory suggests that individuals behave to maximize their benefits and minimize their costs (Thibaut and Kelley, 1986). Prior KM studies also focused on the costs and benefits of knowledge contribution and seeking through technology (Markus, 2001) because costs during social exchange can be incurred in the form of opportunity and obligation costs (Molm, 1997).

Organizational learning theory. Across various disciplines, many prior studies have attempted to understand the concept of organizational learning over the past 40 years (Borgatti and Cross, 2003). They have mainly considered such learning as either an individual's cognitive process (Daft and Weick, 1984) or a function of the individual's behavioral change encouraged by modifying an organization's programs, goals, decision rules, or routines (Nelson and Winter, 1982). How organizational learning is realized and how such learning influences organizational performance have been explained by organizational learning from operating experience (Argote et al., 1990), innovation efforts (Van de Ven and Polley, 1992), unique events (March et al., 1991), teams (Edmondson, 1999), improvement initiatives (Winter, 1994), and individuals (Cohen and Bacdayan, 1994).

Specifically, research in organizational learning has demonstrated processes and occasionally the performance implications of the acquisition of declarative (know-what) and procedural (know-how) knowledge (Borgatti and Cross, 2003). On top of the knowledge workers' acquisition of declarative and procedural knowledge, Borgatti and Cross (2003) suggested that considerable attention needs to be

paid to learned characteristics of relationships that affect the decision to seek information from other people. In addition, Borgatti and Cross (2003) proposed a formal model of information seeking in which the probability of seeking information from another person is a function of the following: knowing what that person knows, valuing what the person seeking information knows, being able to gain timely access to that person's thinking, and perceiving that seeking information from that person would not be too costly. They also hypothesized that the knowing, access, and cost variables mediate the relationship between physical proximity and information seeking.

By doing so, Borgatti and Cross (2003) attempted to answer Miner and Mezias (1996)' call for new approaches to research in organizational learning. A social network perspective can enrich our understanding of both dyadic and collective learning in organizations by breaking the mainstream of social network research which has mainly concentrated on the structural properties of networks (identifying cliques or measuring centrality) and paid less attention to relational characteristics (how different aspects of relationships affect the individuals involved) (Monge and Contractor, 2000).

Innovation diffusion theory. Many studies have been interested in the factors that influence the spread of innovations in social networks across groups, communities, societies, and countries (Wejnert, 2002). Diffusion of innovations refers to the spread of abstract ideas and concepts, technical information, and actual practice within a social system. The spread denotes the flow or movement from a source to an adopter, typically through communication and influence (Rogers, 1995). An adopter's (an actor's) probability of adopting innovation is altered by such communication and influence because the actor might be any societal entity, such as individuals, groups, organizations, or national polities (Wejnert, 2002). One of the key concepts in innovation diffusion studies is the innovators' position in social networks. Diffusion research has mainly focused on factors that mediate communication processes (transmission and absorption of information) among social network members because the timing of adoption depends on the interaction among social units in the communication process (Rogers, 1995). As such interaction occurs between individuals, between individuals and the media, or through business/professional organizations, an actor's position in social networks is in terms of the interaction in four major aspects: interpersonal networks for individual actors, organizational networks for collective actors, the structural equivalence of individual and collective actors, and social density (Wejnert, 2002).

Ⅳ. Research Questions About Knowledge Management in Social Networks

According to Kilduff et al. (2006), networks in which people, as organizational members or as representatives of organizations, constitute the nodes are unusual. Each node is itself a complex adaptive system. The nodes are constituted in part through their relationships with others in the network, but they also bring idiosyncratic network expectations and perceptions to any particular network. In this sense, I follow the suggestion of Kilduff et al. (2006) that network stability and change involve both the interaction patterns within the overall network system and the idiosyncrasies of the network actors, in terms of their cognitions of and expectations concerning the social networks, in suggesting potential research questions for future social network research

in KM literature.

4.1. Multilevel Understanding of Knowledge Networks

Organizational network studies need to investigate the multilevel understanding of social networks (Kilduff et al., 2006). The dynamic stability perspective has focused on the structuration of organizational networks over time by knowledgeable but boundedly rational actors. This idea emerged from the pioneering social network research (Kapferer, 1972) and is consistent with the social theory (Giddens, 1984). In this sense, Kilduff et al. (2006) suggested that "organizational network research can enhance the structuration approach by investigating the dynamic interplay between the psychology of individuals and the complexity of social networks within which they interact, and by investigating how perceived and actual network systems mutually constitute each other" (p. 1038). Thus, I raise two research questions in the social context of organizations: *how the multilevel technology-mediated practice supports multilevel KM capabilities to manage organizational knowledge successfully* and *how the multilevel KM capabilities improve multilevel organizational performance*. These research questions may advance KBV by explaining KM in organizations as a multilevel phenomenon to theorize organizational learning across individuals, groups, and organizations in their networks.

4.2. Roles of Knowledge Workers in Social Networks

By focusing on the key individual players (knowledge workers) in knowledge networks within/beyond organizational boundaries, I raise another research question: *what are the key social roles of managers (or at higher positions) in business or governmental organizations?* A significant part of their job involves communicating with others and providing/seeking knowledge to perform problem solving and decision making for their organizations (defining middle-level managers as knowledge workers is required, such that prior studies have also considered them key players in knowledge networks). In particular, I need to understand and explain their roles for effective KM in the virtual context mediated by technology (not only typical KM systems but also trendy social media). Empirically, role definitions are probably quite diverse, depending on the nature and size of organizations, the organizational knowledge asset, its production and utilization processes, and so on. Although Davenport (2011) has attempted to spell out the roles of knowledge workers with some connection to business process management, many relevant matters are not fixed, as the KM field is rapidly changing. In addition, executives, including chief technology officers, are often considered key players in technology-mediated knowledge networks. However, new technology and approaches arise and create new types of knowledge workers and key players.

On the other hand, the roles of such social actors in knowledge networks can be considered as both knowledge providing and knowledge seeking. From the perspective of knowledge contribution, I suggest a research question: *why do knowledge providers contribute their effort and time to knowledge transfer with social media even though they cannot expect certain benefits from knowledge seekers?* At the same time, the perspective of knowledge seeking needs to account for this concern: *why does a knowledge seeker use social media to acquire task-related knowledge given the uncertainty of social relationships with*

other users? The uncertainty is caused by the motives of social media use, which can be explained by the so-called hedonic goal to feel fun, pleasure, and excitement rather than the utilitarian goal to realize utility, rationality, and task-relatedness (Venkatesh and Brown, 2001). In other words, it is irrational for knowledge seekers to use social media to communicate about their organizational tasks with other social media users because they are less likely to seek knowledge relevant to their specific tasks from interactions with other users.

4.3. Knowledge Transfer in Social Networks

In terms of knowledge transfer in social networks, I reviewed prior research on knowledge transfer in online communities to suggest individual motivation factors. Knowledge providers can contribute knowledge to knowledge seekers who want to learn relevant knowledge through mutual technology-mediated connections. Literature also suggests a fundamental research question: *why do knowledge providers and seekers participate in knowledge transfer with costs and benefits?* Individuals would participate in knowledge transfer when the benefits from their participation are expected to exceed the costs of their involvement in knowledge transfer. This proposition infers that the individual-level calculation of costs and benefits can be understood by *what motivation factors encourage knowledge providers and seekers to transfer knowledge.* The individual motivational factors include the desire for reputation (Wasko and Faraj, 2005), monetary incentives (Kankanhalli et al., 2005a), information need and knowledge growth (Ma and Agarwal, 2007), self-efficacy (Kankanhalli et al., 2005b), usability (Phang et al., 2009), and sociability (Phang et al., 2009).

In this sense, we can understand why knowledge providers help knowledge seekers. To contribute knowledge to knowledge seekers, knowledge providers need to perceive that their contribution to others will be worth the effort and that some new value will be created, with the expectations of receiving some of that value for themselves (Nahapiet and Ghoshal, 1998). The act of knowledge contribution requires costs to knowledge providers as an expense of time and effort (Markus, 2001). For example, Orlikowski (1993) explained that consultants avoided knowledge contribution due to high opportunity costs. On the other hand, knowledge seekers also want to reduce time and effort to seek knowledge through technology, according to the theory of planned behavior, which argues that the availability of resources facilitates human decisions to use the technology (Taylor and Todd, 1995). In this sense, I suggest that knowledge seekers are motivated to use social media by reducing their time and effort to access available knowledge sources in their networks. According to Bouazza (1989), "information use is that seeking behavior that leads to the use of information in order to meet an individual's needs" (p. 146). In human information processing, individuals use information gathered from available and reliable sources at the information-seeking stage to perform given tasks at the information use stage, thus improving their understanding (knowledge) of given tasks according to changeable workplace situations. By seeking information using social media, individual workers achieve knowledge outcomes and improved status of work knowledge. In this sense, I suggest that the knowledge seeker's knowledge outcome can be perceived and evaluated according to the expected costs and benefits of the knowledge transfer. Drawing on these premises, I raise a research idea: *how knowledge transfer happens between knowledge providers and seekers.* To explain this research

idea, we can attempt to understand the matching between knowledge providers and seekers by relying not only on the search and matching theory, i.e., an econometric theory in terms of monetary economics (Kiyotaki and Wright, 1989; Kiyotaki and Wright, 1993) and labor market (Rogerson et al., 2005), but also on social network-related theories and perspectives that can explain such matching between two actors/nodes in social networks.

4.4. Concept of Social Media Affordance

I also need to understand the concept of technology affordance in social media use. The rationale is to investigate critical functions of social media that employees (knowledge workers) use as information/knowledge sources by understanding *why and how they use such sources to perform their organizational tasks*. Based on this research question, future studies may help us better understand how employees gain value from formal versus informal collaboration. This question may also help us understand the communication with the experts being relied upon in various social networks, such as whether the experts are internal or external to the firm. In explaining the technology affordance of social media, one example can be the individual embeddedness in social technology-mediated knowledge networks (Kim and Benbasat, 2012).

As the public widely adopts the Internet and communication technology, individuals can acquire knowledge through web-based texts. These public Internet-based services provide knowledge contents that are structured by knowledge sources. From such public services, knowledge seekers learn from external experts, for utilitarian value, by accessing no more than what they need to know (one-way need-to-know approach from knowledge sources to knowledge seekers) (Desouza and Awazu, 2004). In this way, such public services form a virtual knowledge network by connecting knowledge seekers with external knowledge sources. The knowledge seekers, embedded in the knowledge network, access and gain knowledge content structured by external sources: i.e., formally externalized embeddedness.

On the other hand, a new communication channel, consisting of microblogging and social network sites, provides virtual spaces for informal communication with unstructured contents, similar to short catching-up and water-cooler conversation, for hedonic value through friendship, membership, and common interest sharing. Such informal communication in virtual social networks encourages users to broadcast information/knowledge to share with others (two-way need-to-share approach between knowledge sources and knowledge seekers) the content that they are unlikely to transmit or receive in a formal relationship with experts (Pu et al., 2022; Zhao and Rosson, 2009). In this sense, I suggest that through social media, the users can be embedded in another type of knowledge network in a different way: they are connected with informal ties to potential knowledge sources beyond organizational boundaries (informally externalized embeddedness).

In addition, organizations introduce corporate technology, including not only intranet-based KM systems but also enterprise social media platforms, to internalize formal and informal interaction, collaboration, and accessibility of structured and unstructured knowledge contents. Using internal technology, individual workers can connect with internal experts and coworkers for utilitarian and hedonic values through formal and informal relationships within organizational boundaries. In this sense, I suggest that individuals rely on internal knowledge networks through typical KM systems (formally in-

<Table 1> Summary of Individual Embeddedness in Knowledge Networks

Classification	Formally externalized embeddedness	Formally internalized embeddedness	Informally externalized embeddedness	Informally internalized embeddedness
Scope of sources	External knowledge sources	Internal knowledge sources	External knowledge sources	Internal knowledge sources
Ties to sources	Formal social media	Formal social media	Informal social media	Informal social media
Knowledge seeking approach	One-way need-to-know approach beyond organizational boundaries	One-way need-to-know approach within organizational boundaries	Two-way need-to-share approach beyond organizational boundaries	Two-way need-to-share approach within organizational boundaries
Personal goal of embeddedness	Utilitarian value by leaning from external experts	Utilitarian value by learning from internal experts	Hedonic value through friendship/sharing interest	Hedonic value through organizational membership
Feature of contents	Structured contents	Structured contents	Unstructured contents	Unstructured contents
Networking technology	Public internet-based services	Corporate participatory KM systems	Public social media platforms	Enterprise social software
Examples	Public websites for collective intelligence: e.g., Google, Stack Overflow, and Wikipedia	Intranet-based technology: e.g., corporate wikis, corporate blogs, knowledge bases, and groupware	Public social media and public microblogs: e.g., Twitter, Facebook, and LinkedIn	Corporate social media and microblogs: e.g., Yammer, Socialtext, and CubeTree

ternalized embeddedness) or corporate social media (informally internalized embeddedness). <Table 1> summarizes four different classes of individual embeddedness in knowledge networks, as defined in a previous paper (Kim and Benbasat, 2012).

Ⅴ. Discussion

Based on the review, this paper discusses the limitations of social network analysis approaches adopted by prior studies. Future directions are also discussed for social network research in the KM discipline.

5.1. Critiques on Social Network Analysis

The structural tradition of social network analysis (heavily focusing on the structural properties of networks—such as identifying cliques or measuring centrality—without substantial attention to relational characteristics—such as how individuals involve their relationships consisting of social networks) is essential. Nevertheless, this structural tradition cannot provide an explanatory mechanism relating what people learn about each other to information-seeking behavior and a real-world illustration of the importance of the distinction for network actors (Borgatti and Cross, 2003). For managerial implications, social network research needs to suggest how knowledge workers can leverage the expertise of others in knowledge networks in an accurate and timely fashion. The properties of the relationships that a social actor has with others allow him/her to rapidly leverage his/her expertise to respond to such opportunities for knowledge through his/her social capital. In terms of organizational learning,

our understanding of the cognitive and effective aspects of relationships that are learned and affect information/knowledge seeking can encourage future research to contribute to meaningful findings and practical implications.

In addition, prior KM studies have recognized KM processes as an ongoing set of KM activities embedded in the social and physical structure of organizations with outcomes, organizational knowledge (Pentland, 1995). In a similar vein, KM can be defined as a systematic approach to managing organizational knowledge to create value (O'Dell and Grayson, 1998). Managing organizational knowledge is the process of capturing the collective expertise of the organization from different sources (organizational systems, documents, and knowledgeable workers) and utilizing the knowledge sources to leverage organizational performance (Hibbard, 1997). In this sense, we should simultaneously consider the different KM processes to understand group- and organization-level KM. Nonaka (1994) suggested the dynamic theory of organizational knowledge in which group- and organization-level KM processes are distinguished from each other. Combination (from explicit knowledge to explicit knowledge) and socialization (from tacit knowledge to tacit knowledge) are group-wide KM processes, whereas internalization (from explicit knowledge to tacit knowledge) and externalization (from tacit knowledge to explicit knowledge) can be observed at the organization level. Simultaneously considering group- and organization-level KM processes, I postulate that the cross-level relationship of key KM processes generates new organizational knowledge from individual knowledge through dynamic processes within and between organizations.

5.2. Future Directions for Social Network Research in Knowledge Management

In my view, the contribution of Kane and Borgatti (2011) to social network analysis can be an exemplar of social network research in KM. They argue that although network analysis in literature is already familiar with the general concept of using correlation as an independent variable, researchers have yet to propose the property of centrality-resource alignment, which could be useful in many contexts. For example, in the context of networks and HIV (Morris, 1997), a correlation between centrality and high-risk behavior would provide a better index of community risk than simply averaging individual risk behavior because it harms the community more if the more central nodes in the sexual network are engaging in the riskiest behaviors. More generally, in the network diffusion literature (Valente, 1985), a negative correlation between centrality and openness to innovation should translate to slower diffusion rates because the early adopters are more marginal and directly impact fewer people. In the network social capital literature (Coleman, 1988), the correlation between individual centrality and possession of resources could provide an index of group-level social capital—specifically, the group's ability to access and exploit its resources. Thus, centrality-resource alignment effectively melds Burt (1992)'s structural perspective with Lin (1982)'s resource theory, two major streams in network literature (Borgatti and Foster, 2003).

Another exemplar of social network research in KM is the work of Gray et al. (2011). They questioned the dominant perspective voiced in the structural holes of literature, which hinges on selectivity in information provision from alters as key to why some egos are more innovative than others. Burt (1992)'s

theoretical mechanisms are premised on the idea that alters are only willing to selectively help egos they know. However, the idea that structural holes might be explained by egos' selectivity about which alters they approach for information is rarely considered. Their access to data through social media is directional (each is a one-way connection); their results can only be explained by selectivity in information seeking. This suggests that perhaps some of what has been seen in the structural holes literature as selectivity in the alters' information provision is, in fact, selectivity in the egos' information-seeking behaviors. Given the general difficulty in separating these two effects in interpersonal social networks, their use of archival data from social media introduces a level of precision in understanding directionality, which is typically impossible. Therefore, social network research may benefit from this evidence as a catalyst for more precisely theorizing and testing various ways in which structural holes could be created. However, their research suggests that structural holes remain a relevant explanation of innovativeness, even in contexts indirectly contemplated by the originator of the structural hole theory.

VI. Conclusion

This paper suggests a review of core network ideas and social network theories based on prior relevant studies to understand how organizations manage their knowledge in the social context with individual KM activities and team- and organization-wide KM processes. In addition, I emphasize the role of technology usage and practice in enhancing KM competence and effectiveness to encourage a deep social network understanding of how organizations generate sustainable competitive advantages by managing organizational knowledge with social media. I expect that social network analysis, based on the multilevel perspective, is superior to the traditional KBV of prior studies. The reason is that the key processes of managing organizational knowledge and technology-oriented capabilities are transformative factors in knowledge-intensive organizations, thus requiring theoretical considerations of both the individuals and their collectives in knowledge networks within/beyond organizational boundaries. The multilevel insights with social network perspectives that consider such transformative factors across levels as explanatory variables are required in KM studies (Agarwal et al., 2008; Agarwal and Lucas, 2005). To satisfy these fundamental needs for KM literature, the present research might suggest meaningful theoretical implications for future studies about multilevel KM in the social context of organizations.

The newest trend in Internet use is the prevalence of social media and microblogging platforms as alternative communication media: users post snippets of information on topics ranging from their daily life and professional work to current events, news, observations, and thoughts (Zhao and Rosson, 2009). Users stay up to date on their interests by subscribing to informal communication, such as "tweets" on Twitter between authors and followers. Many companies adopt and use enterprise social software to improve knowledge sharing and social interaction within an organizational context. I claim to consider how such organizational efforts to internalize social media are effective in enhancing the individual actors' social capabilities in KM (Kim and Benbasat, 2012).

In addition, I suggest that future studies focus on the critical features of social technology that individuals use in workplaces. This suggestion could impact the issue of whether typical KM systems can

be replaced with various EMB platforms and ECM systems providing virtual spaces where workers can not only communicate by blogging according to their tasks but also ubiquitously access unstructured content and data of coworkers' blogs within organizations (Rockley, 2003). A key feature of knowledge-intensive firms is internalizing such informal knowledge using social media as a routine function of business operations. Social technology provides meta-discourse and meta-content (social bookmarking and tag clouds for unstructured but valuable knowledge) (Kim and Benbasat, 2012).

Individuals can realize social capital with metaphoric advantages through social media (Burt, 2005). The performance achieved by people can vary, although they have equal abilities and skills. The difference in individual performance is attributed to a better position in the social structure. In a similar vein, I suggest that individual actors' capabilities to manage knowledge be complemented by using social media in which individual workers are formally/informally embedded in internal/external networks. This notion is supported by the social theory that social capital generates advantages by facilitating specific positive outcomes (Coleman, 1990). Individual social capital shortens the transaction time by providing social interpersonal connections between knowledge owners and knowledge seekers (Baehr and Alex-Brown, 2010).

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