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Introduction to special issue

Knowledge creation management: Issues and challenges

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If 'Globalization' was the most-hyped word in the business media in the last decade, it is likely to have been matched, if not exceeded, by the growing buzz around 'Knowledge Management' in recent years. Understandably, the explosive growth of information technology and the Internet, and the concomitant rapid rise of the so-called 'New Economy' based on knowledge-intensive industries, have led to growing recognition of the importance of knowledge as a critical resource for competitive advantage not only at the level of the firm (Quinn 1992; Sveiby 1997; Teece 1998) but also at the level of nations (OECD 1996; World Bank 1998; Ungson and Trudel 1999).

A similar convergence of interest towards knowledge management has been observed among scholars from diverse management disciplines ranging from management information systems, operations management, organizational behavior and strategic management. Rather than a unified field, knowledge management reflects multidisciplinary approaches that draw upon the theoretical insights from their respective disciplines. While knowledge management encompasses the spectrum of management concerns from knowledge creation to knowledge exploitation, this special issue focuses primarily on the former, recognizing however that the two aspects are closely intertwined and often need to be examined together. In particular, our primary interest is in the management of organizational knowledge rather than individual knowledge. From an organizational context, it can be argued that new organizational knowledge can only be said to have been created when individual knowledge becomes diffused, adopted and embedded as new codes and routines that guide the actions of a significant number of organizational members (Argyris and Schon 1996).

At the risk of over-simplification, five major strands of literature on knowledge creation management can be discerned. The first draws upon insights from the perspective of organizational learning, as illustrated by the work of Hayek (1945), Polanyi (1962; 1966), Argyris and Schon (1978; 1996), Nelson and Winter (1982), March (1991), Huber (1991), Nonaka (1994) and Spender (1996). This literature makes a fundamental epistemological distinction between explicit and tacit knowledge, and highlights the social and interactive nature of knowledge creation and learning. In particular, the recent

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work of Nonaka (1994) and Nonaka and Konno (1998) strongly argue that the interaction between these two modes of knowing is critical for the creation of new knowledge at the organizational level.

The second strand of knowledge creation management literature is motivated by the perspective of strategic management and centers on the resource-based theory of the firm, which argues that the competitive advantage of a firm ultimately resides in the unique resources that it commands (Penrose 1959; Barney 1991). While there has been considerable debate about analytical constructs for categorizing the nature and attributes of such unique resources (e.g. the concept of core competence (Prahalad and Hamel 1990), core capabilities (Teece and Pisano 1994), and invisible assets (Itami 1987)), recent work has increasingly gravitated towards the concept of knowledge-base (Grant 1996; Kogut and Zander 1992; Leonard Barton 1995; Tsoukas 1996; and Teece 1998), or a more recent variant, intellectual capital (Stewart 1997; Sullivan 1999; Edvinsson and Malone 1997). This emerging literature similarly places attention on the importance of tacit knowledge, and indeed argues that it is the tacit nature of much of organizational knowledge that makes it a unique resource specific to the firm that prevents easy imitation or replication by other firms. At the same time, the 'stickiness' of tacit knowledge or the lack of recognition of the value of sharing such knowledge also means that organizations may encounter significant difficulties in diffusing and transferring valuable knowledge across internal or external boundaries, leading to the all too familiar 'resource imprisonment' and 'not invented here (NIH)' problems.

The third literature strand originates in the work of scholars interested in the process of technological innovation, particularly from the perspective of how organizations can manage the process of bringing idea to market commercialization more effectively. With this perspective, the process of knowledge creation is intimately linked to the process for its use and transformation into products and services through the concept of innovation. For example, the concept of critical functional roles (Roberts and Fusfeld 1981) or the concept of key innovation process stages (Cooper 1993; Van de Ven 1986) are fundamental analytical constructs to study how new ideas are eventually transformed into products in the marketplace or manufacturing processes on the shopfloor. Recent research from this perspective increasingly emphasizes the importance of inter-organizational linkages and networks that facilitate knowledge exchange and R&D cooperation (see e.g. DeBresson and Amesse 1991; Wong 1992; and Inkpen 1996).

While sharing the same belief in the organizational embeddedness of knowledge, the fourth literature strand broadens the focus of knowledge creation beyond the confines of the individual organizations to the larger context of societal influences at the regional, national or international level. Beginning with the national innovation systems literature (Lundvall 1992; Freeman 1995; and Nelson 1993), this emerging body of literature attempts to incorporate cultural, social and institutional constructs, particularly in comparative analyses of why organizations of different national origins or embedded in different social and cultural environments manage the knowledge creation process differently, or with different performance outcomes (see e.g. Lam 1996; Hedlund 1993).

All four of these distinctive approaches suggest that much of the organizational challenge in managing knowledge has to do with tacit knowledge rather than explicit knowledge. This is in great contrast to the fifth strand of the knowledge management literature originating from the management information systems and operations management field. With this perspective, the major focus is on the processes and tools whereby information can be captured, communicated and processed or analyzed into useful knowledge. The three books reviewed by Law (this issue) (Liebowitz (1999), Liebowitz and Wilcox (1997) and Borghoff and Pareschi (1998)) provide an overview of representative work in this approach. While constituting the main bulk of work by management consulting firms and likely to be more familiar to the practicing managers, this process view of knowledge is, understandably, biased towards the use of information technology as enabling or facilitating tools to improve the leverage of knowledge. With the explosive growth of the Internet and the ability to access ever wider amounts of information, the tendency towards emphasizing ever more powerful tools that enable users to search, navigate and extract knowledge from ever larger amounts of information is understandable. However, as forcefully pointed out by McDermott (1999) and Hansen *et al.* (1999), the focus on codifying knowledge in the form of elaborate electronic databases is often misplaced, while the importance of person-to-person interactive exchange is often under-appreciated, in many organizations.

Reflecting the multidisciplinary diversity of the knowledge creation management literature, this special issue brings together several research papers that examine emerging issues and challenges of knowledge creation management from different disciplinary perspectives. Earlier versions of these papers were presented at an international conference organized by *APJM* and the Center for Management of Innovation and Technopreneurship (CMIT) at the National University of Singapore in 1998.

A common theme that underlies most of these papers is the concern with extending our understanding of the knowledge creation management process from within an organization to inter-organizational processes. A related theme addressed by more than one of the papers is how the process of knowledge creation is embedded within the larger social and institutional contexts of nations or communities.

In the strategic management literature, strategic alliance with external partners has been recognized as important means of learning by firms. Phan and Peridis (this issue) examine the process of new knowledge creation through strategic alliance, rather than the traditional focus on knowledge transfer through assimilation of partners' routines or replication of their technology. They argue that for new knowledge creation to occur through the interaction of two parties in a strategic alliance, a certain degree of conflict and tensions should exist. This position is contrasted to existing theories that present conflict minimization as the route to alliance success. They further suggest that knowledge creation often occurs in turbulent and discontinuous environments associated with tensions between alliance partners of different cultural origins, and that this paradox provides new insights on why strategic alliances often fall short in their potential to create new knowledge.

On the similar theme of inter-organizational knowledge creation, Ernst (this issue) examines how small and medium sized Taiwanese firms in the global computer industry were able to rapidly develop their technological capabilities, and consequently their global competitiveness, by concurrently leveraging multiple sources of knowledge – the global production networks of suppliers and buyers of both domestic and foreign origins, large Taiwanese business groups, and public R&D institutions. Ernst argues that it is the diversity of their inter-organizational learning linkages that is the key to the past success of many Taiwanese firms; moreover, he suggests that the nature and composition of such linkages need to change over time as these firms move up the technological ladder.

A different form of inter-organizational knowledge creation management challenge is examined by Thoburn (this issue) in her study of how knowledge is transferred from a public research and development institute in Australia through the creation of new spin-off ventures. She found that the effectiveness in the transfer of tacit knowledge was important in explaining the survival of the new firms. Her findings suggest that public R&D institutions, including universities, need to develop better understanding of the nature of tacit knowledge in designing technology transfer and spin-off programs.

In contrast to Thoburn's study of technology spin-offs, Nam examines the knowledge creation process in the setting up of incubator organizations in Korea. In spite of the growing popularity of incubator organizations for facilitating the creation of new ventures worldwide, little is actually known of how the management structures of such organizations and their link with parent organizations (universities, public R&D labs, and private sector divisions) contribute to the knowledge creation performance of the incubatee ventures. Based on case interviews with ten Korean high-tech venture founders, Nam is able to generate several hypotheses regarding how the organizational characteristics of incubators may influence the process of knowledge creation of new ventures and consequently their likelihood of success after they graduate from the incubator.

Sigurdson (this issue) uses the knowledge creation management lens to examine the relative influence of national policies and institutions versus corporate R&D strategies in determining the geographic location of knowledge creating activities of large multinational corporations (MNCs). Through case studies of several global Japanese, Korean and Scandinavian MNCs, he highlights the complexity of the locational decisions and how national innovation systems and corporate innovation systems intertwined in both cooperative and contentious ways. At the same time, the case studies also suggest the need to distinguish between engineering-driven and science-driven R&D activities, which are found to be managed quite differently.

Like Sigurdson, Ahlstrom and Nair (this issue) also examine the process of knowledge creation and diffusion in a wider context than that of an individual organization. In their case, they focus on how new knowledge is created and diffused throughout an industry or community, using the biomedicine industry as a case study. They argue for the need to distinguish between three types of knowledge – know-what, know-how and know-why, and demonstrate that, in the case of the biomedicine industry, rapid advances only occur

when the focus of knowledge shifted from know-what to know-why. In contrast to the other papers which stress the importance of tacit knowledge, their findings implicitly suggest that codification of know-why is an important element for hastening the pace of new knowledge creation at the industry level. Although not explored in this paper, this implicit finding raises the interesting public policy question of social welfare trade-off between firm-specific, tacit knowledge versus explicitly codified know-why that can be easily diffused and replicated by all industry players. Ernst's analysis of Taiwanese computer makers suggests that the public sector in Taiwan has played an important role in facilitating the codification and diffusion of such know-why to many of the small and medium sized players by organizing R&D consortia among these firms, with public R&D institute like ITRI playing the key knowledge creation role within these consortia.

To provide a practitioner perspective on the relevance of the knowledge management research literature to those who are actually involved in creating and managing knowledge in industry, we invited Herbert Eleuterio, a research scientist and later a senior corporate R&D manager at Du Pont Corporation, to reflect on his own industry and corporate experience in dealing with knowledge creation management. Besides endorsing the critical importance of tacit knowledge in the corporate knowledge creating process, he argues forcefully that strong attention to managing tacit knowledge is common among managers in innovative companies in the West and is not unique to innovative Japanese companies as implied by Nonaka and Takeuchi (1995).

Eleuterio's position is interesting in the light of the substantial literature on Japanese management practices highlighting substantial differences between Japanese and Western management practices in general. In particular, the recent ethnographic study by Fruin (1997) on the knowledge management practices at one Toshiba manufacturing and development factory in Japan, as reviewed by K. Hoyt (this issue), argues strongly that a distinctive source of competitive advantage of Toshiba is its emphasis on integrating R&D, engineering and manufacturing operations on the same factory floor, which is said to dramatically improve the way knowledge is created and applied. Moreover, Fruin (1997) argued that the integration process extended to a larger set of cooperative relationships involving external suppliers, and that it is facilitated by the human resource strategy, common among large Japanese firms, that emphasizes long-term employment and team-based work relations. As highlighted by Hoyt, such claims may seem too simplistic in light of Japan's industrial woes over much of the decade of the 1990s and its inability in particular to respond nimbly to the new market and technological opportunities created by the digital convergence of computer, consumer electronics and communications. Clearly, past Japanese core capabilities in managing knowledge creation appear to have led to 'core rigidities' (Leonard-Barton 1995). In contrast, Ernst's analysis of the development of the Taiwanese computer industry suggests that it has been more nimble in adapting to the rapid technological changes of the global IT industry. Similarly, in response to the financial crisis in 1997–98, Korea has exhibited a remarkable shift away from the large *chaebol* business model in recent months, with an explosive growth of new high-tech and Internet-

based start-ups akin to what is happening in Silicon Valley in the U.S. Part of this new development has been facilitated by the new types of incubator organizations identified by Nam (this issue).

The diversity of responses of the national innovation systems in Japan, Korea and Taiwan towards the challenge of the Internet and digital convergence suggests that it is not useful to speak of an Asian model of knowledge creation management. While innovative firms in Asia have sought to adapt elements of the Japanese model in the past, in recent years it is the American Silicon Valley model that is gaining increasing attention.

To what extent does the so-called Silicon Valley model of new venture creation represent a superior mode of managing the creation and diffusion of new knowledge? Does the ascendancy of this model of business organization suggest that tacit knowledge is no longer a useful construct? I suspect not. Indeed, I believe that the success of the Silicon Valley model – to the extent that there is one model – also highlights the central importance of knowledge of a substantially tacit nature, albeit now in the form of entrepreneurial insights and experience and the social network of venture capitalists and angel investors. In this regard, the Silicon Valley model can be interpreted as providing an external market mechanism to manage the creation and exploitation of tacit knowledge, as opposed to intra-organizational management processes commonly found in large, established firms. This perspective suggests that the challenge for large organizations to improve their knowledge creation management lies less in trying to codify more and more of their tacit knowledge than in imitating the Silicon Valley mechanisms of facilitating the flow of resources to the nodes of tacit knowledge – what Hamel has aptly called 'Bringing Silicon Valley Inside' (Hamel 1999). Although not directly addressed by any of the papers in this special issue, I believe that research along this direction will prove to be most illuminating in the emerging new economy, whether in large established organizations seeking to transform themselves into knowledge-base enterprises, or new ventures seeking to create and dominate new industries with innovative technologies and entrepreneurial insights. Clearly, more research in this area is called for, and hopefully this volume will help build momentum for this research particularly among scholars in Asia.

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