Knowledge Work

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Characterized by global competition and rapid technological change, the 21st century competitive market landscape creates numerous opportunities and challenges for organizations (Matusik and Hill, 1998; Miles, 1989). Organizations increasingly compete on the basis of cost reduction, as well as continuous innovation, quality improvement, and customer service. Among the many*factors that contribute to organizational survival and success, knowledge is a resource that can serve as the foundation for an organization's sustained competitive advantage (Barney, 1991). The ability to create and successfully manage knowledge resources stands out as one of the key capabilities of successful organizations (Grant, 1996). Indeed, a search of the keyword 'knowledge management' in the Business Source Premier data base generated 8,289 articles, of which 5,805 were published between 2001 and 2006; only 89 were published before 1980.

As the value of knowledge resources has become evident, many companies have invested in electronic knowledge management systems. The expectation was that electronic systems would increase the ability to store, sort, distribute, and (perhaps) analyze the vast array of knowledge residing within the organization. Experienced users of electronic knowledge management systems now realize that electronic systems can be effective only when they are integrated into a total management system that supports the complex array of activities referred to as knowledge work. Besides electronic knowledge systems, work designed around multidisciplinary teams and communities of practice with decentralized decision-making are perhaps the most prevalent features of knowledge-intensive organizations.

As electronic systems for managing knowledge have evolved in recent years, managers have found that employee behavior is less malleable than information hardware and software. Often subtle social barriers that are difficult to see and control interfere with the effectiveness of electronic knowledge management systems. Increasingly, it is being recognized that effectively managing knowledge-intensive organizations requires an understanding of how social dynamics influence the speedy and efficient creation and transfer of knowledge (Kogut and Zander, 1996: 503). Of particular

interest is the configuration of organizational facilities, routines, principles, practices and capabilities that contribute to the performance of knowledge-intensive firms (Jackson et al., 2006). In this chapter, we examine the social dynamics of two aspects of knowledge work, namely knowledge creation and knowledge sharing, We recognize that a much larger constellation of knowledge work activities contributes to the success of firms engaged in knowledge-based competition, but a full discussion of those is beyond the scope of this chapter.

Knowledge creation and knowledge sharing are closely related to two strategies adopted by firms in knowledge-intensive industries: knowledge exploitation and knowledge exploration. Knowledge exploitation refers to the refining and deepening of existing knowledge, and knowledge exploration refers to the pursuit of new knowledge that does not exist within a firm (Kang et al., 2006; Taylor and Greve, 2007). Presumably, knowledge work serves as a source of sustainable competitive advantage when the type of knowledge work employees engage in matches the strategic imperatives of the organization (Taylor and Greve, 2007). Using knowledge sharing and knowledge creation as examples of the types of knowledge work found in organizations, we present a multi-level overview of recent research and offer some suggestions for future research.

A GENERAL FRAMEWORK FOR UNDERSTANDING KNOWLEDGE WORK

Previous research has documented the criticality of knowledge in sustaining organizational success, but scant effort has been devoted to organizing the empirical endeavors into a general framework. Building on previous work, we offer a multi-level framework for organizing research on knowledge work conducted at three levels of analysis: the individual, the team or unit, and the organization.[1]

Knowledge

We use the term knowledge to refer to subjectively construed information. Following Davenport and Prusak (1998), we view knowledge as 'a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information' (p. 5). That is, knowledge accrues as a result of learning through action, and reflects the justified beliefs and commitments of its holder (see Nonaka et al., 2003).

Unlike many other organizational resources, knowledge is renewable and regenerative. Knowledge that is context specific (to an organization, for example) is also relatively difficult for competitors to imitate effectively. The inimitability of knowledge is an especially important attribute that differentiates it from other types of resources that contribute to sustainable competitive advantage (Barney, 1991).

Explicit and tacit knowledge

Two types of knowledge resources are relevant to understanding knowledge work: explicit knowledge and tacit knowledge (Polyani, 1967). Explicit knowledge is easily codified and recorded. It can be formulated into sentences and equations, which are easily and reliably shared through written documents and oral presentations. Due to these characteristics, explicit knowledge can usually be obtained by competing firms and thus it is not a likely basis for sustainable competitive advantage (Jackson et al., 2003).

In contrast to explicit knowledge, tacit knowledge is more complex and ambiguous, making it difficult to codify and transmit. People accumulate tacit knowledge through observation, imitation, and repeated interactions, which produce actionable skills or 'know how.' Tacit knowledge is also 'sticky' and cannot be transferred easily from one person to another or from one organization to another (see Von Hippel, 1994; Szulanski, 1996). Tacit knowledge is often shared during casual interactions (Lubit, 2001) that unfold

within a trusting relationship. The stickiness of tacit knowledge makes it potentially more valuable than explicit knowledge as a source of competitive advantage (Lado and Wilson, 1994).

Knowledge stocks and flows

Another typology of knowledge resources that has implications for understanding knowledge work differentiates between knowledge stocks and knowledge flows. Knowledge stocks are more tangible and accessible (Amit and Schoemaker, 1993); included here are the specific knowledge and expertise of employees as well as resources that are at least partially controlled and sometimes owned by the organization, such as patented technologies and production processes.

To assure adequate knowledge stocks, firms must effectively manage knowledge flows. Dierickx and Cool (1989) likened knowledge flows to the movement of water into and out of a bath tub. In a bathtub, the water level (knowledge stock) is equal to the amount of water that has flowed in minus the amount that has flowed out. By analogy, a firm's knowledge stock is equal to the amount of knowledge it accumulates – through means such as knowledge creation and knowledge sharing – minus the amount it loses.

Likening knowledge to water emphasizes the power of knowledge aggregation and knowledge in motion. A single molecule of standing water has far less power to transform a landscape than does a river of moving water (cf. Fiol, 2003; Hass and Hansen, 2005). Knowledge that flows only between individuals is not likely to create competitive advantage for a large firm with global operations. Sustained competitive advantage is gained by firms that understand how to manage knowledge flows between teams, throughout and among business units, through ill-defined social networks, and beyond organizational boundaries. In other words, the concept of knowledge flows includes both horizontal knowledge transfers and cross-level dynamics.

Knowledge work

Knowledge work occurs when one or more individuals endeavor to move and transform knowledge.[2] It is through knowledge work that an organization can transform the knowledge held by an individual into something of value to the organization as a whole. The specific behaviors and activities that comprise knowledge work include knowledge acquisition, knowledge sharing, knowledge combination, knowledge creation, knowledge application, and knowledge revision (Jackson et al., 2006). Activities such as these are central to the work of scientists and engineers engaged in new product development, experts from various backgrounds who work together to serve customer-focused accounts, multi-functional sales teams, managers charged with planning and implementing a merger, and so on.

Knowledge work is not a category of work. Instead, it refers to a type of activity that may occur relatively frequently or infrequently, and that may be of more or less importance for a particular individual, team or organization. What differentiates knowledge work* from other types of organizational behavior is the extent to which knowledge-centered activities dominate the interactions. For some employees, knowledge work may be their only responsibility, requiring all their time and effort. For others, knowledge work may be central to only one of their several responsibilities.

Unlike many other resources, an organization's knowledge is difficult to separate from the people and human relationships within which it exists. As noted by Subramaniam and Youndt (2005: 459), 'unless individual knowledge is networked, shared, and channeled through relationships; it provides little benefit to organizations in terms of innovative capabilities.' Likewise, Nahapiet and Ghoshal (1998) argued that 'knowledge and meaning are always embedded in a social context – both created and sustained through ongoing relationships in such collectivities' (p. 253).

Furthermore, knowledge work is inherently a multi-level construct – it can involve

interactions between individuals, between an individual and a team, between teams, between organizations, and/or among a combination of individuals, teams and other social groupings of participants who are linked together in a network of collaboration. In this chapter, we use the term knowledge work broadly to refer to all of the knowledge-related behaviors and activities that employees can engage in, as individuals or collectively.

Knowledge sharing

While knowledge itself may be possessed independently by individuals, knowledge sharing occurs through interactions involving at least two individuals. Knowledge is shared when it is transferred from one person or group to another person or group. It is a critical intermediate process that aligns the acquisition and application of knowledge (Jackson et al., 2003; Snell et al., 1996). Knowledge sharing is the most frequently used method for individual employees and managers to obtain new knowledge (Cross et al., 2001); it is also essential to an organization's ability to secure and leverage the knowledge held by individual members of an organization (Starbuck, 1992). In addition, knowledge sharing can stimulate new knowledge creation (Nahapiet and Ghoshal, 1998).

Deriving competitive advantage from internal knowledge transfers while preventing knowledge from leaking to competitors is a key challenge for organizations in knowledge-intensive industries (Argote and Ingram, 2000). Transferability of knowledge can threaten competitiveness, for the issue of knowledge inimitability lies at the heart of competitive advantage and its sustainability (Spender and Grant, 1996). Indeed, one approach to gaining a competitive advantage may be to maximize knowledge acquisition, while minimizing knowledge sharing with external entities. In international joint ventures, for example, a firm's ability to keep an appropriate balance between its own knowledge acquisition (e.g., an improved understanding of the market)

and knowledge transfers to partners (e.g., technological and management know-how) can be a major determinant of success (Tsang, 2002).

The importance of appropriate knowledge-sharing has been emphasized in many discussions of knowledge-based competition and innovation (e.g., Hargadon and Sutton, 2000). One objective of effective knowledge sharing is efficiency. No individual knows everything, and no individual can keep up with all of the relevant new knowledge continually being created. Knowledge sharing among employees conserves resources, and frees up time for people to use the knowledge they have. Moreover, knowledge sharing promotes knowledge application. As employees attempt to share knowledge, they are forced to articulate what they know; this makes it possible to evaluate the knowledge and apply it to solve problems or create new products (Von Krogh et al., 2000). Thus, the successful management of knowledge sharing should promote organizational effectiveness (Cross et al., 2001; Davenport and Prusak, 1998).

Given the presence of knowledge, knowledge sharing is not an automatic process, however. Sharing knowledge often incurs costs, such as the time and effort required to communicate (Reagans and McEvily, 2003). Other potential barriers to knowledge sharing include lack of awareness about the existence or location of relevant knowledge, loss of power associated with being the sole source of knowledge, and difficulties in articulating or absorbing available knowledge. Therefore, deliberate efforts may be needed to encourage, support and sustain knowledge sharing within an organization.

Knowledge creation

Whereas knowledge sharing is mostly concerned with the mobilization of existing knowledge, knowledge creation is a process through which novel knowledge is generated and added to the existing knowledge stock. New knowledge is defined as 'discoveries about phenomena that were not known previously' (McFadyen et al., 2004); it can

take the form of ideas, processes, or solutions (Perry-Smith and Shalley, 2003). Knowledge creation is useful when it contributes to an organization's growth or effectiveness (Amabile et al., 1996). Generally, knowledge creation requires the acquisition and combination of existing knowledge (Kogut and Zander, 1992).

The creation of new knowledge often begins with an idea generated by an individual or perhaps a small group of individuals. The process is enabled by exposure to diverse ideas through network positions and dynamics (Burt, 2004; Perry-Smith and Shalley, 2003). As the initial idea is explored and developed, a wider circle of people typically become involved in discussions and other interactions that go beyond solitary individual activities such as reading, writing, and experimenting (McFadyen et al., 2004). Eventually, novel ideas contribute to an organization's success when they are made available to others in the organization (Oldham, 2003). By ensuring they have exclusive access to such knowledge and using it effectively, firms can gain a competitive advantage (Barney, 1986). At the same time, when the organization gives legitimacy to the creative ideas of individuals, it reinforces their centrality in the organizational network, which further enables them to gather more information and further contribute to the innovation process (Perry-Smith and Shalley, 2003).

Thus, both knowledge sharing and knowledge creation have substantial implications for the success of knowledge-intensive organizations. Next we examine these activities at three levels of analysis: individuals, teams and other collectives, and organizations.

DYNAMICS OF INDIVIDUAL-LEVEL KNOWLEDGE WORK

Several studies shed light on the dynamics of individual-level knowledge work. This work serves as a basis for understanding the social dynamics that unfold at higher levels of analysis.

Individual knowledge sharing

Knowledge sharing at the individual level refers to the transfer of knowledge from one individual to another. Relevant studies conducted at this level of analysis include those that treat individuals as the recipients and disseminators of knowledge (Nebus, 2006). The dynamics of knowledge reception are addressed in studies that investigate the motivation or ability of individuals to obtain knowledge from others. The dynamics of knowledge dissemination are addressed in studies that investigate the conditions that encourage or discourage the social interactions required for knowledge sharing to occur.

Recipients of knowledge

Research on social networks is central to an understanding of the conditions that increase focal actors' receipt of knowledge. The strength and redundancy of an individual's social ties have been proposed as two predictors of the knowledge a person is likely to receive from others.

According to one argument, people with strong social ties are more likely to be knowledge recipients. One rationale for this prediction is that frequent (i.e., strong) contacts are associated with positive affective relationships, which often are friendly in nature and supportive of 'reciprocal favors' (Nelson, 1989: 380), including the sharing of knowledge.

An alternative and more common perspective argues that more advantages accrue to individuals with more diverse 'weak ties.' Ideally, these weak ties create bridges across structural holes as well, giving the recipient access to sources of non-redundant information (Burt, 1992). In addition, diverse ties provide exposure to different perspectives, which also are a form of nonredundant knowledge (Perry-Smith and Shalley, 2003). Evidence to support these arguments was provided by Seibert et al. (2001), who found that people with more weak ties to contacts at higher levels and in other functions had access to more information. Similarly, individuals

acting as brokers across structural holes were shown to have greater access to diverse and often contradictory and innovative ideas (Burt, 2004).

The competing views of the value of weak versus strong ties seems to pose a dilemma – should organizations that wish to maximize knowledge sharing at the individual level create conditions that support the development of a smaller network of strong ties or a larger network of more diverse weak ties? The answer to this question may depend on what types of knowledge sharing are most valuable to the organization. Weak ties with a wide range of contacts that provide access to non-redundant information are likely to be more valuable when the organization or work team values efficient knowledge transfer (Reagans and McEvily, 2003; Seibert et al., 2001). In contrast, when organizations wish to reinforce norms of reciprocity and create common perspectives and language for effective knowledge sharing, developing strong ties may be more valuable (Levin et al., 2006; Reagans and McEvily, 2003). In other words, the superiority of one form of network ties over the other may depend on the relative importance of efficiently accessing knowledge versus enabling effective knowledge transfers.

The type of knowledge to be shared may also be an important consideration when choosing between managerial practices that promote the development of weak and strong ties. As explained previously, explicit knowledge is easily codified and can be transferred without direct face-to-face communication, but tacit knowledge is learned through experience and is more difficult to articulate and communicate. When the knowledge to be transferred is explicit and codified, individuals who are connected to a diverse set of colleagues by weak ties can easily access and retrieve that knowledge (see Reagans and McEvily, 2003). Regarding tacit knowledge, however, merely knowing who knows what is not sufficient; transferring tacit knowledge requires more frequent and direct socialization and the development of a shared cognitive map. Individuals tend to trust others

with whom they have strong ties and are more likely to share the perspectives and language base that facilitates tacit knowledge transfer (Reagans and McEvily, 2003). Therefore, the nature of knowledge also dictates whether access to or transfer of knowledge is more valuable, and thus whether strong or weak ties are more desirable.

Disseminators of knowledge

When knowledge sharing is considered from the perspective of disseminators, a large literature on training and development make it clear that issues of individual motivation, opportunity and ability are all relevant to understanding what knowledge individuals are likely to disseminate (e.g., Goldstein and Ford, 2002). Recent research on knowledge sharing reinforces an appreciation for the role of informal social ties as conduits of learning (Nebus, 2006). Discussions of knowledge sharing have also brought more attention to the importance of understanding knowledge dissemination processes. Whereas traditional approaches have often assumed that knowledge disseminators shared knowledge freely in the process of enacting their formal roles (e.g., as supervisors or trainers), studies of knowledge-intensive organizations recognize that effective knowledge dissemination may require that managers find ways to motivate employees whose roles are not formally construed to include training and development activities.

An individual's motivation to disseminate knowledge is likely to reflect his or her view of whether his or her knowledge is a private good (individual social capital) or a public good (communal social capital) (Ibarra et al., 2005). If knowledge is viewed as a private good, individuals may be less likely to share it freely with others, because doing so diminishes their own worth. When knowledge is viewed as a private good, its dissemination is likely to follow the predictions of social exchange theory (Blau, 1964) – that is, individuals are likely to share knowledge with the expectation that others will reciprocate immediately or in the near future. Knowledge dissemination, therefore, is preceded by a

weighing of its potential costs and benefits to the individual (Bock et al., 2002, 2005). As Ibarra et al. (2005) noted, organizations suffer from a 'tragedy of the commons' when their members take advantage of collective knowledge but do not freely contribute their own knowledge.

In contrast, individuals who view their knowledge as a public good may be more likely to share it without expecting something in return. This happens when individuals are committed to the organization, feel that their own personal interests are aligned with the organization's interests, perceive the organization climate as supporting affiliation and believe that organizational relationships are governed by a strong norm of reciprocity (Bock et al., 2002, 2005; Connelly and Kelloway, 2003). A state of 'network congruence' exists when individual's knowledge sharing behaviors satisfy the interests of both individuals and the organization (Ibarra et al., 2005).

The success of knowledge sharing behaviors also depends on others' interests in learning from the disseminator. Burt (2004) shows that managers who are situated at the gap of network structural holes are more likely to discuss their ideas with others, and more importantly, are more likely to have their ideas attended to by senior management and evaluated as valuable. The ideas of people who are peripheral in the network get less attention, which reduces their motivation to engage in further knowledge sharing. Thus, the contours of social networks have substantial implications for knowledge sharing amongst individuals.

Individual knowledge creation

The dynamics of individual knowledge creation are illuminated by studies of individual creativity and innovation. Individual creativity has traditionally been treated as an outcome that can be explained largely by individual attributes and capabilities, including domain expertise, creative thinking skills, and task motivation (Amabile, 1998; Taggar, 2002). More recently, however, scholars have drawn attention to the potentially important role of unit and organization factors (e.g., Oldham, 2003). Thus, for example, individuals who are surrounded by creative coworkers tend to be more creative themselves (Zhou, 2003). Another study found that the innovation performance of managers was greater when managers had close and trusting relationships with others (Moran, 2005). Mehra et al. (2001) found that social network position and self-monitoring personality both had unique and additive influences on individual creativity performance. Broader organizational contextual factors, such as a sense of reciprocity, learning goal orientation, and team learning may also influence individual creativity (Da Silva et al., 1999).

Leaders influence an individual's creativity, too. A leader's role expectations, problem solving style, and the leader-member exchange relationship all influence perceptions of innovation support and innovation behavior (Scott and Bruce, 1994). Zhou (2003) found that individuals display more creativity when their supervisors provide developmental feedback, and when their supervisors display less monitoring behavior.

Finally, we note that the value of an individual's creative ideas will not be fully realized unless others recognize the potential of those ideas (Burt, 2004). Creativity is not only a business of 'genius' but also a business of 'import-export' communication and centrality (Burt, 2004; Perry-Smith and Shalley, 2003). The same ideas that are considered useless and dismissed in one environment may be perceived as highly innovative and valuable by others in a different context; the same ideas that are discounted as not credible when they come from someone who is peripheral in a network may be accepted and acted up when offered by someone more centrally located. Indeed, Burt (2004) showed that to some extent the value of 'an idea resides in a situation, in the transaction through which an idea is delivered to an audience; not in the source of the idea, nor the idea itself' (p. 388). Network position

therefore comes into play in facilitating and realizing individual creativity.

Interplay between knowledge sharing and knowledge creation

Scholars who study individual knowledge sharing and knowledge creation typically focus on one or the other type of behavior. In practice, these two components of knowledge work are not so easily separated. Indeed, they may be completely intertwined. Knowledge sharing often stimulates new knowledge creation (Taylor and Greve, 2007). In a study of research scientists, for example, McFadyen et al. (2004) found that both the number and strength of contacts that researchers had were positively related to the knowledge they created. Presumably, these scientists benefited from a wide network of weak ties, which brought them into contact with a more diverse range of ideas, and a (perhaps) smaller network of strong ties that they were able to effectively leverage for creative productivity. Conversely, it is also the case that organizations can benefit from individual knowledge creation when it is accompanied by knowledge sharing. To date, however, the question of whether individuals who are more creative are also more likely to be effective knowledge disseminators (vs. recipients) remains largely unexplored.

Looking ahead, we believe knowledge-intensive organizations could benefit from individual-level research that improves our understanding of the interplay between knowledge sharing and knowledge creation. Also needed is research that examines more closely the dynamics of sharing and creating tacit knowledge versus explicit knowledge. Perhaps these knowledge activities are mutually reinforcing. If so, organizations need not choose which to maximize. More likely, individual employees make choices among these various activities, either intentionally or unintentionally. Knowledge-intensive organizations need to understand the individual knowledge activities that are likely to contribute to their effectiveness, as well as the

conditions that are likely to maximize the most valuable activities.

DYNAMICS OF UNIT-LEVEL KNOWLEDGE WORK

We now consider research that examines knowledge work within or between teams and other organizational units, such as departments or divisions. The outcome of interest at this level is the knowledge work of a unit as a collective. We begin by focusing separately on the within-unit and between-unit social dynamics of knowledge work, and then consider the implications of jointly accounting for both types of dynamics.

Within-unit knowledge sharing

Within-unit knowledge sharing refers to the transfer of knowledge among unit members. To understand within-unit knowledge work, researchers have examined three social components of collectivities: the cognitive, relational, and structural (Nahapiet and Ghoshal, 1998).

Cognitive component of within-unit knowledge sharing

The cognitive dimension of within-unit dynamics corresponds to the ability of the unit to avoid misunderstandings (Nahapiet and Ghoshal, 1998). When members share a common language, narrative, and cognitive map or mental model, they communicate more effectively; knowledge can be shared more easily and with higher fidelity (for a review of the literature on team mental models, see Langan-Fox, 2003). In addition, corresponding to the public good perspective, common goals and interests mean that team members are more likely to expect positive outcomes from knowledge sharing (Tsai and Ghoshal, 1998).

Relational component of within-unit knowledge sharing

The relational dynamics among members of a team or unit can nurture or impede

many aspects of the collective's knowledge work. Trust, trustworthiness, active empathy, lenience in judgment, courage and access to help, norms, sanctions, expectations, and obligations all facilitate the achievement of collective outcomes (Zarraga and Bonache, 2005), and in this case, knowledge sharing.

Trust is necessary in situations characterized by vulnerability and risk (Mayer and Davis, 1995). Trust refers to 'the belief that an exchange partner would not act in self-interest at another's expense and ... a predilection to assume the best when interpreting another's motives and actions' (Uzzi, 1997: 43). Trustworthiness, on the other hand, reflects how much one is trusted by others (Tsai and Ghoshal, 1998). With mutually favorable beliefs, actors are less concerned that their sharing behavior will be taken advantage of and are more likely to effectively cooperate and engage in knowledge sharing behavior (Nahapiet and Ghoshal, 1998).

Kang et al. (2006) further differentiated between generalized trust towards members of a group, and dyadic resilient trust towards direct contacts; these have differential implications for knowledge work. It is generalized trust towards a group of individuals (e.g., members of a work team or unit) that is likely to facilitate knowledge sharing. Norms favoring cooperation and openness should encourage broad knowledge sharing among individuals of the collective (Starbuck, 1992). Identification with the collectivity, in turn, instils individuals with the motivation to share knowledge that might contribute to collective outcomes (Nahapiet and Ghoshal, 1998). Leaders who encourage active involvement and empower employees to participate in decision making and social events also facilitate knowledge sharing within teams (Zarraga and Bonache, 2005).

Structural component of within-unit knowledge sharing

The structural component of knowledge work refers to social relationships that bind together members of the collective. The social structures (hierarchical vs. horizontal, mechanistic vs. organic) of a collective entity,

physical proximity at work, and personal ties established at work are all relevant to the development of conditions that support knowledge sharing.

The structural component of social networks creates and frames opportunities for knowledge work. Dense social networks appear to facilitate complex knowledge sharing (Reagans et al., 2004). Because actors in such a network interact with each other frequently, they have more opportunities to share fine-grained and in-depth knowledge; such interactions also increase the ability of the collective to effectively exploit their shared knowledge (Reagans and Zuckerman, 2001). Sparse networks, on the other hand, may present actors with more non-redundant information and stimulate the entrepreneurial behaviors associated with knowledge creation (Kang et al., 2006). Therefore, the optional structural configuration for unit knowledge sharing also depends on the knowledge in focus.

Between-unit knowledge sharing

Analogous to knowledge sharing among individuals, knowledge sharing among units involves searching for and identifying new knowledge, as well as transferring and incorporating existing knowledge. In this case, however, the focal actors are units taken as a collective. Cognitive, relational and structural factors may again serve as determinants of knowledge sharing at this higher level of analysis.

Cognitive and relational influences

When units within an organization share common interests or goals, they may be more likely to establish a cooperative relationship; knowledge sharing and joint learning can then create a win-win situation that has benefits to everyone involved. When units compete with each other for internal resources, however, knowledge sharing may be less likely (Tsai, 2002; Ingram and Simons, 2002). As to the relational component, when multi-national corporation (MNC) subsidiaries trust and identify with headquarters' management, it is

more likely that organizational practices will be transferred to subsidiaries (Kostova and Roth, 2002).

Relational influences

While cognitive and relational factors are undoubtedly important to understanding inter-unit knowledge sharing, studies of knowledge work at this level of analysis have typically focused on the structural component. Units that are interconnected in a rich network seem to benefit from greater knowledge flow, which provides greater information access and timeliness (Burt, 1992). For example, research shows that when project teams have short inter-team network paths (structural social capital) with other teams, they are able to obtain more knowledge from other teams and complete their projects sooner (Hansen, 2002). Within a single network, some units may also reap more gains due to their position and ties. For example, those units that are most central in the network and those with the largest number of weak ties are more likely to engage in knowledge exchange and combination with other units (Tsai and Ghoshal, 1998). While weak ties to external entities provide greater access to nonredundant knowledge, a denser network of stronger ties seems to be more conducive to the sharing of complex and tacit knowledge among units (Hansen, 1999; Nahapiet and Ghoshal, 1998).

Hierarchical relationships among units may also influence knowledge flows. When units have a vertical relationship with one another and the locus of decision making lies at the upper level, the lower-level units may be reluctant to voluntarily share knowledge unless directed by the authority to do so (Tsai, 2002). Thus, the structural position of a unit may influence its ability, motivation, and opportunity to share knowledge.

Within-unit knowledge creation

An extensive literature informs our understanding of unit-level knowledge creation. Indeed, the prevalence of team-based work reflects the commonly held belief that teamwork enhances knowledge creation. As individuals with different knowledge stocks collaborate, the continual (re)combination of their knowledge serves as the basis for incremental change (Noe et al., 2003), and occasionally leads to radical changes such as significant new ideas, products, or procedures. Reviews of past work clearly illustrate the importance of cognitive and relational factors as determinants of knowledge creation within teams and other organizational units (e.g., see West and Hirst, 2003).

Cognitive influences

The increasing prevalence of team-based organizations reflects a belief in the ability of teams to create new and valuable knowledge. When creativity is the objective, work teams are typically designed to include people who bring a variety of differing perspectives to the problems at hand. While substantial evidence supports the assumption that new knowledge creation is more likely to occur in teams and work units that are more cognitively diverse, the evidence is sufficiently mixed to suggest that cognitive diversity alone is not a sufficient condition for new knowledge creation. For a unit to effectively use its stock of cognitive diversity, it must also have a social fabric that supports effective knowledge flows (Reagans et al., 2004; Reagans and Zuckerman, 2001).

Relational influences

The presence of diverse knowledge within teams may provide opportunities for knowledge creation, but those opportunities are more likely to be realized when the social relations among team members are positive (Reagans and Zuckerman, 2001). Those with minority viewpoints must feel free to express them, and the majority must be willing to actively engage in a consideration of the minority's ideas. A team climate characterized by active empathy and lenience in judgment, courage, and mutual trust and support is conducive to the creation of knowledge in teams (Zarraga and Bonache, 2005).

Unless knowledge sharing occurs among team members with diverse knowledge

stocks, there is no basis for the analysis and problem solving activities that lead to new insights and ideas. The use of team building and other practices designed to develop strong interpersonal relationships reflect an understanding of this point among managers, and there is some empirical evidence to support this view (Schulze and Hoegl, 2006). In addition, research on creative organizational climates has identified organizational support, supervisory encouragement, work group support, sufficient resources, challenging work, and flexibility as elements of creative organizations. Conversely, creativity is impeded by internal political problems, harsh criticism of ideas, destructive internal competition, risk avoidance, and protecting the status quo. Too much emphasis on productivity and excessive workloads also appear to reduce creativity (Amabile et al., 1996).

Between-unit knowledge creation

The between-unit collaboration required for new knowledge creation is fraught with difficulties. One source of difficulty is that knowledge is not easily transferred between units due to its 'sticky' nature. Other barriers to inter-unit collaboration include conflicting goals and incentives as well as lack of motivation or opportunity (Dyer and Hatch, 2006).

To encourage the types of inter-unit collaborations that are likely to lead to the creation of new knowledge, managers may need to intentionally adopt management practices that both reduce knowledge stickiness and promote the use of knowledge from one part of the organization for solving problems in other parts of the organization. Attending to the organizational culture seems to be an obvious imperative for promoting inter-unit collaboration.

Just as within-unit trust facilitates knowledge sharing among members of a unit, a culture of cooperation and solidarity creates a relational atmosphere conducive to joint problem solving and knowledge creation between units. Commitment-based human resource management practices that foster trust and cooperation among employees include collective-based incentives, internal promotion, team-based work design, and training. Human resource practices such as cross-training, company-wide social events, and internal promotions may also help cultivate a shared cognitive schema among employees, which should also facilitate cooperation (Collins and Smith, 2006). The ongoing and continuous nature of knowledge creation suggests that actively managing turnover rates and patterns may also prove useful at the organizational level (Inkpen and Tsang, 2005; Nahapiet and Ghoshal, 1998).

Interplay between individual-level and unit-level knowledge work

Studies of knowledge work at the individual and unit or team-level share much in common. Many of the same theoretical explanations are used as the foundations of research at these two levels of analysis. The use of network theory and its related analytic techniques may prove to be especially useful for identifying general principles that hold across both levels of analysis. For example, the differential usefulness of weak vs. strong ties seems to transcend levels of analysis. Despite some similarities in the arguments applied to individuals and teams or units, however, it would be overly simplistic to view knowledge sharing and knowledge creation processes as directly parallel across these levels of analysis.

Given that teams are comprised of individuals, it is reasonable to expect that creativity at the individual level may aggregate to team-level innovation. But team innovation is not a simple aggregation of individual creativity. A more useful model views team innovation (i.e., team knowledge creation) as a two-stage process (West, 2002). The first stage resembles the simple aggregation of individual creativity, but this alone can lead to at most the sum of the individuals' ideas (Zarraga and Bonache, 2005). To ensure a team produces more value than the sum of its parts, contextual factors must also be considered. Thus, for example, Taggar

(2002) proposed a multi-level model in which individual creativity combines with 'team creativity-relevant processes' to produce new knowledge creation. West and Hirst (2003) argue that team and organizational processes combine with individual inputs to determine the number of innovations produced by teams. Such processes include developing shared objectives, reflexivity, leadership, and participation (Anderson and West, 1998). Such team-level factors support the aggregation of individual knowledge and also make it possible to realize an exponential gain that would not be achieved by individuals acting alone.

DYNAMICS OF ORGANIZATION-LEVEL KNOWLEDGE WORK

Whereas teams and work units can bring together diverse knowledge located within the organization, inter-organizational arrangements can bring together knowledge distributed among several organizations. Strategic alliances and network forms of organization support knowledge sharing and knowledge creation by encouraging knowledge flows between companies.

The US biotechnology industry is characterized by strategic alliances and networked relationships between new biotechnology firms and established firms. Strategic alliances allow older, established firms to gain access to the new discoveries of scientists employed by universities and small start-ups. Dedicated to research and new product development, small biotechnology firms often excel in the creation of new technical knowledge. In return for sharing their technical knowledge with larger firms, such as pharmaceutical companies, the smaller firms gain access to their partners' resources for product testing, marketing, and distribution (Liebeskind et al., 1996).

The concept of a 'network organization' has prevailed as an intermediate form of organization that complements markets and bureaucracies to facilitate organizational success (Borgatti and Foster, 2003). Central to network organizations are knowledge sharing routines that engage other organizations in the transfer, recombination, and/or creation of specialized knowledge (Dyer and Singh, 1998). Multinational corporations often take the form of a network of semi-autonomous business units. Indeed, some scholars (Gupta and Govindarajan, 2000) have argued that 'the primary reason why MNCs exist is because of their ability to transfer and exploit knowledge more effectively and efficiently in the intracorporate context than through external market mechanisms' (p. 473).

As organizational boundaries become more permeable, managers must weigh the value of the knowledge that might be gained against the associated costs. Thus, research on strategic management is actively focused on improving our understanding of the dynamics of inter-organizational knowledge sharing and knowledge creation. For example, researchers are asking how competing organizations that rely on the same suppliers can manage to share knowledge with suppliers while preventing them from using the knowledge to serve other competitors (Dyer and Hatch, 2006). Although reviewing that literature is beyond the scope of this chapter, we discuss it briefly here to encourage research that incorporates this higher level of analysis.

Inter-organization knowledge sharing

Increasingly, organizations need to absorb knowledge from outsiders to compete effectively, as no organization can possibly possess all required knowledge to deal with change (Anand, et al., 2002; Powell et al., 1996). Firms gain access to knowledge and learning opportunities through the network of relationships they have with other firms (Powell et al., 1996). Thus, one key role of top management teams is building social networks with, for example, suppliers, customers, competitors, and government agencies, thereby obtaining access to first-hand and valuable information that can be used to enhance organizational performance (Collins and Clark, 2003).

Actively sharing knowledge with others also can be beneficial. A study of the automotive industry found that by sharing knowledge with its suppliers, Toyota enabled them to learn more quickly and provide better products to Toyota, which helped Toyota outperform its American competitors (Dyer and Hatch, 2006). Strategic alliances, joint ventures, joint technical committees, and industrial districts are all examples of inter-organizational arrangements that can support knowledge sharing (Rosenkopf et al., 2001). Another approach used to obtain knowledge is hiring contingent workers and consultants who possess specialized knowledge that is not held by the firm's regular or core employees (Davis-Blake and Hui, 2003).

Aside from the structural connection with networking organizations, it is equally important for firms in knowledge-intensive industries to cultivate relational and cognitive social capital (Maurer and Ebers, 2006). When the knowledge to be shared between organizations is explicit, it is relatively easy to transmit and record (Zollo and Singh, 2004). The use of email, telephones, and face-to-face meetings facilitate the sharing of explicit knowledge among organizations.

When sharing tacit knowledge, organizations face the same challenges as individuals and teams – they must establish relationships that support knowledge sharing. Uzzi (1997) found that inter-organizational relationships characterized by trust were more conducive to fine-grained knowledge transfer compared to arms-length transactional relationships. Likewise, partners in a strategic alliance gain most from freely flowing knowledge when they establish noncompetitive relationships guided by common goals (Inkpen and Tsang, 2005). Activities such as visiting the facilities of other companies, attending industry consortia, and benchmarking against other firms are useful knowledge sharing mechanisms (Appleyard, 2006). Thus, just as social capital promotes knowledge sharing between individuals and between teams, it also promotes knowledge sharing between an organization and various external partners or stakeholders. Lessons learned about the dynamics of knowledge sharing at lower levels of analysis (individual and team) provide opportunities to develop new insights into organization-level phenomena, and vice versa.

Inter-organizational knowledge creation

When organizations are the unit of study, the notion of knowledge creation is often referred to as organizational innovation. Analogous to team-level research, work conducted at the organization level generally assumes that knowledge sharing contributes to knowledge creation (Huber, 2006). Thus, just as positive and cooperative relationships between organizations facilitate knowledge sharing, they are assumed to promote the creation of new organizational knowledge, both by accident as well as by design (Nahapiet and Ghoshal, 1998). Consistent with this assumption, studies have found that organizational innovation is facilitated by external ties with other organizations (Subramaniam and Youndt, 2005; Uzzi, 1997).

Multiple forms of network organizations that support knowledge sharing also are conducive to knowledge creation. Inter-organizational embeddednesss, including relationships with suppliers and clients, promotes joint problem solving (Uzzi, 1997). When top management teams of high tech firms have strong and wide ranging social ties with external entities, the firms experience greater sales growth and stock returns (Collins and Clark, 2003). External venturing, in which companies invest in start-up ventures outside the firm, enables investing firms to quickly access newly created knowledge even when they are not directly involved in the process of knowledge creation (Wadhwa and Kotha, 2007).

In some cases, the diverse knowledge obtained from external sources complements internal knowledge, which in turn can facilitate knowledge creation that stimulates incremental innovation. For example, Matusik and Hill (1998) showed that contingent workers bring in fresh and valuable public knowledge

that helps stimulate the creation of new private knowledge within firms. Likewise, Yli-Renko et al. (2001) reported that the knowledge of customers facilitates product innovation. In their study of technology firms, customer network ties and strong relationships with customers were associated with both new product development and technology renovation. Thus, organizational social capital appears to promote both incremental innovation and radical innovation (Subramaniam and Youndt, 2005).

While networking organizations are likely to benefit from social capital, they are also subject to the constraints brought by their structural, relational, and cognitive social capital. For example, frequent interaction with contacts in a dense network, strong obligations for reciprocity with contacts, and homogeneous cognitive schema with contacts may cause relational and cognitive 'lock-in,' which prevents organizations from innovating and changing (Maurer and Ebers, 2006).

Interplay between team and organization knowledge work

Studies that jointly investigate team- and organization-level knowledge sharing and knowledge creation are needed to develop a better understanding of how the dynamics of knowledge work are influenced by the types of boundaries that must be spanned. Conceptually, the arguments used to explain the dynamics and potential outcomes of inter-organization knowledge work are quite similar to those used to explain inter-unit (within-organization) knowledge work. However, more research is needed to fully understand the similarities and differences in knowledge work at these levels of analysis.

Management scholars generally assume that inter-organization knowledge sharing carries with it more risks than inter-team knowledge sharing. Nevertheless, not all firms are likely to face the same risks. For example, companies in the semiconductor industry are less likely to share private knowledge with other companies than those in the steel industry, because the rapidly changing nature

of the semiconductor industry places more threats to competitive advantage if companies share knowledge with others (Appleyard, 1996).

Meanwhile, scholars who conduct research at the level of teams generally assume that knowledge sharing and knowledge creation within organizations are essentially risk-free. For example, one study included as impediments to the transfer of best practices within companies social distant, lack of ability, and ambiguity, but not potential risks associated with transferring best practices to other units (Szulanski, 1996). The consequences of differing levels of risk for the behavior of the individuals and teams involved in knowledge work are not yet well understood.

FUTURE DIRECTIONS

In reviewing the research on knowledge work conducted at the individual, team and organization levels of analysis, we found many similarities, some differences and several gaps. Strong ties and network embeddedness appear to facilitate knowledge sharing; when actors trust one another, they are perhaps less likely to view knowledge sharing as risky (Reagans and McEvily, 2003). Strong and cohesive networks characterized by frequent interaction allow the development of a common language and perspective, which enables the sharing of tacit knowledge. Yet weak ties are also desirable because they are more likely to provide access to non-redundant information, which is conducive to new knowledge creation. In addition, when actors are connected by weak ties to multiple diverse entities, they are more likely to develop the ability to communicate complex ideas to dissimilar recipients, which contributes to knowledge sharing (Hansen, 1999). What is not yet understood, however, are the management practices that nurture the development of networks with the appropriate structures and characteristics. Therefore, research on social networks and knowledge work provides scant guidance to practicing managers. To conclude, we discuss a few

directions for future research that may yield additional insights to practicing managers.

Managing competencies and capabilities

For organizations that rely on knowledge work, both the competencies of individuals and the capabilities of collectives (e.g., teams, units, networks) are likely to influence knowledge sharing and knowledge creation. The dynamic nature of knowledge work and the importance of tacit (vs. explicit) knowledge pose two special challenges to building and maintaining the needed competencies and capabilities. In addition, managing the ability component of knowledge work involves bridging across multiple units of analysis. Thus, one objective for future research should be improving our understanding of the linkages and disconnects between individual-level competencies and the capabilities of collectives.

Individual competencies

At the level of individual employees, competencies associated with creative and innovative behavior include cognitive skills, some personality characteristics and deep task knowledge (Taggar, 2002). Staffing an organization with people who have these competencies should facilitate effective knowledge work (Pulakos et al., 2003), so standard selection and training practices may be of some use in maintaining the needed individual competencies. However, as Jackson et al. (2006) noted, traditional top-down training may be inadequate because it underestimates the dynamic, problem-driven nature of knowledge work. Rather than 'spoon feeding' employees *what* they need to know, knowledge-intensive organizations may find it is more effective to teach employees *how* to use social dynamics to access knowledge when they need it and recognize potentially useful or outdated knowledge when they encounter it.

Employees with technological know how – conducting effective internet searches, using electronic bulletin boards to communicate with experts, and participating in webcasts – can quickly acquire up-to-date information on almost any topic. If collaborators know how to use intranets, groupware, and myriad other information technologies, it makes it easier to perform their work despite their being geographically distributed. But knowledge work also requires interpersonal skills to navigate and leverage the tacit knowledge that is available in organizations; useful interpersonal skills include conflict resolution, collaborative problem-solving and communication (Stevens and Campion, 1999). In their analysis of talent contracting situations, Davis-Blake and Hui (2003) reported that contracting relationships typically require managers who are adept at managing the interface between contract employees and regular employees. Such managers should build mutual trust and engender feelings of identification with the contracting firm to encourage the flow of knowledge between contract and regular employees. Additional empirical work is needed to determine the degree to which improving the interpersonal competencies of managers results in the development of effective social networks.

Collective capabilities

At the individual level, knowledge work competencies constitute knowledge stocks. The knowledge work of teams, networks organizations and other social units draws upon such knowledge stocks. Capabilities of a collective are not isometric with the competencies of individual members, however. Group-level knowledge can increase even when not all individuals in the group gain knowledge. Conversely, individual knowledge can increase without a concurrent change in the knowledge of the collective, which is likely to bring little advantage to the organization (Turner and Makhija, 2006)

Research on team performance provides insights into the capabilities needed by collectives engaged in knowledge work. For example, effective teams are skilled at constructive controversy (Jehn, 1995). When creativity is needed, useful team capabilities include non-evaluative brainstorming, goal

setting, the appropriate use of breaks, and scheduling of iterative team and individual idea sessions (Paulus et al., 2001). In rapidly changing environments, adaptation skills are likely to be important to success also (LePine et al., 2000). Adaptation occurs when members of the collective recognize changes in task demands and respond by re-evaluating and perhaps reformulating their approach.

Developing the capabilities of collectives may be more difficult than simply ensuring that individuals have the needed competencies for knowledge work. Rather than focusing on the development of individual competencies as most organizations do, it may be preferable to focus on developing the knowledge work capabilities of intact collectives. Currently, there is little empirical work to guide the design of learning approaches for developing the capabilities of collectives. Research that improves our understanding of how social collectives can develop the capabilities that facilitate knowledge work is clearly needed.

Tacit competencies and capabilities

In addition to extending what we know about developing individual competencies to include the development of collective capabilities, more research is needed to improve our understanding of how tacit competencies and capabilities can be developed. Like tacit knowledge, tacit competencies and capabilities are embedded in experience, and are not easily articulated and codified. For individual knowledge workers, creativity and political savvy may be useful tacit competencies. For collectives engaged in knowledge work, useful tacit capabilities may include building consensus, managing changes in membership, and maintaining network ties. Research that improves our understanding of the tacit competencies and capabilities that are needed for effective knowledge work should be given high priority. Subsequently, research can investigate how to develop such tacit competencies and capabilities. For example, when dealing with the ambiguities of tacit process-related and outcome-related knowledge, it may be appropriate for organizations to rely on informal socialization and 'clan control' (Turner and Makhija, 2006).

Managing motivation

Developing individual competencies and collective capabilities may help ensure that individuals and collectives can engage in knowledge work, but motivation must also be present. Next we consider the motivational question of whether employees *will* engage in knowledge work.

Participation in knowledge work

Descriptions of knowledge-based competition often highlight the ability of knowledge workers to exercise their free will when deciding which organizations to join, which projects to work on, whether to participate in various informal communities of practice, and whether to share their ideas (see Kelloway and Barling, 2000). Thus, employers need to understand how employees decide to exert the effort needed for effective knowledge work, e.g., joining a particular project team, accepting informal leadership and advocacy roles, participating as an instructor or mentor, developing relationships that have no immediate utility in anticipation of the future, and so on. Such decisions to participate may reflect purely rational choices, but it is more likely that they also reflect political considerations (Arthur and Kim, 2005). Establishing trust between employees and managers may be the fundamental challenge that must be met to ensure that knowledge workers choose to participate and stay actively engaged.

Rewards and recognition

Scholars disagree about the effects of rewards as motivators of knowledge work. Lawler (2003) argued that contingent rewards should be effective motivators if they direct employees' attention to the most important aspects of their work. His view is consistent with research showing that organizations are more likely to achieve their goals when they reward employees for results that reflect those goals (Montemayor, 1996; Shaw et al., 2002). The design of contingent rewards

that support knowledge work is fraught with difficulties, however. For example, it seems likely that rewarding the development of individual knowledge stocks may inadvertently dilute employees' motivation to share their knowledge.

An alternative perspective suggests that tying rewards to the achievement of creative outcomes may *reduce* creative output (Oldham, 2003). To address the organization's desire for accountability while providing room for individuals to take the risks associated with creating new knowledge, Oldham (2003) recommended offering only small rewards, and giving them after considerable time had elapsed. In addition, rewards that focus attention on quality over quantity may be more consistent with knowledge-centered activities (Zenger and Marshall, 2000).

Some field studies have reported that monetary rewards are not the main motivators of collaborative behavior (Swart and Kinnie, 2003), but research also shows that people tend to underestimate the importance of pay due to social desirability considerations and lack of self-insight (Rynes et al., 2002). Research that yields practical suggestions for how to develop effective reward and recognition systems for employees engaged in knowledge work (as individuals as well as participants in teams, networks, communities-of-practice) is needed to resolve this ongoing debate.

Motivation to learn

Research on individual learning has found that emotions and goals are two factors that influence learning outcomes. However, the implication of this work for managing knowledge-intensive organizations has yet to be closely examined.

Learning is inherent in knowledge work, but often the emotional cost of learning is more salient than the need for learning. The costs associated with learning are perhaps most salient when learning is construed as a remedy for knowledge deficiencies – i.e., as a remedial fix that corrects inaccurate or obsolete knowledge. Admitting that a remedial fix is needed may threaten an individual's self-esteem or a group's sense of efficacy. Determining how to best motivate employees to critically evaluate and perhaps revise existing knowledge may require an improved understanding of the emotions associated with knowledge work. Research that examines the role of positive and negative emotions in knowledge-intensive organizations may provide new insights into how organizations can promote learning without reprisals (and see Grandey in this volume).

Additional research on the use of goal setting for knowledge work may prove useful, also. The motivational effectiveness of specific and difficult goals is well-established for tasks that are simple and routine (Locke and Latham, 1990). Studies of innovation processes indicate that specific and difficult goals enhance the performance of R&D teams (Zirger and Maidique, 1990). Contrary evidence indicates that individual creativity is impeded by productivity goals and excessive workloads (Amabile et al., 1996), perhaps because specific performance goals interfere with experimentation and learning (Dweck and Leggett, 1988). The tacit nature of knowledge may also reduce the usefulness and feasibility of setting specific goals. For example, Turner and Makhija (2006) argued that outcome control is viable only when outcome-related knowledge is explicit and complete, thus setting goals for developing tacit knowledge may not be appropriate.

When innovation is the objective, motivation seems to be enhanced by challenging work and autonomy, which suggests that 'do your best' goals may be most appropriate for complex knowledge work (Kanfer and Ackerman, 1989). Nonetheless, the practical value of vague goals is questionable. The size and complexity of knowledge-intensive projects may make it difficult to identify with the project as a whole, and see one's impact on the final outcome. Specific team goals may prove useful for establishing a definite 'line of site.' In other words, a mixed goal model might prove most effective, with teams having specific difficult goals while individual members work under more general 'do your best' goals. Research that examines

the combined use of individual and collective goals is needed to resolve this issue.

Managing opportunities for knowledge work

If an organization's workforce has both the motivation and competencies/capabilities required for effective knowledge work, is it possible that knowledge work will fail to flourish? The answer is yes, unless opportunities for knowledge work are also present. Considerable research documents the value of contacts among people who have dissimilar information, perspectives and experiences. A variety of management policies and practices may be useful tools for increasing knowledge work opportunities.

An organization's culture – i.e., it's norms and rituals – can create opportunities for people to cross or span boundaries that might otherwise be barriers to knowledge flow (Bouty, 2000). In knowledge-intensive organizations, such opportunities should pervade organizational life. In addition to the structure of work itself, events such as meetings, celebrations, training programs, conferences, and myriad other occasions for social contact can be designed to encourage contact and learning among employees with different perspectives (Turner and Makhija, 2006).

Management practices and the organizational culture can also create opportunities for employees to engage in knowledge work outside the organization. Practices that create such opportunities include short-term leaves for community service work and other non-employment activities, paying the costs associated with professional memberships and conference travel, staffing practices that draw in a *broad* pool of external applicants, maintaining positive relationships with 'alumni' and supporting alumni-centered events that encourage current employees to mingle and learn from former employees, and supporting mentoring relationships that cross organizational boundaries (e.g., seasoned employees serving as mentors for college students).

The extant literature paints a clear picture of the importance of developing social connections among members of the organization and beyond. Less clear are the specific management practices that can be used to create and sustain such connections, which practices are especially harmful to them, and how to maximize benefits and avoid harms of building network connections.

CONCLUSION

To successfully compete on the basis of knowledge, organizations must learn to effectively manage knowledge work at multiple levels of analysis, including individuals, teams, departments, business units, and boundary-crossing networks. The management literature offers many insights into the dynamics of knowledge work at each of these levels of analysis. It offers fewer insights into the challenge of sustaining knowledge work at all of these levels of analysis simultaneously. We hope this chapter illuminates some of the many opportunities for conducting multi-level research that advances our understanding of how organizations can effectively manage the knowledge work of individuals as well as the knowledge work of the collectives in which they are embedded.

NOTES

1 A more complete framework would also include research conducted at higher levels of analysis, such as studies at the level of strategic groups, industries, and organizational networks; the development of such a framework is a project for the future.

2 For a discussion of other perspectives on how to define knowledge work, see Kelloway and Barling, 2000.

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