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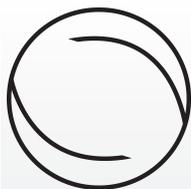**Email Alerts:** http://oss.sagepub.com/cgi/alerts

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Review Paper

Organizational Knowledge Creation Theory: Evolutionary Paths and Future Advances

Ikujiro Nonaka, Georg von Krogh and Sven Voelpel

Ikujiro Nonaka
Hitotsubashi
University, Japan

Georg von Krogh
ETH Zurich,
Switzerland

Sven Voelpel
International
University of
Bremen, Germany

Abstract

Organizational knowledge creation is the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it to an organization's knowledge system. In other words, what individuals come to know in their (work-)life benefits their colleagues and, eventually, the larger organization. The theory explaining this process — the organizational knowledge creation theory — has developed rapidly in academia and been broadly diffused in management practice over the last 15 years. This article reviews the theory's central elements and identifies the evolving paths taken by academic work that uses the theory as a point of departure. The article furthermore proposes areas in which future research can advance the theory of organizational knowledge creation.

Keywords: organizational knowledge, organizational epistemology, organizational knowledge creation theory, knowledge management, knowledge-based view of the firm

Organizational knowledge creation is the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it with an organization's knowledge system. In other words, what individuals comes to know in their (work-)life benefits their colleagues and, eventually, the larger organization. Organizational knowledge creation theory explains this process. Over the last 15 years, there has been an increasing interest in organizational knowledge creation among academics and managers alike. Academic studies have made significant progress in developing and testing the theory's many facets and in seeking new areas in which to apply it. Organizational knowledge creation theory has been used to explain phenomena in many fields, including those of organization theory (e.g. Osterloh and Frey 2000), organization behaviour (e.g. Peterson 2002), human resource management and leadership (e.g. Ranft and Lord 2000), innovation and technology management (e.g. Nonaka et al. 1996b), strategic management (e.g. Choo and Bontis 2002), public administration (e.g. Larsen and Pedersen 2001) and management information systems (Scott 1998). The theory has consequently become an integral part of many universities' and business schools' curricula. In various ways, it is increasingly having an

impact on today's general management practice. Several organizations, such as the ABB, Unilever, Sony, Toyota, General Electrics, Siemens, Phonak and Matsushita, report that they have built initiatives, projects and functions on concepts outlined in organizational knowledge creation theory (Nonaka and Takeuchi 1995; von Krogh et al. 2000).

It is therefore time to take stock of organizational knowledge creation theory. The purpose of this paper is to briefly investigate the evolution of the theory and indicate fruitful areas of research that will advance it further. The paper is organized as follows: the first section discusses the theory's central elements, namely epistemology and knowledge conversion. The next section explains how the theory led to distinct academic paths. We discuss organizational enabling conditions and the context for knowledge creation, knowledge vision, knowledge activism, organizational forms, leadership, the nature of the firm and knowledge strategy. The following section outlines rewarding areas in which research could advance organizational knowledge creation theory, as this section's purpose is to inspire additional investigation. The final section summarizes the main points made.

Organizational Knowledge Creation Theory

This section briefly discusses two fundamental elements of organizational knowledge creation theory: epistemology and knowledge conversion. These were the starting points of the theoretical developments. We show how the theory departed from many established assumptions in the mainstream organization and management theory.

Epistemology Matters!

The field of organization and management studies has a long tradition of 'epistemology', which is the study of the theories of knowledge and ways of knowing, particularly in the context of the limits or validity of knowledge. Yet, until the mid-1980s, the field's epistemology was mainly introspective; it concerned the limits of the methods applied by organization and management scholars, and the limited ability of the field to progress scientifically (e.g. Morgan 1983). The epistemology did not provide much insight into the objects of the study.

At that time, much of the mainstream theory for all practical purposes considered 'knowledge' to be interchangeable with 'information'. In economics' classic view of rational choice, — largely adopted by mainstream management and organization theory — one of the individual's major tasks was to gather information and represent a given problem or situation, gather information about alternative courses of action and choose an appropriate solution that would maximize utility. In two papers, Herbert Simon (1955, 1956) argued that intended rational behaviour is behaviour with constraints. Constraints regarding choice also included those properties of human beings as processors of information and as problem solvers, for example cognitive

limits constraining the range of alternative paths of action that could be considered in a choice situation. A major redirection of management and organization theory resulted in organizational information processing, choice, adaptation and, particularly, the interplay between decision making and organizational design under the assumption of individuals' bounded rationality (e.g. March and Simon 1958; Galbraith 1973; March and Olsen 1976; Simon 1991).

Towards the end of the 1980s, a growing group of scholars began to doubt the usefulness of many of the mainstream theory's assumptions about cognition and knowledge that ranged from the work of Fredrick Taylor to that of Herbert Simon. For example, new research questioned the notion of information as a 'pre-given', and proposed that the organization should be viewed as processes of 'information creation' (Nonaka 1987, 1988). Organization theory had for too long emphasized the processing of pre-given information at the expense of organizational knowledge creation (Nonaka 1991, 1994). Many western scholars clung to a weighted definition of knowledge as the universal 'justified true belief', while failing to create a role for physical skills, experiences, and perception in their theories. In response, a broader concept of knowledge was developed that included both explicit aspects, such as language and documentation, and tacit aspects, such as experience and skills (Nonaka 1991).

It was also shown that the mainstream organization and management theory based its notions of 'information' and 'information processing' on scientific work in the area of cognitive psychology dating back to the 1950s (von Krogh et al. 1994). Mainstream theory had therefore neglected important advances in this area for some time. Recent research had found that knowledge is embodied in the individual, and is therefore history dependent, context sensitive, specific and aimed at problem definition rather than problem depiction, and problem solving (Varela et al. 1991). This finding was consistent with the advances of organizational knowledge creation theory, and it was argued that this way of understanding knowledge had several important implications for organization and management theory. For example, if knowledge is embodied, a core problem of organizational theory is not organizations' design and adaptation under bounded rationality's conditions, but how to overcome the fragile transmission of knowledge between individuals in the organization (von Krogh et al. 1994).

Organizational epistemology became the study of ways of knowing in the organization and prompted inquiry based on an unprecedented variety of theories, assumptions and methods (e.g. Nonaka et al. 1996b; Kogut and Zander 1992; Grant 1996; Spender 1994, 1996; Eden and Spender 1998; von Krogh and Roos 1995; Tsoukas 2005; Baum 2005). Organizational knowledge creation theory both injected ideas, and built on these towards a comprehensive definition. In this theory, knowledge is, first, justified true belief, meaning that individuals justify the truthfulness of their observations based on their observations of the world. Justification therefore hinges on unique viewpoints, personal sensibility and experience (Nonaka and Takeuchi 1995). Knowledge is also, second, the capacity to define a situation and act accordingly (Stehr

1992, 1994; von Krogh et al. 2000). Here, knowledge is oriented towards defining a situation so as to act on it rather than the solving of depicted and manipulated pre-given problems (e.g. Newell and Simon 1972). Finally, third, knowledge is explicit *and* tacit (Nonaka 1991). Knowledge that can be uttered, formulated in sentences, captured in drawings and writing, is explicit. Knowledge tied to the senses, movement skills, physical experiences, intuition or implicit rules of thumb, is tacit (Polanyi 1966). This definition transcends the Western epistemology with its strong focus on explicit knowledge to cover elements of perception, skills, experience and history. It underscores that knowledge is never free from human values and ideas.

The definition of knowledge also raised a number of issues regarding the interrelationships between the tacit and explicit elements, and yielded questions on the relationship between individual knowledge and social values and ideas. This led to further examination of the conversion of knowledge, the second fundamental element of organizational knowledge creation theory.

Knowledge Conversion

Knowledge creation can be understood as a continuous process through which one overcomes the individual boundaries and constraints imposed by information and past learning by acquiring a new context, a new view of the world and new knowledge. Building on the idea of transcendence in the physical universe put forward by Ilya Prigogine (1980), knowledge creation is a journey from 'being to becoming' (Nonaka et al. 2000). It is interesting to note that the constraints on behaviour introduced by the notion of bounded rationality is 'relaxed' as far as knowledge rather than information is concerned. By interacting and sharing tacit and explicit knowledge with others, the individual *enhances the capacity* to define a situation or problem, and apply his or her knowledge so as to act and specifically solve the problem.

In the organization, knowledge 'becomes' or 'expands' through a four-stage conversion process ('SECI'). *Socialization* aims at sharing tacit knowledge among individuals. *Externalization* aims at articulating tacit knowledge into explicit concepts. *Combination* aims at combining different entities of explicit knowledge. *Internalization* aims at embodying explicit knowledge into tacit knowledge. In knowledge conversion, personal subjective knowledge is validated, connected to and synthesized with others' knowledge (Nonaka and Takeuchi 1995). Particular and tentative knowledge created from an individual's values and experiences is shared and justified by other members of the organization. Collecting data from 105 middle-level Japanese managers, Nonaka et al. (1994) conducted a first empirical test of conversion in organizational knowledge creation theory by using confirmatory factor analyses. The study suggests viewing organizational knowledge creation as a construct comprising knowledge conversion by means of externalization, internalization, socialization and combination.

Important studies have followed up and tested the SECI model in a variety of settings with positive results (e.g. Sabherwal and Becerra-Fernandez 2003; Dyck et al. 2005; Schulze and Hoegl 2006).

The concept of 'knowledge conversion' raises two important considerations, that of the knowledge system to which it contributes, and that of social justification. First, the knowledge system captures the organization's global learning. The outcome of organizational knowledge creation is re-categorized and re-contextualized in this layer of the organization. As such, the knowledge layer does not solely exist in the 'material and physical space', but is embedded in the corporate vision, outlining the fields of development for the organization, and the organizational culture that orients individuals' choices, mindsets and actions. Whereas the corporate vision and the organizational culture provide the knowledge base from which to 'tap' tacit knowledge, technology taps the explicit knowledge in the organization (Nonaka and Takeuchi 1995). The knowledge system incorporates what is termed 'knowledge management systems'. The latter term is widely used in the information systems oriented literature (see Alavi and Leidner 2001). In these discussions, knowledge management systems are often equated with the information systems that assist knowledge conversion or information management processes in the organization. As will be shown in the next main section, the knowledge system interacts with the organization's other more or less formal aspects.

Second, according to the epistemology examined above, knowledge is embodied, particular, history-dependent and oriented towards problem definitions at the outset. For an individual, the justification of beliefs is natural, often automatic and instant (we rarely reflect deeply on the truth of the apple — the correspondence between the word apple and the 'physical' entity — before we eat it!). Yet, the expansion of knowledge in the organization through conversion makes justification a social process. In essence, this is the gist of 'synthesizing', during which new, useful, practical, valid and important knowledge is connected to the knowledge system in the organization. Due to 'embodied necessity', two individuals will never share exactly the same values, beliefs, observations and viewpoints. Knowledge results from individual investments, and thus reflects personal interests (e.g. Collard 1978). Therefore, the flip-side of social justification is that knowledge creation is highly fragile and, in effect, individual knowledge often fails to benefit others in the organization and vice versa (von Krogh and Grand 1999; von Krogh 2002).

On first glance, the fragility inherent in organizational knowledge creation is nothing but a severe obstacle to coherence, creativity, sharing and innovation. However, for reasons of cost and time, not all knowledge created by individuals in the organization can be shared; too much redundancy in knowledge offsets the advantages of specialization and division of labour (Grant 1996). Newly created knowledge also needs to be integrated into the organization's knowledge system. The knowledge system's maintenance requires an infrastructure (e.g. information system, archive, procedure, routine) that becomes increasingly costly with the system's growing complexity (Walsh and Ungson 1991). However, redundancy and complexity in the organization's knowledge system are a prerequisite for innovation (Nonaka and Takeuchi 1995). For example, a high degree of shared tacit knowledge among engineers is needed for effective product design, process improvement

and service offering. Therefore, social justification should be understood as a mechanism by which the organization trades off innovation against cost containment in knowledge creation. In the process of conversion, during which individuals externalize their experiences, and during which individual knowledge is socially justified due to fragility's adverse conditions, knowledge can indeed be shared with others. Other individuals combine the process of conversion with the organization's knowledge system, socialize around it, and internalize the new knowledge. Knowledge creation can be regarded as moving up through different organizational levels, from the individual to the communities and the larger networks, and it spans sectional, departmental, divisional and organizational boundaries (Swan et al. 1999).

In organizations, many vital processes of innovation, change and renewal can be analysed through the knowledge conversion lens. For example, consider product development (see Nonaka et al. 1996a): this activity must be organized to safeguard the intense flow of information between the organization and its market, thus allowing product developers to distinguish unimportant market signals from the important need-related information required to make good product design decisions (e.g. Dougherty 1996). Yet, effective product development is more than merely a matter of building an effective information system to process relevant market data. The interaction between the organization and its environment is inherently fragile: knowledge created in the organization needs to be justified through the introduction of successful products and services, thus generating new knowledge for customers. Moreover, new knowledge from the customers' usage of the products may be inherently tacit (von Hippel 1988). Therefore, it must be shared with the firms' engineers through intense collaboration with the customers, and it must be made explicit and justified before the knowledge can be communicated through information systems. In this way, insights are created through the synthesizing of different reactions from the marketplace (Nonaka and Toyama 2005). As this example shows, epistemology and knowledge conversation have implications for organizational design and processes. Having established the two fundamental elements of organizational knowledge creation theory, we next turn to the evolutionary paths that these elements initiated in theory building and research.

Paths in the Evolution of Organizational Knowledge Creation Theory and Research

As seen in the introduction, central elements of organizational knowledge creation theory have found their way into many fields, although it is beyond the scope of this article to review the full extent of the theory's application. Here, we outline some evolutionary paths that have impacted organization and management theory. First, the definition of knowledge and the concept of knowledge conversion prompted academic works on organization-enabling conditions and the context for knowledge creation. More specifically, research established that knowledge vision, activism, organizational forms and

leadership impact organizational knowledge creation (e.g. Nonaka and Takeuchi 1995; von Krogh et al. 2000). As organizational knowledge creation theory evolved further, it also shed new light on the nature of the firm and advanced the concept of 'knowledge strategy' (e.g. Nonaka and Toyama 2005).

Organization-Enabling Conditions and *Ba*

A central purpose of organizational knowledge creation theory is to identify conditions enabling knowledge creation in order to improve innovation and learning (Nonaka 1994; Nonaka and Takeuchi 1995; von Krogh et al. 2000). Following knowledge's definition, organizational knowledge creation is context dependent. The context for knowledge creation is *ba* (Nonaka and Konno 1998), a Japanese concept that roughly translates into the English 'space', originally developed by the Japanese philosopher Nishida (1970, 1990) and later refined by Shimizu (1995).[1] *Ba* is a shared space for emerging relationships. It can be a physical, virtual or mental space, but all three have knowledge embedded in *ba* in common, where it is acquired through individual experiences, or reflections on others' experience. For example, members of a product development project share ideas and viewpoints on their product design in a *ba* that allows a common interpretation of the technical data, evolving rules of thumb, an emerging sense of product quality, effective communication of hunches or concerns, and so on. To participate in *ba* means to become engaged in knowledge creation, dialogue, adapt to and shape practices, and simultaneously transcend one's own limited perspective or boundaries.[2]

Various *ba* characteristics are particularly suited for the conversion of knowledge (Nonaka and Konno 1998). In the *originating ba*, individuals meet face-to-face, share emotions, feelings, experiences and mental models. The originating *ba* is where knowledge creation begins, and it represents socialization among individuals. The *interacting ba* supports externalization. Here, individuals work with peers. Through dialogue, their mental models and skills are probed, analysed and converted into common terms and concepts. The *cyber ba* is a place of interaction in the virtual world rather than in the physical world. Combining explicit new knowledge with existing information and knowledge serves to systematize and generate explicit knowledge throughout the organization. Whereas effective knowledge creation in the originating and externalization *Bas* limits the number of participants (von Krogh et al. 2000), the cyber *ba* can involve many hundreds of individuals in the organization by using information and communication technology. Finally, the *exercising ba* supports the individual's internalization of explicit knowledge. Here, focused training with instructors and colleagues consists of repetitive exercises that stress patterns of behaviour and the establishing of such patterns. Drawing upon case studies of Japanese firms, it can be concluded that the awareness of a *ba*'s particular characteristics and their support enable successful knowledge creation (e.g. Nonaka and Konno 1998).

If knowledge is separated from a *ba*, it takes the form of information that can be communicated beyond the *ba*. Mainstream organization and management

theory of information processing in the organization forwarded a hypothesis regarding what organizational designs would allow effective decision making under conditions of bounded rationality, but neglecting *ba*, it could not predict where and how this information would originate, nor if the process of origination was effective. Therefore, the work on organization-enabling conditions complements the mainstream theory. At the same time, organizational knowledge creation theory epitomizes a dynamic view: The organization might *be* a well-designed engine for information processing, but more importantly, it assiduously *becomes* a context in which knowledge — the engine's fuel — is created.

Many theories and studies that attempted to shed light on organizational conditions that enable knowledge creation emerged from this point of departure. Since social justification makes knowledge creation a fragile process, relationships among individuals in *ba* impact organizational knowledge's synthesis and expansion. One theory is that knowledge creation is more effective when relationships exhibit a high degree of care for the other (mutual trust, active empathy, access to help, leniency in judgement, and courage), particularly in the originating *ba* in which individuals share tacit knowledge (von Krogh 1998). Based on the construct of care as a condition for knowledge creation, Zárraga and Bonache (2005) developed a framework that linked team atmosphere to knowledge transfer and creation. They gathered data through a survey of 363 individuals from 12 firms who worked in self-managed teams. The study confirmed that high-care relationships favour both the transfer and creation of knowledge.

Another theory is that various types of information systems support *ba* and enable organizational knowledge creation (e.g. Alavi and Leidner 2001). Chou and Wang (2003) developed and tested a model of organizational learning mechanisms and organizational information mechanisms of composite effects on organizational knowledge creation. Using data from 232 organizations, they identified several ways in which information systems can facilitate and support *ba*. For example, information systems designed to support electronic repositories, email communication, collaboration and simulation may enable teamwork by supporting the exchanging and organizing of knowledge.

Knowledge Vision and Activism

The concept of *ba* highlighted two critical challenges for organizational knowledge creation theory. First, teams might have very strong and positive relationships and a group atmosphere that correspond to the effective gaining of collective experiences, idea generation and tacit knowledge sharing, but, as Zárraga and Bonache (2005), Swan et al. (1999), Grant (2001) and others pointed out, whether or not the organization is successful at creating knowledge hinges on a broader set of factors than merely the knowledge outcome of team work. How the organization coordinates and shares knowledge more broadly matters too (Goodall and Roberts 2003). Due to knowledge creation's local context, knowledge might not easily expand

beyond the level of the team. Second, social psychologists who research creativity have long been pessimistic regarding the potential for knowledge creation in groups. For example, Abraham Zaleznick suggested that 'creativity involves regressive states … when regression occurs in groups, what happens is catastrophic. There is something about groups that reduces creative ability' (Zaleznick 1985: 54). In this view, *ba* might become self-preserving, myopic, conservative, reinforcing existing routines rather than creating new knowledge. Whereas the interacting and originating *bas* support the diffusion and embedding of skills and routine behaviour, they could foster group-think, stifle creativity and limit the participation of outsiders with new mental models and skills.

Based on an investigation of these two problems in a number of case studies that included Siemens, Skandia, Shiseido and General Electric, the concept of 'knowledge activism' was developed (von Krogh et al. 1997, 2000). The case studies reported that there are various forms of knowledge activism; it can originate from the CEO, an executive responsible for knowledge management, a project manager or a middle-level manager. However, regardless of their position or location, knowledge activists perform similar roles: they catalyse and coordinate knowledge creation and transfer, and communicate future prospects. First, as outsiders, knowledge activists provide new input for knowledge creation. They bring different knowledge sets, and introduce what Leonard-Barton (1995) termed 'creative abrasion' that leads to conflicting ideas but also new possibilities to create knowledge. In this way, the knowledge activist catalyses knowledge creation. Knowledge activism helps the team break out of the group-think, routine behaviour, and the socially reinforced prudence that characterizes its *ba*.

Second, knowledge creation and innovation's role in the organization as boundary spanning has been well documented (e.g. Quinn et al. 1997; Wenger 2000; see overview in Newell et al. 2002). Generally, knowledge is created locally, where tasks are attended to, problems defined, and resolved. As Szulanski (1996) found in empirical studies on 'best-practice transfer', knowledge is contextual in nature. Sharing it beyond the context therefore incurs costs. Moreover, in a study of the diffusion and adoption of telemedicine technology and the use of remotely generated medical knowledge in the Massachusetts area, Tanriverdi and Iacono (1998) found that not only technically feasible, but also medically justified, solutions had to be developed and locally learnt for knowledge transfer to occur. In the organization, the problem of coordinating and integrating knowledge input from these local activities needs to be resolved (Grant 1996). By spanning the boundaries of teams and communities, the knowledge activist coordinates knowledge creation initiatives and ensures that teams are all informed about the results of knowledge creation throughout the organization. The activist also broadly signals the opportunities for knowledge sharing and the utilization of knowledge input. In the case studies, the notion of 'imagined communities' depicted the observation that teams adjusted their knowledge creation, knowledge sharing and knowledge outcome to what they imagined or thought was available in other teams without necessarily interacting directly with

these. Knowledge activists also help to identify gaps in the team's knowledge and ascertain how these could be filled by packaging, dispatching and recreating knowledge locally and between teams.

Third, the roles discussed thus far concentrate on input for organizational knowledge creation. However, because organizational knowledge creation is a process, coordination can also be anticipatory; knowledge activists communicate future prospects and so provide an overall direction for the knowledge creation occurring in the different teams throughout the organization. Knowledge activists thereby maintain 'a bird's eye perspective', soaring beyond the many specific interactions in an organization to look at them from above. By communicating future prospects in respect of knowledge creation, the activist connects the local knowledge creation initiatives in the various teams with their specific *bas* with the organization's overall vision. Due to the dispersed nature of organizational knowledge creation, the need for the coordination of teams and knowledge transfer, the theory of organizational knowledge creation emphasizes the development of 'knowledge visions' in organizations (Nonaka and Takeuchi 1995; von Krogh et al. 2000). For example, Sharp provided a roadmap that showed the various company teams how they could contribute to technology development in order to integrate the businesses of communication equipment and services and information technology. A knowledge vision specifies a 'potentiality for being' (Nonaka et al. 2005): the current and future organizational state, and the broad contours of knowledge that the organization should seek and create in order to move from the current to the future state. Knowledge visions both result from, and inspire, conversations and rhetoric throughout the organizations, and, as such, they are important resources to justify involvement in organizational knowledge creation (see also Giroux and Taylor 2002).

Organizational Forms

Energized *bas*, guided by knowledge activism and knowledge visions, only partly solve the problem of coordination raised above. In order to advance the idea of stronger approaches to coordination in organizational knowledge creation theory, several contributions were made in respect of the relationship between organizational forms and organizational knowledge creation. Hedlund and Nonaka (1993) proposed that Japanese and Western companies fundamentally differ in the coordination of knowledge creation through organizational forms. The Western firm forms organizational units based on the division of labour and specialization. Specialization and coordination are calibrated in respect of information processing and decision making's requirements. Therefore, the basis for organizational forms is explicit knowledge rather than tacit knowledge. In Western organizations, knowledge is created within a hierarchy that comprises organizational units such as departments, functions and groups. As argued by Osterloh and Frey (2000), tacit knowledge is excessively difficult to share across organizational units due to the nature of the hierarchy, the group, its members' interests and the failing incentive structures. Reorganization, for example adding or changing organizational units, will be affected by the natural constraints on the ability

to articulate knowledge resulting from knowledge creation processes in existing units. At worst, the hierarchy may be fatal for knowledge creation. Hedlund and Nonaka (1993) echoed a long-standing critique of Max Weber's idea that hierarchy and bureaucracy are the most efficient organizations in modern society (e.g. Selznick 1949; Merton 1940). In their words: 'the difficulties of large Western firms to create novelty have to do with overemphasizing the instrumental, articulating, exploiting nature of the corporation' (Hedlund and Nonaka 1993: 139).

In Japanese organizations, both tacit and explicit knowledge is created in formal (project) or informal groups encompassing *bas* that may span several organizational units. These groups share and create both tacit and explicit knowledge that may require a new division of labour and specialization. Reorganization is neither constrained by group members' inability to artic-ulate knowledge, nor by requirements in respect of information processing and decision making. Rather, reorganization results from new demands for specialization and coordination as revealed by knowledge creation. In comparison, Japanese organizations may therefore appear more dynamic and flexible than their Western counterparts.

Based on the 'Japanese vs Western' dichotomy, Hedlund (1994) proposed that 'heterarchy' is superior to hierarchy as an organizational form for knowledge creation. In the heterarchy form, assets, talent and leadership are dispersed, communication is horizontal, and coordination informal and network based (see Hedlund 1986). Nevertheless, Hedlund (1994: 86–7) warned that despite its many virtues, the heterarchy form is inferior to the hierarchy in achieving some forms of economic efficiency. Compared with the heterarchy form, the hierarchy specifically allows for less costly knowledge creation through the sheer combination of explicit knowledge, faster diffusion and infusion of dramatically new practices and perspectives through people, reorganization, spin-offs and acquisitions, and a superior ability to design and implement large-scale system changes. Finally, he argued that the hierarchy is more strategically robust due to quasi-independent organizational units that can be managed as a portfolio of businesses.

Field studies showed that many organizations did not follow either of the forms exclusively, but rather an amalgamation of the heterarchy and hierarchy forms that granted them the high capacity required to solve coordination problems inherent in knowledge creation. The concept of a 'hypertext organization' was developed to explain these findings, and was adapted to the definition of knowledge, the nature of the knowledge creation processes, and the distinct purpose and character of the context for knowledge creation (Nonaka 1994; Nonaka and Takeuchi 1995). The hypertext organization is, as the name indicates, a layered structure of activities. The business system layer is hierarchical and bureaucratic and this is where normal and routine tasks are carried out. Parallel to this, the project system layer is heterarchical and consists of projects teams that engage in knowledge-creating activities such as new product development. These two layers provide distinct, purposeful *bas* for organizational knowledge creation and allow for both heterarchical and hierarchical coordination of these activities.

It is important to recognize that both the business system and the project system layers draw upon and feed the organizational knowledge system, as was briefly discussed in the previous section. According to theories of organization learning, without a knowledge system, the organization would fail to share information, face rapidly increasing task complexity, develop an inability to cope with uncertainty in decision making, or repeat problem-solving errors (e.g. Lyles and Schwenk 1992; Huber 1991; March 1991; Walsh and Ungson 1991; see also Werr and Stjernberg 2003). This third layer captures the organization's global learning: here, the outcome of organizational knowledge creation is re-categorized and re-contextualized. As mentioned above, the layer does not exist solely in the 'material and physical space' such as in technology, but is embedded in the knowledge vision and organizational culture. Most important, the knowledge system layer coordinates activities vertically across the two other layers. For example, if a product development team at Sharp generates a new idea for a product, the justification of this idea is needed for the product to be developed and brought into the business system layer. The idea is not to disrupt routine activities that ensure quality and decrease manufacturing costs unless the new product can enhance Sharp's image, better satisfy customer needs and provide financial returns. The justification of the idea draws directly on the organization's knowledge system in areas such as marketing, manufacturing, research and development, corporate finance, corporate strategy, and so on. Without the knowledge system layer, the business and project system layers would be disconnected and limited innovation would ensue. In sum, the organizational form that best coordinates and enables knowledge creation is an amalgamation of three layers working in parallel: the business system, the project system and the knowledge system.

Leadership

By the early 1990s, works by scholars such as Fredrick Taylor, Elton Mayo, Chester Barnard, Herbert Simon, James G. March and others had forcefully shaped many theories of leadership (Nonaka and Takeuchi 1995: 35–43). However, the underlying epistemology of organizational knowledge creation theory and its focus on knowledge conversion and organization-enabling factors implied a need to fundamentally revisit the nature and role of leadership. Examples from the literature serve to illustrate this point. Recall that according to mainstream organization and management theory, the individual processes information, represents problems and situations, gathers information about alternative solutions, and makes choices that maximize utility. Consequently, providing accurate, timely and complete information for decision making is one of the most critical tasks of leadership. For example, in order for middle managers to understand, accept and implement strategies, top managers need to communicate self-explanatory messages regarding these strategies' rationale and goals (e.g. Guth and MacMillan 1986). Moreover, a vision set by the leaders can be 'programmed' into the many organizational members through accurate explanation and presentation.

Programmed with the right direction, organizational members are expected to act accordingly (Simon 1993).

This 'Humboldtian' view of learning and universal knowledge did not conform to the epistemology of organizational knowledge creation theory that posits that human knowledge is shaped by a history of bodily movement, perception, experiences and values (e.g. von Krogh and Roos 1996). In a traditional sense, leadership cannot exercise control by implanting an accurate depiction of a direction in 'hundred of heads'. This raises fundamental questions: What is 'leadership'? What if a leader cannot control information flow and, through accurately represented visions, ensure a direction for others to follow? In other words, is there, at all, room for a 'leadership' concept in organizational knowledge creation theory?

At first glance, leadership's primary function is to maintain efficiency in the business system layer, thus enabling knowledge creation in the project system layer, while shaping, maintaining and securing the knowledge system layer. In keeping with the concept of the heterarchy form, leadership is distributed in the organization that supports the flow of knowledge from the middle to the top and down to the rest of the organization (Nonaka and Takeuchi 1995). How is this accomplished according to the theory? First, top managers articulate knowledge visions and communicate them throughout, and outside the organization (see also Robertson et al. 2003). Second, by coordinating top management's visionary ideals and the front line's everyday reality, middle management has to break down the values and visions created by the top into concepts, images and activities that guide the knowledge creation process. This coordination is not so much about accurate representation and explanation, as it is about translating the ideals into a work context. Middle managers work as 'knowledge producers' that remake reality and produce knowledge that supports the company's knowledge vision. Third, top managers deal with the knowledge system layer and ascertain that it is both used and fed by organizational knowledge creation. To this end, they promote the sharing of knowledge among the organizational units. They also reflect upon the knowledge system's evolution at a high level and monitor this. Fourth, top managers redefine the organizational units that comprise the current activity-coordinating hierarchy. They reorganize to enhance the fit with the knowledge system layer. New knowledge produced can give rise to entirely new organizational units and may make others redundant. Fifth, top managers foster and nurture middle managers to act as knowledge producers in the organization. Sixth, top managers and middle managers are activists engaged in building new *ba*. They provide physical space, such as meeting rooms, virtual space, such as a computer network, or mental space, such as corporate goals. They help bring the right mix of people to the *ba* and promote their interaction. Seventh, top managers and middle managers also search for, support, and utilize spontaneously and informally created groups for knowledge creation, and, as activists, they connect these groups across the organization. Finally, middle managers help keep the *bas* energized and focused and secure conditions such as resources, diversity in participation, autonomy, access to information, and so forth. Middle managers create an

environment in which people feel entrusted and emboldened to express their ideas, share their knowledge, and be creative in general (for more information, see Nonaka et al. 2000: 22–9).

The essence of leadership is to promote the SECI process described above. Therefore, by interpreting, nurturing and supporting the knowledge vision, middle managers promote organizational knowledge by facilitating all four modes of knowledge conversion. Their most significant contribution is the externalization of knowledge in the *ba*. They synthesize the tacit knowledge of frontline people, top managers, customers and suppliers, help make it explicit, and incorporate it into new concepts, technologies, products or systems. To this end, they not only facilitate knowledge creation at various organizational levels, but also create their own concepts and make these known to the rest of the organization (Nonaka et al. 2000).

To summarize, leadership is about enabling knowledge creation, — not controlling and directing it. Interestingly, recent studies on strategic change have reached the same conclusion. Top managers and middle managers are engaged in a cycle of formulating and reformulating visions that explore the 'new territory' envisioned by the top, while ensuring that the visions and the 'old' frontline realities fit. Echoing a powerful idea by Karl Weick (1979), strategic change is not perceived as 'act as planned', but 'plan as enacted'. The organization is in a state of becoming, moving between cycles of sense-giving from the top and sense-making in the middle, to sense-giving in the middle and sense-making at the top (Gioia and Chittipeddi 1991).

The Nature of the Firm and Knowledge Strategy

According to Richard Nelson (1991), the central question in the theory of the firm is why firms differ. There are many explanations. Rooted in neoclassical economics, the positioning school explains that firms differ due to their inability to move into profitable industries or industry segments because of high entry barriers and mobility barriers. In evolutionary economics, firms' differences are explained by managers' limited capacity to foresee and act on an uncertain future, and firms' path dependency. Transaction cost economics explain firm differences due to the difficulty of transacting certain types of goods and services. More recently, the resource-based view of the firm has explained firm differences by means of the cost of imitating or acquiring resources. Firms that seek to acquire resources that give other firms a competitive advantage are prevented from doing so because these resources are too costly, or impossible to acquire in the factor market. Together these theories explain firm differences as a result of the profit-maximizing firm's lack of ability to imitate more profitable firms. Assuming that profit maximization is a goal, differences among firms result from market imperfections that could be minimized by intensifying competition (Tirole 1988), unless blocked by barriers, high cost, or managers' limited capability (Nonaka and Toyama 2005).

The concept of organizational knowledge and organizational knowledge creation theory provided alternatives to these explanations. In 1996, J. C.

Spender and Rob Grant edited a special issue of the *Strategic Management Journal* aimed at developing a knowledge-based theory of the firm (Spender and Grant 1996). In the introduction to the issue, Dan Schendel (1996: 2) reflected: 'The question of the day is what is the source of competitive advantage within the firm? Asked somewhat differently: How is advantage created, and how is it sustained?'

The knowledge-based view of the firm was developed as an extension of the resource-based theory of the firm (e.g. Penrose 1959; Wernerfelt 1984; Barney 1991), with the primary interest of the former being the special characteristics of knowledge that give rise to the competitive advantage referred to in Schendel's question (e.g. Spender and Grant 1996; Bontis 1999). Moreover, in seeking to explain why firms differ, a knowledge-based theory of the firm also accounted for the empirical fact that profit is just one of a firm's several purposes. As noted by Spender and Grant in their introduction to the special issue (1996), Kogut and Zander (1992), Prahalad and Hamel (1990), Tsoukas (1996), Spender (1996), Gupta and Govindarajan (2000) and many others, firms are also social institutions that fulfil the needs and meet the many and diverse intentions of their managers, organizational members, customers, suppliers and other constituents. The broader purpose of a theory of the firm is therefore to explain the nature of the firm.

A short example serves to illustrate the point. A wine manufacturer enjoys a valuable and imperfectly imitable resource and a unique reputation for product quality, but, through a strategy of optimal reputation cheating, it maximizes profit by gradually lowering product quality (for example, increasing output by using more grapes of marginal quality) at a pace and level guaranteed not to affect the firm's reputation adversely. Nevertheless, very few firms would engage in this practice because their managers know that the medium- to long-term consequences can be fatal, not only for customer and employee satisfaction and profit, but for the firm's very survival. Creating excellent wine is certainly a strategy for profit maximization, but it is also the firm's raison d'être that prevents it from trading off quality against profits. Firms differ because they want and strive to differ, and first and foremost, because they cannot escape the idiosyncrasy of organizational knowledge creation.[3]

Organizational knowledge creation theory proposes concepts and relationships regarding organizational enabling conditions and *ba*, organizational forms, as well as leadership that explain the conundrum of firm differences, and hence provide the building blocks of a knowledge-based theory of the firm. Due to the intersubjective nature of knowledge, firms differ because organizational knowledge creation gives rise to unique organizational knowledge systems. In an industry, firms may share certain characteristics, such as knowledge visions, but they will produce distinct knowledge outcomes. This distinctiveness is due to a number of factors: the firm's repertoire of enabling conditions; organizational members' irreplaceable experiences; the *ba* in which they practise dialogue to create knowledge; the concrete objectives and milestones driving the knowledge creation; the middle managers' leadership, including their abilities to express concepts; top managers'

knowledge activism; the dynamics of the firm's project system layer; and/or its business system layer's efficiency. Clearly, organizational knowledge creation theory lends support to a rapidly emerging conjecture on organization theory, namely that firms and other types of organizations develop an organizational identity (e.g. Whetten and Godfrey 1998) that produces organizational members' commitment, distinctive actions and strategic outcomes in the marketplace and other relevant environments (e.g. Dutton and Dukerich 1991; Hatch and Schultz 1997; Sammarra and Biggiero 2001).

The business system layer typically displays similarities across a population of firms in the industry, often driven by competitive forces to reduce cost and attempts by firms to mimic their most successful competitors (e.g. Chandler 1977). For example, most wineries are functionally structured in 'growing', 'producing', 'bottling', 'marketing' and 'distributing'. Yet, the likelihood is small that two firms will have identical knowledge system layers. The market for wine, for example, has a very high price elasticity, and whereas two wineries in the Bordeaux region may display similar organizational hierarchies and cost structures, their knowledge systems diverge as reflected in the huge differences in the prices they can charge for their products. Therefore, the question of why firms differ may be appropriately reformulated as: Where and how much do they differ (von Krogh et al. 1994)?

The winery example also illustrates an important reply to Schendel's question: the firm's knowledge system layer relates to firm profit, directly (DeCarolis and Deeds 1999) or indirectly (Dröge et al. 2003), giving rise to strategic considerations. The concept of knowledge assets was infused into the knowledge-based theory of the firm in order to provide a more comprehensive and detailed analysis of the knowledge system layer for strategic purposes, rather than merely focusing on knowledge processes (Nonaka et al. 2000; Nonaka and Toyama 2005). Knowledge assets are the outcomes of knowledge creating processes through the dialogues and practices in *ba*. They are intangible, change dynamically, are semi-permanently tied to the firm, and, hence, can often not be easily transacted (Teece 1998, 2000). Knowledge assets include knowledge recently created, such as routines and know-how, concepts, patents, technologies, designs or brands. The firm becomes a 'manufacturer' and 'steward' of such knowledge assets. Some of these assets it may choose to keep for current or future business and projects, some it may sell, license or give away, and some it may choose to discard. Managers may use knowledge management's tools and techniques that assist in identifying, storing, transferring and utilizing knowledge assets in projects and organizational units (e.g. Boisot 1998; Davenport and Prusak 1998).

Hannan and Freeman (1984) observed that firms are exposed to inertia that often prevents adaptation to a changing environment. A closer look at the firm from within provides a rationale. In the business system layer, patterns of behaviour are gradually fine-tuned to become routines (knowledge assets) for securing existing products and services' quality, optimizing economic efficiency and securing firm profits. When firms are faced with changing market conditions, their routines may become 'core-rigidities' that prevent adaptation (Leonard-Barton 1992). When the firm is exposed to rapid

technological change, the firm's routines, language and embedded forms of knowledge may adversely impact firm profits (Poppo and Zenger 1998). To counter this problem, the firm develops and accumulates knowledge assets of a higher order: knowledge to create knowledge, or organizational capability to innovate and self-renew. Firms have 'creative routines' that call upon and inspire people and teams to revisit existing patterns of work and invent new ones. Knowledge visions, *ba* and the knowledge creation process that takes place in *ba* are part of the firm's creative routines and it is nurtured by leadership. Without these higher-order knowledge assets, the firm has a reduced capacity to adapt to the environment (Nonaka and Toyama 2002, 2005; Nonaka and Reinmoeller 2002).

If a firm cannot build knowledge assets that can be utilized in its business system layer and project system layer, it can neither fulfil its raison d'être, generate profit, nor survive changing market conditions and intensifying competition. The firm needs to manufacture its knowledge assets, which requires both time and resources. Knowledge assets are therefore the focus of the firm's strategic decision making and resource allocation aimed at aligning it with its changing environment (Nonaka et al. 2005). As noted by Bierly and Chakrabarti (1996: 123), there are many strategic choices that managers make that shape the organization's learning process and, subsequently, determine the firm's knowledge base. Managers formulate and implement knowledge strategies to build and utilize knowledge assets. In organizational knowledge creation theory, there are four distinct knowledge strategies that involve resource allocation to strategic activities and target the organization's knowledge-system layer (von Krogh et al. 2001). First, firms allocate resources to leverage their knowledge assets, making them available to organizational units and projects. Second, based on existing expertise, they expand their existing knowledge assets further. Third, firms build knowledge assets internally by appropriating information and knowledge from markets, strategic partners, customers, suppliers or other external constituents. And, finally, firms explore and develop completely new knowledge assets by probing new technologies or markets.

Research has confirmed the relationship between firm performance and knowledge strategy. In a study of knowledge strategies at 21 firms in the US pharmaceutical industry, Bierly and Chakrabarti (1996) found that firms that explore new knowledge assets and technologies internally and externally with limited budgets for research and development (R&D), and those firms that spend above the industry average on innovation, are the most profitable. Choi and Lee (2002) classify strategies based on human types and systems types. Based on a study of 58 Korean firms, they show that a dynamic alignment of knowledge strategies leads to better firm performance. The study implies that firms should adapt their knowledge strategies to the dominant mode of knowledge conversion that they use, for example socialization that requires a human-focused strategy for the sharing of knowledge.

In spite of knowledge strategies' obvious economic effects, they also serve another purpose that extends beyond short-term profit maximization. Knowledge strategies build distinctiveness through resource allocation. In as

far as firm differences matter, knowledge strategies become the nexus of a knowledge-based theory of the firm. Patterns of managerial decisions build and extend knowledge assets that, due to the uniqueness of each firm's knowledge creation process, give the firm its distinctive character. Moreover, even if a cross-sectional analysis of a population of firms in an industry were to indicate that the firms' knowledge strategies resemble each other (by having, for example, comparable levels of investment in R&D), each firm's decisions are self-referential and form irreversible networks that shape knowledge assets in unique ways (Luhmann 1990). However, even if short-term considerations were to favour certain resource allocation decisions to discard or develop knowledge assets, the irreversibility of past decisions aligned with the firm's reason for being could take precedence.

The purpose of a theory of the firm must be to understand the nature of the firm; not only to explain why they differ, but also to explain where and how much. This calls for a synthetic understanding of the firm, combining subjective views of the firm with objective facts, compounding the premise of economic rationality with the principles of social behaviour (Nonaka and Toyama 2002, 2005). Because of its vantage point in economic theory, such an analysis of the knowledge-based theory of the firm epitomizes the intention behind the project of a theory of organizational knowledge creation. Organizations are dialectic phenomena that cannot be analysed through a simple set of premises about behaviour, be it profit and utility maximization, bounded rationality, altruism, human values and social norms. The power of explanation lies in prudently combining insights from theories and research that draw upon diverse premises. In so doing, we come closer to understanding the multifaceted nature of organization. The reason why firms differ is suddenly less of a puzzle.

In this section, we have provided an overview of some evolutionary paths in organizational knowledge creation theory and research. Next, we indicate some rewarding areas where theory and research can advance the current understanding of organizational knowledge creation.

Future Advances in Organizational Knowledge Creation Theory

This section is to outline areas where further theory building and research can advance organizational knowledge creation theory. In a fundamental way, organizational knowledge creation theory is generative: the concepts and proposed relationships can be used in sum or in parts to generate progress in management and organization theory. The purpose of this section is therefore neither to provide an encompassing but constraining research agenda, nor to conclude one or more debates, but to open up and inspire new development around the theory.

The origin of knowledge in organizations is an important issue that warrants much theory building and research. Without substantial emphasis on this topic, our analyses will be confined to knowledge-in-motion reflected in organizational becoming. We will analyse and explain what the organization is and

becomes, but not its potential. However, given their origin in knowledge, organizations exist in potentiality too, not only in actuality. The lack of focus on potentiality may represent an obstacle to the advancement of any theorizing on organization. Therefore, rather than listing open research questions, we elect to sketch a possible chain of inquiry that proceeds from the origin of knowledge in *ba* via the formation of an organization to the study of organizational becoming.

First, as became clear from the analysis in the previous section, knowledge originates in *ba*, and therefore the concept of *ba* assumes a particular importance in organizational knowledge creation theory. While *ba* is theoretically relevant, it is also empirically under-explored (with some notable exceptions, like Chou and Wang 2003). As we discussed above, *ba* can be both positive and negative for organizational knowledge creation's effectiveness — a result underscored by social psychological work showing cohesion in groups' potential detrimental impact. So far, little is known about the many factors that potentially impact the effectiveness of *ba*, and we therefore call for more empirical research investigating such factors across organizations. An important purpose of this work would be to advise on the practice and identify ways in which management can develop *bas* to foster knowledge processes both in teams and the organization as a whole. More empirical work on *bas* would also reveal the nature of interaction, relationships and learning that is bestowed on individuals as they enter, dwell in, or exit *ba*. Studies would need to explore *ba* as an aesthetic space in which groups aspire to function without compromising form and beauty. More work is needed to explore the implications of plural (sometimes alternative or contested) epistemologies for an understanding of the nature of knowledge, its origin, and the *ba*. Accompanying these theoretical advances, theoretical and empirical work is needed to shed more light on the controversial issue of the possibilities of and constraints on the sharing of tacit knowledge, or the process of conversion from tacit to explicit knowledge (Gourlay 2002; Tsoukas 2003).

More theoretical elaboration is urgently needed on the interrelationships between leadership and *ba* in organizational knowledge creation theory. There are many helpful ideas in the literature on the complex nature of leadership in knowledge-intensive organizations (e.g. Alvesson 1995, 1996; Snowden 2005; Sveiby 1997; Reinmoeller 2004). Research has demonstrated, for example, that interactive leadership styles and encouragement of participative decision making have a positive influence on the skills and traits that are essential for knowledge management (Politis 2001). However, the critical question remains unanswered: What does leadership of, and/or in *ba* entail? What forms, shapes, energizes, positions, nurtures and transforms them? Is there an empirically robust and conceptually elegant theory of 'high quality' leadership that proposes specific and mutual interactions between leadership and *ba*? We believe a promising line of work would be inductive theorizing in the vein of Ghoshal and Bartlett (1996). Their work first identified the dimensions of leadership, and thereafter the characteristics of leadership quality that created effective change in an organization.

Second, to date there has been limited use of entrepreneurship research in organizational knowledge creation theory, and particularly of the exploration of the relationship between the origin of knowledge and the origin of firms and organizations. Contributions in the entrepreneurship literature suggest that entrepreneurs' prior knowledge of technologies, markets and customer needs shape their abilities to perceive and seize business opportunities (Shane 2000, 2001; Shepherd and DeTienne 2005). However, based on field studies conducted in the software industry, Urwyler (2005) concluded that entrepreneurs frequently do not possess much prior knowledge — either about markets or about customer needs — before they establish their firms and try to sell their products and services. Urwyler's important findings initiate a novel and interesting line of inquiry in organizational knowledge creation theory: does the *ba* precede the firm, and if yes, what characterizes the *ba* of entrepreneurship prior to firm formation? What distinguishes entrepreneurial knowledge creation from knowledge creation within the boundaries of a firm? What spaces, discourses and stakeholders are imperative for entrepreneurial knowledge creation (see Steyaert and Katz 2004)? What is the relationship between entrepreneurial knowledge creation and the entrepreneur's ability to perceive, create and profit from business opportunities (see Grand 2003)? The knowledge system layer is likely to contain entrepreneurial knowledge prior to firm formation. Therefore, an interesting question is: What is the knowledge system layer's impact on the emerging project and business system layers in the entrepreneurial firm? Likewise, what is the project system and business system layers' impact on the knowledge system layer after the firm has been founded and resources acquired for business and projects?

Third, as elaborated earlier, the organization is in a state of becoming. The temporal dimension of organizational knowledge creation theory makes it dynamic. Knowledge assets represent an organization's past, knowledge creation the present, and knowledge visions the future. The theory can explain how the accumulated product of past efforts can give rise to present activities, guided by and extended towards an ideal future. Yet, an important area for future research is not only why organizations succeed in doing all this, but also why they fail. Organizational failure must be studied along the temporal dimension where imbalances can emerge (Probst and Raisch 2005). Knowledge assets accumulated through past achievements can constrain current organizational knowledge creation. Creative routines may receive less managerial attention and resources than more easily manageable assets such as databases, patents, brands or product designs. In the face of intensifying competition, market changes and technological disruption, the organization clings to its knowledge assets that have produced success in the business system layer and that can be effectively fed through knowledge management practices. The current project system layer focuses more on applying existing knowledge assets than on generating its capacity for creativity (Haas and Hansen 2005). Leadership is retrospective, and falls short of formulating and implementing effective knowledge strategies that balance exploration and exploitation (March 1991; Bierly and Chakrabarti 1996). The organization therefore fails to adapt to a changing environment.

Another trajectory is also worth investigation. The organization does not build effective organizational memories and knowledge management, and the organization's knowledge system layer falters (e.g. Argote 1999). Knowledge activism creates a frenzy of activities in existing and new *bas*, but leaders fail to connect these to an overall knowledge vision. Justification loses its impact, and over time coherence in decision making is lost throughout the organization. Costly knowledge assets are created, but they are either lost 'on the spot', as the organization allocates resources and pushes knowledge creation towards the knowledge vision, or they become too costly for the project systems and business system layers to access. The cost of organizational knowledge creation threatens the firm's short-term profits and its long-term survival.

The final trajectory is based on the lack of a knowledge vision. Here the *bas* work effectively and knowledge creation utilizes existing and accumulates new knowledge assets. Leadership energizes *bas* and connects their activities. However, there is no direction for the investments in knowledge creation, and no effective knowledge strategies can therefore be formulated and executed. Organizational members have no ideal future towards which they can direct their attention. The justification of knowledge creation hinges on the past and current utility of knowledge, driven by the immediate needs in the business system and project system layers. The firm sacrifices economy of patience for economy of speed (Nonaka and Toyama 2002): fast and effective knowledge use becomes the primary justification criterion. The aesthetical dimension of an envisioned future (if we only could …) is lost in everyday work, hindered by short-term concerns, and dampened by irreversible operational decisions (we only can, if …). Boredom threatens the motivation of creative talent, their outflow increases, and inflow of newcomers subsides. While firm profits might increase in the short term, the organization loses foresight as a resource for action embedded in the knowledge vision. In the long run, it will fail to adapt to a changing environment, and, more importantly, it loses its reason for being.

As becomes clear from these three trajectories, the study of the balance in organizational knowledge creation is not only a topic for cross-sectional research (for example, resources allocated to exploration versus exploitation, the yearly R&D budget versus investment in operational improvement), but should also be studied as processes. Firms may create, lose and restore their balance on the temporal dimension, and it is important for future research to understand how these processes work. Comparing successful and unsuccessful organizations will lead to better predictions regarding the adaptation of organizations in the face of internal and external changes. But, as we have argued, understanding relative 'success' requires a retrospective view of the context of entrepreneurial knowledge creation, *ba* and leadership, and, ultimately, the very origin of organizational knowledge. In this sense, epistemology continues to matter!

Conclusion

In this paper, we reviewed central elements in organizational knowledge creation theory, namely epistemology and knowledge conversion. We traced and described evolutionary paths in the theory, specifically organizational enabling conditions, *ba*, knowledge vision, knowledge activism, organizational forms and leadership. We analysed the nature of the firm from the vantage point of organizational knowledge creation theory and reviewed the concept of 'knowledge strategy'. Finally, we indicated promising areas of future advance, including the theory of and research on the origin of knowledge, *ba*, the origin of the firm and the dynamics of organizational knowledge creation in organizational adaptation.

Over the last 15 years, scholars have increasingly recognized that 'information' and 'knowledge' are not interchangeable. The construct 'knowledge' was increasingly accepted and now occupies a central and legitimate role in much mainstream organizational and management theory. As shown, the emergence of multiple epistemologies was key for this development. The analysis demonstrates that organizational knowledge creation theory synthesizes insights from different epistemologies and theoretical perspectives in order to enrich our academic and practical knowledge of organization and management. The evolution of the theory verifies an important point: The field greatly benefits from keeping its boundaries open. Open boundaries implies scholars' readiness to include different perspectives and approaches, nurturing multiple epistemologies, a broad range of methods and a forward-thinking use of theory.

Notes

1   Based on an existentialist framework, in which the key platform for knowledge creation is a 'phenomenal' space, it was developed further in the organizational knowledge creation theory (Nonaka and Konno 1998: 41).

2   At first glance, there are similarities between *ba* and the concept of a 'community of practice' in the social theory of organizational learning (Lave and Wenger 1991; see also Brown and Duguid 1991, Wenger 1998 and Plaskoff 2003 for complementary views). In the latter concept, tacit knowledge is acquired through participation in communities of practice. However, there are some pronounced differences, too. First, while a community of practice constitutes a place where individuals learn (existing) knowledge embedded in this community, *ba* is a living place for knowledge creation. Second, while learning is likely to occur in any community, the *ba* needs resources and energy to become an active place where knowledge is created. Third, while the boundaries of communities of practice can be drawn around 'participation', membership, task, culture or history, the boundaries of *ba* may be fluid and arbitrary, participation is driven by opportunities to share and create knowledge, and can change quickly.

3   Please note that this discussion about firm differences relates back to the elaboration on epistemology. Firms have frequently been described as either objective information-processing entities or subjective organisms. Surprisingly little attempt has been made to synthesize these contrasting perspectives, perhaps due to the persistent dualisms in organizational science. In a recent publication, Nonaka and Toyama (2005) construed the opposing or competing positivism and interpretative approaches as complementary. They proposed that knowledge is created through the synthesis of the thinking and actions of

individuals interacting with one another within and beyond the organizational boundaries. The authors' holistic framework incorporates subjectivity issues such as values, context and power, and aims to capture dynamic knowledge-creation processes through the interaction of subjectivities and objectivities to shape and be shaped by the business environment. In the framework, knowledge inherently includes human values and ideals.

References

Alavi, Maryam and Dorothy E. Leidner
2001   'Knowledge management and knowledge management systems: Conceptual foundations and research issues'. *MIS Quarterly* 25/1: 107–136.

Alvesson, Mats
1995   *Management of knowledge intensive companies*. Berlin: Walter de Gruyter.

Alvesson, Mats
1996   'Leadership studies: From procedure and abstraction to reflexivity and situation'. *Leadership Quarterly* 7/4: 455–485.

Argote, Linda
1999   *Organizational learning: Creating, retaining, and transferring knowledge.* Berlin: Springer.

Barney, Jay
1991   'Firm resources and sustained competitive advantage'. *Journal of Management* 17: 99–120.

Baum, Joel A. C.
2005   *Blackwell companion to organizations*. Oxford: Blackwell.

Bierly, Paul, and Alok Chakrabarti
1996   'Generic knowledge strategies in the U.S. pharmaceutical industry'. *Strategic Management Journal* 17: 123–135.

Boisot, Max H.
1998   *Knowledge assets: Securing competitive advantage in the knowledge economy*. New York: Oxford University Press.

Bontis, Nick
1999   'Managing organizational knowledge by diagnosing intellectual capital: Framing and advancing the state of the field'. *International Journal of Technology Management* 18/5: 433–462.

Brown, John S., and Paul Duguid
1991   'Organizational learning and communities of practice: Toward a unified view of working, learning, and innovation'. *Organization Science* 2/1: 40–57.

Chandler, Alfred D.
1977   *The visible hand: The managerial revolution in American business*. Cambridge, MA: Belknap Press.

Choi, Byounggu, and Heeseok Lee
2002   'Knowledge management strategy and its link to knowledge creation process'. *Expert Systems with Applications* 23: 173–187.

Choo, Chun W., and Nick Bontis
2002   *The strategic management of intellectual capital and organizational knowledge.* New York: Oxford University Press.

Chou, Shih-Wei, and Su-Ju Wang
2003   'Quantifying "ba": An investigation of the variables that are pertinent to knowledge creation'. *Journal of Information Science* 29/3: 167–180.

Collard, David A.
1978   *Altruism and economy: A study in non-selfish economics.* New York: Oxford University Press.

Davenport, Thomas H., and Lawrence Prusak
1998   *Working knowledge: How organizations manage what they know*. Cambridge, MA: Harvard Business School Press.

DeCarolis, Donna M., and David L. Deeds
1999   'The impact of stocks and flows of organizational knowledge on firm performance: An empirical investigation of the biotechnology industry'. *Strategic Management Journal* 20: 953–968.

Dougherty, Deborah
1996   'Organizing for innovation' in
       Handbook of organization studies.
       S. Clegg, C. Hardy, and W. Nord
       (eds), 424–439. Beverly Hills, CA:
       Sage.

Dröge, Cornelia, Cindy Claycomb and
Richard Germain
2003   'Does knowledge mediate the effect
       of context on performance? Some
       initial evidence'. *Decision Sciences*
       34/3: 541–568.

Dutton, Jane E., and Janet M. Dukerich
1991   'Keeping an eye on the mirror:
       Image and identity in organizational
       adaptation'. *Academy of
       Management Journal* 34/3:
       517–544.

Dyck, Bruno, Frederick A. Starke,
Gary A. Mischke, and Michael Mauws
2005   'Learning to build a car: An
       empirical investigation of
       organizational learning'. *Journal of
       Management Studies* 42/2:
       387–416.

Eden, Colin, and J.-C. Spender
1998   *Managerial and organizational
       cognition: Theory, methods, and
       research.* London: Sage.

Galbraith, Jay R.
1973   *Designing complex organizations*.
       Reading: Addison-Wesley.

Ghoshal, Sumantra, and
Christopher A. Bartlett
1996   'Rebuilding behavioral context:
       A blueprint for corporate renewal'.
       MIT Sloan Management Review
       37/2: 23–36.

Gioia, Dennis A., and Kumar Chittipeddi
1991   'Sensemaking and sensegiving in
       strategic change initiation'.
       Strategic Management Journal 12:
       433–448.

Giroux, Helene, and James R. Taylor
2002   'The justification of knowledge:
       Tracking the translations of quality'.
       Management Learning 33/4:
       497–517.

Goodall, Keith, and John Roberts
2003   'Repairing managerial knowledge-
       ability over distance'. *Organization
       Studies* 24/7: 1153–1175.

Gourlay, Stephen
2002   'Tacit knowledge, tacit knowing, or
       behaving'. Paper presented at the
       OKLC 2002 Conference, Athens.

Grand, Simon
2003   'Making sense of the economy:
       Entrepreneurial strategic thinking
       and acting as theory building and
       theory testing under ambiguity' in
       *Knowledge management and
       networked environments:
       Leveraging intellectual capital in
       virtual business communities.*
       73–95. New York: Amacom.

Grant, Robert M.
1996   'Toward a knowledge-based theory
       of the firm'. *Strategic Management
       Journal* 17: 109–122.

Grant, Robert M.
2001   'Knowledge and organization' in
       *Managing industrial knowledge:
       Creation, transfer, and utilization*.
       I. Nonaka and D. Teece (eds),
       145–169. London: Sage.

Gupta, Anil K., and Vijay Govindarajan
2000   'Knowledge management's social
       dimension: Lessons from Nucor
       Steel'. *MIT Sloan Management
       Review* 42: 71–80.

Guth, William D., and Ian C. MacMillan
1986   'Strategy implementation versus
       middle management self-interest'.
       Strategic Management Journal 7:
       313–327.

Haas, Martine R., and Morten T. Hansen
2005   'When using knowledge can hurt
       performance: The value of
       organizational capabilities in a
       management consulting company'.
       Strategic Management Journal
       26/1: 1–24.

Hannan, Michael T., and John Freeman
1984   'Structural inertia and
       organizational change'. *American
       Sociological Review* 49/2: 149–164.

Hatch, Mary Jo, and Majken Schultz
1997   'Relations between organizational
       culture, identity, and image'.
       European Journal of Marketing
       31/5: 356–365.

Hedlund, Gunnar, and Ikujiro Nonaka
1993 'Models of knowledge management in the West and Japan' in *Implementing strategic processes: Change, learning, and co-operation*. P. Lorange, B. Chakravarthy, J. Roos and A. Van de Ven (eds). Oxford: Blackwell.

Hedlund, Gunnar
1986 'The hypermodern MNC — A heterarchy?' *Human Resource Management* 25: 9–25.

Hedlund, Gunnar
1994 'A model of knowledge management and the n-form corporation'. *Strategic Management Journal* 15: 73–90.

Huber, George P.
1991 'Organizational learning: The contributing process and the literature'. *Organization Science* 2/1: 88–115.

Kogut, Bruce, and Udo Zander
1992 'Knowledge of the firm, combinative capabilities, and the replication of technology'. *Organization Science* 3/3: 383–397.

Larsen, Michael H., and Mogens K. Pedersen
2001 'Distributed knowledge management in health-care administration'. *Proceedings of the 34th Hawaii International Conference on System Sciences*: 155.

Lave, Jean, and Etienne Wenger
1991 *Situated learning — Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Leonard-Barton, Dorothy
1992 'Core capabilities and core-rigidities: A paradox in managing new product development'. *Strategic Management Journal* 13: 363–380.

Leonard-Barton, Dorothy
1995 *Wellsprings of knowledge: Building and sustaining the sources of innovation*. Boston, MA: Harvard Business School Press.

Luhmann, Niklas
1990 *Essays of self-reference*. New York: Columbia University Press.

Lyles, Marjorie A., and Charles R. Schwenk
1992 'Top management, strategy, and organizational knowledge structures'. *Journal of Management Studies* 29: 155–74.

March, James G.
1991 'Exploration and exploitation in organizational learning'. *Organization Science* 2/1: 71–87.

March, James G., and Johan P. Olsen, *editors*
1976 *Ambiguity and choice in organizations*. Bergen: Universitetsforlaget.

March, James G., and Herbert Simon
1958 *Organizations*. New York: Wiley.

Merton, Robert K.
1940 'Bureaucratic structure and personality'. *Social Forces* 18: 560–568.

Morgan, Gareth, *editor*
1983 *Beyond method: Strategies for social research*. Beverly Hills, CA: Sage.

Nelson, Richard R.
1991 'Why do firms differ, and how does it matter?' *Strategic Management Journal* 12: 61–74.

Newell, Allen, and Herbert A. Simon
1972 *Human problem solving*. Englewood Cliffs, NJ: Prentice Hall.

Newell, Sue, Maxine Robertson, Harry Scarbrough, and Jacky Swan
2002 *Managing knowledge work*. New York: Palgrave.

Nishida, Kitaro
1970 'Fundamental problems of philosophy: The world of action and the dialectical world'. Tokyo: Sophia University.

Nishida, Kitaro
1990 *An inquiry into the good*. New Haven, CT: Yale University Press.

Nonaka, Ikujiro
1987   'Managing the firm as information
       creation process'. Working Paper,
       Institute of Business Research,
       Hitotsubashi University.

Nonaka, Ikujiro
1988   'Toward middle-up-down
       management: Accelerating
       information creation'. *MIT Sloan
       Management Review* 29/3: 9–18.

Nonaka, Ikujiro
1991   'The knowledge-creating
       company'. *Harvard Business
       Review* November-December:
       96–104.

Nonaka, Ikujiro
1994   'A dynamic theory of
       organizational knowledge creation'.
       Organization Science 5/1: 14–37.

Nonaka, Ikujiro, and Noboru Konno
1998   'The concept of "ba": Building a
       foundation for knowledge creation'.
       California Management Review
       40/3: 40–54.

Nonaka, Ikujiro, and Patrick Reinmoeller
2002   'Knowledge creation and
       utilization: Promoting dynamic
       systems of creative routines' in
       *Creating value: Winners in the new
       business environment*. M. A. Hitt,
       R. Amit, C. E. Lucier and
       R. D. Nelson (eds). Oxford:
       Blackwell.

Nonaka, Ikujiro, and Hirotaka Takeuchi
1995   *The knowledge-creating company*.
       New York: Oxford University
       Press.

Nonaka, Ikujiro, and Ryoko Toyama
2002   'A firm as a dialectic being:
       Towards a dynamic theory of a
       firm'. *Industrial and Corporate
       Change* 11/5: 995–1009.

Nonaka, Ikujiro, and Ryoko Toyama
2005   'The theory of the knowledge
       creation firm: Subjectivity,
       objectivity, and synthesis'.
       Industrial and Corporate Change
       14/3: 419–436.

Nonaka, Ikujiro, Hiroshi Takeuchi, and
Katsuhiro Umemoto
1996a 'A theory of organizational
       knowledge creation'. *International
       Journal of Technology
       Management* 11/7–8: 833–845.

Nonaka, Ikujiro, Katsuhiro Umemoto, and
Dai Senoo
1996b 'From information processing to
       knowledge creation: A paradigm
       shift in business management'.
       Technology in Society 18/2:
       203–218.

Nonaka, Ikujiro, Ryoko Toyama, and
Noboru Konno
2000   'SECI, ba and leadership: A unified
       model of dynamic knowledge
       creation'. *Long Range Planning*
       33/1: 5–34.

Nonaka, Ikujiro, Vesa Peltokorpi, and
Hisao Tomae
2005   'Strategic knowledge creation:
       The case of Hamamatsu Photonics'.
       *International Journal of
       Technology Management* 30/3,4:
       248–264.

Nonaka, Ikujiro, Philippe Byosiere,
Chester C. Borucki, and Noboru Konno
1994   'Organizational knowledge creation
       theory: A first comprehensive test'.
       International Business Review 3/4:
       337–351.

Osterloh, Margrit, and Bruno S. Frey
2000   'Motivation, knowledge transfer,
       and organizational forms'.
       Organization Science 11/5:
       538–550.

Penrose, Edith T.
1959   *The theory of the growth of the
       firm.* New York: Wiley.

Peterson, Mark F.
2002   'Embedded organizational events:
       The units of process in organization
       science'. *Organization Science* 9/1:
       16–33.

Plaskoff, Josh
2003   'Intersubjectivity and community
       building: Learning to learn
       organizationally' in *Blackwell
       handbook of organizational
       learning and knowledge
       management.* M. Easterby-Smith
       and M. Lyles (eds), 161–184.
       Malden, MA: Blackwell.

Polanyi, Michael
1966 *The tacit dimension*. London: Routledge & Kegan Paul.

Politis, John D.
2001 'The relationship of various leadership styles to knowledge management'. *Leadership and Organizational Development Journal* 22/8: 354–364.

Poppo, Laura, and Todd Zenger
1998 'Testing alternative theories of the firm: Transaction cost, knowledge based, and measurement explanations for make-or-buy decisions in information services'. *Strategic Management Journal* 10: 853–877.

Prahalad, C. K., and Gary Hamel
1990 'The core competence of the corporation'. *Harvard Business Review* 68/3: 79–92.

Prigogine, Ilya
1980 *From being to becoming: time and complexity in the physical sciences*. San Francisco: W. H. Freeman.

Probst, Gilbert, and Sebastian Raisch
2005 'Organizational crisis: the logic of failure'. *Academy of Management Executive* 19/1: 90–105.

Quinn, James B., Jordan J. Baruch, and Karen A. Zien
1997 *Innovation explosion*. New York: Free Press.

Ranft, Annette L., and Michael D. Lord
2000 'Acquiring new knowledge: The role of retaining human capital in the acquisition of high-tech firms'. *Journal of High Technology Management Research* 11/2: 295–319.

Reinmoeller, Patrick
2004 'The knowledge-based view of the firm and upper-echelon theory: Exploring the agency of TMT'. *International Journal of Learning and Intellectual Capital* 1/1: 91–104.

Robertson, Maxine, Harry Scarbrough, and Jacky Swan
2003 'Knowledge creation in professional services firms: Institutional effects'. *Organization Studies* 24: 831–857.

Sabherwal, Rajiv, and Irma Becerra-Fernandez
2003 'An empirical study of knowledge management processes at individual, group, and organizational levels' *Decision Sciences* 34/2: 255–261.

Sammarra, Alessia, and Lucio Biggiero
2001 'Identity and identification in industrial districts'. *Journal of Management and Governance* 5/1: 61–82.

Schendel, Dan
1996 'Notes from the editor in chief'. *Strategic Management Journal* 12.

Schulze, Anja, and Martin Hoegl
2006 'Knowledge creation in new product development projects'. *Journal of Management* 32/2: 210–236.

Scott, Judy E.
1998 'Organizational knowledge and the intranet'. *Decision Support Systems* 23: 1–17.

Selznick, Philip
1949 *TVA and the grass root*. Berkeley: University of California Press.

Shane, Scott
2000 'Prior knowledge and the discovery of entrepreneurial opportunities'. *Organization Science* 11: 448–469.

Shane, Scott
2001 'Technological opportunities and new firm creation'. *Management Science* 47: 205–220.

Shepherd, Dean A., and Dawn R. DeTienne
2005 'Prior knowledge, potential financial reward, and opportunity identification'. *Entrepreneurship Theory and Practice* 29: 91–112.

Shimizu, H.
1995 'Ba-principle: New logic for the real-time emergence of information'. *Holonics* 5/1: 67–79.

Simon, Herbert A.
1955 'A behavioural model of rational choice'. *Quarterly Journal of Economics* 69: 99–118.

Simon, Herbert A.
1956   'Rational choice and the structure of the environment'. *Psychological Review* 63: 129–138.

Simon, Herbert A.
1991   'Bounded rationality and organizational learning'. *Organization Science* 2: 125–134.

Simon, Herbert A.
1993   'Strategy and organizational evolution'. *Strategic Management Journal* 14/2: 131–142.

Snowden, Dave
2005   'Complex acts of knowing: paradox and descriptive self-awareness'. *Bulletin of the American Society for Information Science and Technology* 29/4: 23–28.

Spender, J.-C., and Robert M. Grant
1996   'Knowledge and the firm: Overview'. *Strategic Management Journal* 12: 5–10.

Spender, J.-C.
1994   'Organizational knowledge, collective practice, and Penrose rents'. *International Business Review*, 3/4: 353–368.

Spender, J.-C.
1996   'Making knowledge the basis for a dynamic theory of the firm'. *Strategic Management Journal* 17: 45–62.

Stehr, Nico
1992   *Practical knowledge: Applying the social sciences*. London: Sage.

Stehr, Nico
1994   *Knowledge societies*. London: Sage.

Steyaert, Chris and Jerome Katz
2004   'Reclaiming the space of entrepreneurship in society: Geographical, discursive, and social dimensions'. *Entrepreneurship and Regional Development* 16/3: 179–196.

Sveiby, Karl E.
1997   *The new organizational wealth*. San Francisco: Berrett-Koehler Publishers.

Swan, Jacky, Sue Newell, Harry Scarbrough, and Donald Hislop
1999   'Knowledge creation and innovation: Networks and networking'. *Journal of Knowledge Management* 3/4: 262–275.

Szulanski, Gabriel
1996   'Exploring internal stickiness: Impediments to the transfer of best practice within the firm'. *Strategic Management Journal* 17/2: 27–43.

Tanriverdi, Huseyin, and C. Iacono
1998   'Knowledge barriers to diffusion of telemedicine'. *Proceedings of the International Conference on Information Systems* 19: 39–50.

Teece, David J.
1998   'Capturing value from knowledge assets: The new economy, markets for know-how, and intangible assets' *California Management Review* 40: 35–79.

Teece, David J.
2000   *Managing intellectual capital: Organizational, strategic, and policy dimensions*. New York: Oxford University Press.

Tirole, Jean
1988   *The Theory of industrial organization*. Cambridge, MA: MIT Press.

Tsoukas, Haridimos
1996   'The firm as a distributed knowledge system: A constructionist approach'. *Strategic Management Journal* 17: 11–25.

Tsoukas, Haridimos
2003   'Do we really understand tacit knowledge?' in *Handbook of organizational learning and knowledge management*. M. Easterby-Smith and M. Lyles (eds), 410–427. Malden, MA: Blackwell.

Tsoukas, Haridimos
2005   *Complex knowledge: Studies in organizational epistemology*. New York: Oxford University Press.

Urwyler, Matthäus
2005   'Opportunity identification and exploitation: A case study of three Swiss-based software companies'. Doctoral dissertation, University of St. Gallen.

Varela, Francisco, Evan T. Thompson, and Eleanor Rosch
1991   *The embodied mind: Cognitive science and human experience.* Cambridge, MA: MIT Press.

von Hippel, Eric
1988   *The sources of innovation.* New York: Oxford University Press.

von Krogh, Georg
1998   'Care in knowledge creation'. *California Management Review* 40/3: 133–154.

von Krogh, Georg
2002   'The communal resource and information systems'. *Journal of Strategic Information Systems* 11: 85–107.

von Krogh, Georg, and Simon Grand
1999   'Justification in knowledge creation: Dominant logic in management discourses' in *Knowledge creation: A source of value.* G. von Krogh, I. Nonaka, and T. Nishigushi (eds), 13–35. London: Macmillan.

von Krogh, Georg, and Johan Roos
1995   *Organizational epistemology.* London: Macmillan/New York: St. Martin's Press.

von Krogh, Georg, and Johan Roos
1996   'A tale of the unfinished'. *Strageic Management Journal* 17: 729–737.

von Krogh, Georg, Ikujiro Nonaka, and Kazou Ichijo
1997   'Develop knowledge activists!' *European Management Journal* 15/5: 475–483.

von Krogh, Georg, Ikujiro Nonaka, and Manfred Aben
2001   'Making the most of your company's knowledge: A strategic framework'. *Long Range Planning* 34/2: 421–440.

von Krogh, Georg, Johan Roos, and Ken Slocum
1994   'An essay on corporate epistemology'. *Strategic Management Journal* 15: 53–73.

von Krogh, Georg, Kazou Ichijo, and Ikujiro Nonaka
2000   *Enabling knowledge creation.* New York: Oxford University Press.

Walsh, James P., and Gerardo Rivera Ungson
1991   'Organizational memory'. *Academy of Management Review* 16/1: 57–91.

Weick, Karl
1979   *The social psychology of organizing.* New York: McGraw-Hill.

Wenger, Etienne
1998   *Communities of practice: Learning, meaning, and identity.* Cambridge: Cambridge University Press.

Wenger, Etienne
2000   'Communities of practice and social learning systems'. *Organization* 7/2: 225–246.

Wernerfelt, Birger
1984   'A resource-based view of the firm'. *Strategic Management Journal* 5/2: 171–180.

Werr, Andreas, and Torbjörn Stjernerg
2003   'Exploring management consulting firms as knowledge systems'. *Organization Studies* 24/6: 881–908.

Whetten, David A., and Paul C. Godfrey, editors
1998   *Identity in organizations: Building theory through conversations.* Newbury Park, CA: Sage.

Zaleznick, Abraham
1985   'Organizational reality and psychological necessity in creativity and innovation' in *Frontiers in Creative and Innovative Management.* R. L. Kuhn (ed.). Cambridge, MA: Ballinger.

Zárraga, Celia, and Jaime Bonache
2005   'The impact of team atmosphere on knowledge outcomes in self-managed teams'. *Organization Studies* 26/5: 661–681.

Ikujiro Nonaka   Ikujiro Nonaka is Professor in the Graduate School of International Corporate Strategy at Hitotsubashi University, and Xerox Distinguished Fellow in the IMIO at University of California at Berkeley. He is an Academy of Management Fellow, and has published numerous articles and books on innovation and knowledge management in Japanese and English.
Address: Graduate School of International Corporate Strategy, Hitotsubashi University, National Center of Sciences, 2–1–2 Hitotsubashi, Chiyoda-ku, Tokyo 101–8439, Japan.

Georg von Krogh   Georg von Krogh is a chaired professor of strategic management and innovation at the ETH Zurich, Department of Management, Technology, and Economics. He has published on such topics as the knowledge- and resource-based view of the firm, knowledge creation and innovation, as well as competitive strategy and organizational growth. He is currently exploring models of innovation and their effectiveness.
Address: ETH Zurich, Department of Management, Technology, and Economics, Kreuzplatz 5, 8032 Zurich, Switzerland.
Email: gvkrogh@ethz.ch

Sven C. Voelpel   Sven C. Voelpel is the Director of WISE Business Research and Professor of Business Administration at the Jacobs Center for Lifelong Learning and Institutional Development of the International University Bremen (IUB), Germany. His research explores the fields of Wisdom, Innovation, Strategy and Energy and has contributed more than 100 publications in books and journals to these domains. His most recent book (co-authored with Thomas Davenport and Marius Leibold) is *Strategic Management in the Innovation Economy* (Wiley, 2006). In addition to serving in various (honorary) professorships around the world, he has been a Visiting Fellow at Harvard University since 2001.
Address: Jacobs Center for Lifelong Learning, International University Bremen, Campus Ring 1, 28759 Bremen, Germany.
Email: s.voelpel@iu-bremen.de