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**KNOWLEDGE AND ORGANIZATIONS
LITERATURE REVIEW**

by

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Knowledge and Organizations Literature Review

Abstract

The report overviews and synthesizes literature on various perspectives on knowledge in organizations. Knowledge-based view of the firm is compared to the transaction economics view of the firm. Then various theories on organizational knowledge creation are reviewed. A significant body of literature on knowledge sharing and creation in the inter-organizational context of joint ventures and supply-chain relationships is summarized. This is followed by an overview of intra-organizational knowledge sharing research. Finally, the role of technology and human resource management in creating and sharing knowledge in organizations is reviewed.

Theory of the Firm

A prominent theme in the research on Knowledge and Organizations is the debate on the role of knowledge in the theory of the firm. Two main questions that are addressed under this theme are:

1. What role does knowledge play in providing firms with a competitive advantage?
2. What role does knowledge play in explaining the existence of the firm as opposed to the market governance structure?

As one might suspect, both questions are juxtaposed with Transaction Cost Economics (TCE) (Williamson 1979) and the property rights (Hart 1989) theory of the firm (Kogut and Zander 1992; Conner and Prahalad 1996; Foss 1996b; Foss 1996a; Liebeskind 1996; Madhok 1996; Barney 1999). The roots of the so-called "knowledge-based" theory of the firm come from the resource-based view of the firm (Wernerfelt 1984; Barney 1986; Prahalad and Hamel 1990; Barney 1991; Barney 1996; Barney 1999). The theory of the firm emphasizes the role of organizational capabilities or competencies. Because organizational capabilities are hard to obtain in the marketplace, are difficult to copy, and are path-dependent, they have the potential to become a source of sustainable competitive advantage. The knowledge-based view of the firm is an outgrowth of the resource-based view of the firm which argues that knowledge is the key productive resource of the firm (Kogut and Zander 1992; Grant and Baden-Fuller 1995).

The original idea behind the knowledge-based view of the firm is that "the central competitive dimension of what firms know how to do is to create and transfer knowledge efficiently within an organizational context" (Kogut and Zander 1992: 384). TCE and property rights approaches represents a contractual theory of the firm that emphasizes the role of firms in reducing opportunism and moral hazard through property rights, incentives, and formal contracts (Williamson 1985; Hart 1989). It argues that in the presence of specific investments and uncertainty, firms are more efficient at dealing with transaction costs than markets. On the other hand, the knowledge-based theory of the firm takes its economic roots from Penrose (1959) and emphasizes successful growth

strategies and technological development. In deciding firm boundary questions, the knowledge-based perspective directs firms to consider (Kogut and Zander 1992):

1. How good a firm is at doing something
2. How good it is at learning specific capabilities
3. The value of these capabilities as platforms into new markets.

Since Kogut and Zander's (1992) pioneering work, a number of debates have developed in knowledge-based theory of the firm literature. Most of the knowledge-based theory perspectives make two critical assumptions about the nature of knowledge: they see knowledge as possessing a tacit component (Polanyi 1983) and they see individuals as having bounded rationality (Simon 1947). From these assumptions most authors conclude that a firm's primary function is to integrate/coordinate individual knowledge (Kogut and Zander 1992; Nonaka 1994; Grant and Baden-Fuller 1995; Zander and Kogut 1995; Conner and Prahalad 1996; Grant 1996a; Kogut and Zander 1996; Spender 1996; Kusunoki et al. 1998; Nahapiet and Ghoshal 1998). Yet, many authors go further to say that not only do firms coordinate individuals, but that they also create new knowledge that is social in nature (Kogut and Zander 1992; Nonaka 1994; Zander and Kogut 1995; Kogut and Zander 1996; Spender 1996; Kusunoki et al. 1998; Nahapiet and Ghoshal 1998). Still others express a completely different point of view, proposing that a firm's primary role is in protecting intellectual property that is not adequately protected by legal regulations in the environment (Liebeskind 1996).

While knowledge-based theorists of the firm are often in disagreement with one another, they also need to defend themselves against the criticism that is based on TCE (Foss 1996b; Foss 1996a). This criticism insists that it is impossible to justify the existence of the firm without the notion of opportunism. Knowledge-based theorists reply to such criticism by developing more rigorous justifications for the knowledge-based view of the firm (Conner and Prahalad 1996; Kogut and Zander 1996).

A comprehensive analysis of the existence of firms from the knowledge-based perspective was offered by Connor and Prahalad (1996). These authors argued that even if opportunism played no role in economic relations (the main proposition of TCE), then firms would still exist as mechanisms for knowledge integration. They assumed that firms were distinguished from markets by the employment relationship, which made employees follow the employer's authority. The presence of the employment relationship affects the knowledge applied to business activity in two ways: 1) through knowledge substitution of managers' wisdom for that of employees; and 2) through flexibility, which represents the costs of altering an individual's responsibilities in order to respond to new learning. If knowledge substitution provides positive net value, then firms will be preferred to markets. Similarly, if an employment contract produces cheaper flexibility based on the nature of knowledge that needs to be exchanged, then firms will again dominate markets. Otherwise, markets will dominate. There are also mixed cases, where tradeoffs need to be analyzed more carefully. The critique of the Connor and Prahalad (1996) approach is that knowledge substitution and flexibility can also be a part of the market exchange, i.e. can be written into a court enforceable contract (Foss 1996a). Hence, an employment contract based explanation does not explain the existence of the firm (Foss 1996a).

Another defense of the knowledge-based theory of the firm was offered by Kogut and Zander (1996). They argued that firms exist because people have a preference for the moral communities and shared identities they supply. In the age of industrialization and the increased division of labor, firms provide people with a sense of community in which discourse, coordination, and learning are structured by identity. The symbolic role of identity enables speed and efficiency in the creation and transfer of knowledge. Unlike Connor and Prahalad's theory (1996), this is essentially a non-economic explanation for the existence of the firm. This argument's weakness is in the lack of explanation for the difference between autonomous contracting and the employment contract and for the "patterns of asset ownership observed in firms, monitoring, etc. -- all of which are crucial aspects of firm organization" (Foss 1996a p. 520).

Yet another perspective in this debate is proposed in a recent network theory based explanation for the knowledge-based theory of the firm. It argues that organizations have advantages over markets because they can mobilize social capital embedded in human relations in order to create intellectual capital (Nahapiet and Ghoshal 1998). This explanation argues that social capital increases the efficiency of action and decreases transaction costs. Social capital is created and sustained through the exchange and, in turn, facilitates exchange. Intellectual capital is created through the combination and exchange facilitated by social capital. Because interdependence and coordination characterize organizations, they are conducive to the development of social capital, which is co-owned by parties in a relationship. At the same time, organizations provide institutional settings for human interactions, which also foster social capital. This approach is rooted in post-modernist thinking and moves away from the idea of objective knowledge. It has been criticized for paying insignificant attention to individual knowledge and the discovery of new knowledge (Locke 1999).

Theory of Organizational Knowledge Creation

Not only do knowledge-based theorists argue that firms integrate and create knowledge in order to compete with other firms and with market exchanges, but they also propose how firms engage (or ought to engage) in the knowledge creation process. Again most of the literature on this subject starts with the assumption that knowledge has a tacit component and hence is hard to transfer/integrate. In fact there are two managerial problems associated with knowledge integration in the firm: that of coordination and that of cooperation (Grant 1996b). Contractual theories of the firm have traditionally focused on the cooperation problem, looking at firms as means for reducing opportunistic behavior. Knowledge-based theories of the firm have traditionally preoccupied themselves with the coordination problem - looking at how organizational members transfer, integrate, and create knowledge in view of its tacit nature. The focus on coordination is especially prominent in an early work on the knowledge-based theory of the firm.

A seminal paper by Kogut and Zander (1992) extended earlier work by Nelson and Winter (1982) by proposing several coordination mechanisms for knowledge creation operating on different organizational levels. This paper argued that transfer of knowledge from an individual to a group level occurred through the development of unique language or code which allowed group members to learn who knows what and to coordinate their activities. On the organizational level the transfer of knowledge within the same function (horizontally) is realized by boundary spanners. At the same time, a vertical transfer of knowledge among different organizational functions relies on the use of higher-order organizing principles, sharing of accounting data, and through formal and informal structures. The challenge that organizations face in this paradigm is how to reduce the cost of inter and intra-firm knowledge transfer while protecting that knowledge from imitation by competition.

Kogut and Zander's work has been criticized for their lack of clarity around the concept of "higher-order organizing principles," which is fundamental to their discussion (Foss 1996b; Foss 1996a). Other knowledge-based theorists have been more specific in proposing organizational coordination mechanisms. These coordination mechanisms include:

- Rules and directives (Grant and Baden-Fuller 1995; Conner and Prahalad 1996; Grant 1996a; Grant 1996b)
- Sequencing (Grant 1996b)
- Routines (Nelson and Winter 1982; Grant and Baden-Fuller 1995; Grant 1996a; Grant 1996b; Hargadon and Sutton 1997)
- Group problem solving and decision making (Grant 1996b; Leonard and Sensiper 1998)

The effectiveness of coordination mechanisms depends on the existence of common knowledge, including the existence of common language and other forms of symbolic communication (e.g. statistics), the commonality of specialized knowledge, shared

meaning, and the recognition of individual knowledge domains (Grant 1996a; Grant 1996b).

The research on the coordination mechanisms for knowledge integration is complemented by the research on modes of knowledge integration (Nonaka 1994) (Nonaka and Takeuchi 1995). The dynamic theory of organizational knowledge creation relies heavily on the idea that an organization's primary role is the integration and explication of tacit knowledge on all organizational levels. This theory emphasizes the active, subjective nature of knowledge (defined as "justified true belief") and the problem of justification of the beliefs and getting people's commitment. It sees the main function of organizations in amplifying the knowledge created by individuals and crystallizing it as a part of the knowledge network of organization. Nonaka and Takeuchi's now famous SECI model proposes that knowledge is created and expanded through social interaction between tacit and explicit knowledge. There are four types of interaction: Socialization (tacit to tacit), Explication (tacit to explicit), Combination (explicit to explicit), and Internalization (explicit to tacit). The knowledge conversion occurs through the spiral of organizational knowledge creation, encompassing different organizational levels:

1. Sharing of tacit knowledge by a group of individuals
2. Conversion of tacit knowledge in teams into concepts and metaphors
3. Combination of team-based concepts with existing data and external knowledge
4. Articulation and development of concepts until they emerge into a concrete form
5. Dissemination of new knowledge to others within organization

The process of organizational knowledge creation is enabled by three factors: creative chaos, which involves reflection on the contradictions in the environment and inside organizations; the redundancy of information, which involves sharing of tacit knowledge among organizational members; and requisite variety, which involves constructing the organizational information processing channels that match the information imposed by the environment. Based on these enabling conditions, two types of management principles are proposed: middle-up-down management, where middle managers act as translators of tacit knowledge from top and bottom into explicit knowledge; and hypertext

organization, which represents a mix of hierarchical management and self-organizing teams focused on building requisite variety.

The SECI model has been extended recently by introducing the concept of *ba*, from the Japanese philosophy of existentialism (Nonaka and Konno 1998). *Ba* is defined as a space for emerging relationships, which provides a platform for advancing individual/collective knowledge. Philosophical literature provides examples of different types of *ba* (originating, interacting, cyber, and exercising) that respectively correspond to different modes of knowledge conversion in the SECI model (socialization, externalization, combination, and internalization). The main claim of this theory is that *bas* can be generated by organizational effort, where teams represent *bas* for individuals, organizations for teams, and markets for organizations.

The SECI model, along with the original work by Nelson and Winter (1982) have been criticized for using categories that are not discrete, separable, and stable (as good theoretical concepts should be) (Tsoukas 1996). The two most prominent dimensions of knowledge in the SECI model are the tacit/explicit dimension and the individual/social dimension. In social practice, these categories are critically interrelated. For example, tacit knowledge is a foundation of explicit knowledge and the latter cannot be separated from the former. Similarly, an individual cannot be conceived without a collective -- we see ourselves based on distinctions from our social environment. This criticism is rooted in the theory of practice approach (Bourdieu 1977) and suggests that the knowledge-based theory should focus on the way firms use knowledge in practice rather on abstract integration of inseparable categories.

The SECI model also received criticism for not explaining 1) how individuals generate tacit knowledge; 2) how agency problems are resolved; and 3) what are the closure means for knowledge creation in organizations (Spender 1996). Not surprisingly, other research on the knowledge-based theory of the firm has been trying to address these concerns. The works by Boland and Tenkasi (1995), Leonard and Sensiper (1998), and Hargadon and

Sutton (1997) addressed concerns #1 and #3, by focusing on the means of tacit and explicit knowledge creation and sharing, instead of the knowledge conversion discussion that characterized the SECI model. At the same time, Nahapiet and Ghoshal (1998) and von Krogh (1998) addressed concern #2 by bringing the focus on cooperation back into the knowledge-based theory of the firm.

Boland and Tenkasi's (Boland and Tenkasi 1995) analysis of *perspective making* and *perspective taking* in *communities of knowing* addressed the question of how the organizational tacit knowledge got created. These authors argued that knowledge-intensive firms were composed of multiple communities of knowing with specialized expertise. These communities engage in perspective making (a process whereby a community of knowing develops and strengthens its own knowledge domain and practices) and perspective taking (a process where distinctive individual knowledge is exchanged, evaluated, and integrated with that of others in the organization). Following the "language game" model (Wittgenstein 1953), they emphasized the crucial role of narratives in constructing strong perspectives within a community of knowing. Reflecting upon and representing such perspectives can create boundary objects (Star 1989) which allow for perspective taking between different communities of knowing.

A recent work by Leonard and Sensiper (1998) addressed the issue of how tacit knowledge gets created and how closure is reached in group innovation. While Boland and Tenkasi's unit of analysis was the community of knowing, Leonard and Sensiper's unit of analysis was the individual. Their discussion of divergence, which involves each individual applying its own knowledge to the problem, paralleled Boland and Tenkasi's discussion of perspective making. Here they emphasized the need to enrich individual perspectives with the perspectives of others using brainstorming, access to different functional and regional knowledge, and emphasizing the minority opinion. Once certain diversity of ideas has been achieved, the next step is to focus on convergence of the tacit group knowledge using the apprenticeship mode of learning, sharing of artifacts and methodologies, and creating a common vision using logos and symbols. Hargadon and

Sutton (1997) also stressed the importance of access to diverse knowledge for creating technological innovations. They also pointed out the role of organizational routine and artifacts for access, storage, and retrieval of organizational memory.

To summarize, the literature on coordination mechanisms for knowledge processes emphasizes the role of three critical factors in knowledge integration: shared experiences (Brown and Duguid 1991; Nonaka 1994; Boland and Tenkasi 1995; Nonaka and Takeuchi 1995; Leonard and Sensiper 1998; Nonaka and Konno 1998), shared symbolism captured in metaphors and logos (Nonaka 1994; Leonard and Sensiper 1998), and shared artifacts (Boland and Tenkasi 1995; Hargadon and Sutton 1997; Leonard and Sensiper 1998).

While pioneering work on knowledge-based theory of the firm focused on the coordination problem arguing that too much attention has been given to the cooperation problem in the past, this theory has been criticized for not giving enough attention to the cooperation problem (see Spender 1996 concern #2). Recent works by Nahapiet and Ghoshal (1998) and von Krogh (1998) both focused on the social relationships as the key for understanding cooperation in knowledge creation. Yet the approach that these authors took to the problem was quite different. While Nahapiet and Ghoshal based their argument on the network theory, which perceived individuals as self-interest seeking agents (Burt 1992), von Krogh focused on the concept of "care," which was defined as helping another person grow and actualize himself. Nahapiet and Ghoshal argued that social capital facilitates the development of intellectual capital by affecting the conditions necessary for the exchange and combination of intellectual capital to occur. They identified four conditions necessary for the exchange and combination of intellectual capital:

1. The opportunity to make the exchange and combination must exist.
2. Parties involved in the exchange and combination must expect some value from the exchange

3. Parties involved in the exchange and combination will be able to appropriate or realize some of the new value created by the engagement.
4. The capability to combine information or experience must exist.

Using social network theory, these authors argued that network ties provide access to resources (condition 1). Also shared language, codes and narratives that are developed by people in the network help people get in touch with each other (condition 1), provide apparatus for evaluating likely benefits of the exchange (conditions 2 and 3), and allow for the development of new knowledge (condition 4). Finally, the relational dimension of social capital that embodies trust, norms, obligations and expectations, and identification influence the first three conditions for knowledge exchange. In this work, organizations are seen as institutional settings for fostering social capital embodied in networks.

Von Krogh's discussion of the value of care in organizations is most closely related to Nahapiet and Ghoshal's discussion of the relational dimension of the social capital. Von Krogh argued that care was one of the key enabling conditions for knowledge creation processes. He identified five dimensions of behavior in relationships that emphasized care: 1) mutual trust, 2) active empathy, 3) access to help, 4) lenience in judgement, and 5) courage. Von Krogh believed that low care organizations would have trouble in knowledge integration/creation processes especially with respect to tacit knowledge. In such organizations individuals are likely to try to capture as much knowledge to themselves as possible and the common form of knowledge exchange will be transactional. On the other hand, in a high-care knowledge creation process, individuals will be bestowing their knowledge and the common form of knowledge exchange will be indwelling, which involves joint commitment.

While the development of the theory of organizational knowledge creation clearly has gaps, it is an impressive collection of ideas rooted in a variety of social, economic, philosophical, and psychological theories including philosophy of science, existentialism, network theories, sociological practice theory, psychological theories of care, identity, bounded rationality, etc. Notwithstanding the theoretical gaps, organizational knowledge-

creation theory has been tested empirically against organizational performance criteria. One such empirical investigation proposes that knowledge that forms organizational capabilities has three different layers: knowledge base, which includes individual units of knowledge; knowledge frame, which captures linkages of individual units of knowledge and their priorities; and knowledge dynamics, which represents dynamic interactions of individual units of knowledge (Kusunoki et al. 1998). Three different knowledge layers in organizations give rise to three different types of organizational capabilities respectively: local capabilities (least firm specific), architectural capabilities, and process capabilities (most firm specific). Different capabilities are based either on individual knowledge units or related to organizational ability to link and combine each unit of knowledge. Also, organizations exercise different degrees of control over different capabilities. Thus, for example, management can invest into local capabilities by recruiting particular employees (building local capabilities), yet it is difficult for management to directly control learning by individuals or across organizational units (process capabilities). This framework has been tested against firm's performance in product development. The data indicated that process capabilities have the most significant effect on performance in system-based industry's product development. In material-based industries, local capabilities also play a crucial role. This finding goes to show that the SECI model's emphasis on processes of organizational knowledge creation might have the most significant effect on performance in system-based industries, while issues of individual knowledge creation, which are not addressed by the SECI model, might shed more light on performance in other settings.

In a similar vein, Blackler (1995) proposed that different types of organizations depend on different types of knowledge. Following Collins (1993), he distinguished five different types of knowledge:

- Embrained: depends on conceptual skills and cognitive abilities
- Embodied: action-oriented and rooted in specific physical context
- Encultured: the process for achieving shared understandings.
- Embedded: resides in systemic routines

- Encoded: information conveyed by signs and symbols

Organizations that depend on key individuals and need solutions to routine problems rely mostly on embodied knowledge. If organizations depend on key individuals, but need solutions to unfamiliar issues, then they are mostly reliant on embrained knowledge. On the other hand, if the collective effort is required for the solution of routine problems, then organizations depend on embedded knowledge. Finally, when collective effort is used for the solution of unfamiliar issues, the encultured knowledge becomes critical. Blackler proposed that in today's economy organizations became less reliant on embodied and embedded knowledge and more reliant on embrained and encultured knowledge. This adds a new dimension to the empirical work by Kusunoki (1998), who found that different industries exhibited different degree of reliance on individual vs. collective knowledge. Like Tsoukas (1996) and practice theorists, Blackler called for attention to be shifted away from characterizing knowledge and towards understanding the processes of knowing and doing.

Hargadon and Sutton (1997) conducted an extensive empirical study that focused specifically on the processes of organizational knowledge creation and integration in a context of technological innovations. They combined social network theory (Burt 1992) on a macro level with organizational memory theory (Walsh and Ungson 1991) on a micro level to understand the nature of technology brokering within a single organization. In a two-year-long ethnographic study of IDEO corporation (the largest product design consulting firm), the researchers developed a process model of technology brokering. The brokering was supported by IDEO employees securing *access* to unconnected technical knowledge in a network of different industries and technologies. The *acquisition* of organizational memory was facilitated by employee conversations with clients and industry experts, by looking and taking apart existing products, and by designing products for that industry. In such a way local industry experts who *stored* technical knowledge were created. This individual knowledge storage was complemented by knowledge stored in objects and products that designers collected. Finally, the relevant knowledge was *retrieved* by invoking analogies between problems

and technological solutions and by establishing knowledge sharing routines. The whole process was supported by the way IDEO structured work, assigned designers to teams, rewarded knowledge sharing, and screened job candidates for cultural fit as well as technical knowledge.

Inter-Organizational Collaboration

One of the implications of the knowledge-based theory of the firm is in the area of inter-organizational collaboration. Inter-firm collaborations or alliances broadly refer to a variety of inter-organizational relationships such as joint development agreements, equity joint ventures, licensing agreements, cross-licensing and technology sharing, customer-supplier partnerships, R&D contracts, and some others less dominant forms (Mowery et al. 1996). Most of the literature on knowledge exchange/creation in inter-firm collaboration focuses on bilateral or multi-party horizontal relationships such as joint development agreements or ventures (Liebeskind et al. 1996; Powell et al. 1996; Inkpen and Beamish 1997; Lam 1997; Inkpen and Dinur 1998; Kumar and Nti 1998; Larsson et al. 1998; Powell 1998), with only few authors addressing customer-supplier partnerships (Grant and Baden-Fuller 1995; Weiss and Kurland 1997; Lincoln et al. 1998). Despite such an uneven focus in the literature, much of the theorizing on horizontal relationships can be applied to vertical relationships as well. While most literature focuses on those inter-organizational relationships which are specified in formal agreements, the knowledge exchange may take place in social networks which are governed by shared norms of the exchange, instead of legally binding contracts (Appleyard 1996; Liebeskind et al. 1996).

Some accounts on inter-organizational collaboration attempt to extend the resource-based view of the firm to reach outside organizational boundaries claiming that such collaboration constitutes a key dimension of competition (Liebeskind et al. 1996; Powell et al. 1996; Dyer and Singh 1998; Powell 1998). This "relational view of the firm" (Dyer and Singh 1998) is complementary to the resource-based view of the firm and claims that in addition to internal resources, firms ought to look at inter-organizational networks as a

source of sustainable competitive advantage. Inter-organizational relationships are especially crucial in industries like biotechnology, where knowledge is rapidly changing and broadly distributed placing the locus of innovation inside inter-organizational networks (Grant and Baden-Fuller 1995; Liebeskind et al. 1996; Powell et al. 1996; Powell 1998). When considering vertical customer-supplier relationships, an inter-firm collaboration is more likely to be efficient in cases where it is necessary to integrate explicit knowledge which cannot be completely embodied within the product (e.g. automotive industry) (Grant and Baden-Fuller 1995).

Views on the role of inter-firm collaboration differ significantly on the issue of whether such collaborations should be used to enhance existing knowledge/capabilities of each partner (convergent development) (Kogut 1988; Cohen and Levinthal 1990; Hamel 1991; Inkpen and Beamish 1997) or to allow access to complementary capabilities of others while focusing on exploitation of existing capabilities within each firm (Grant and Baden-Fuller 1995; Nakamura et al. 1996; Dyer and Singh 1998) (divergent development) (Mowery et al. 1996). The latter view comes from the notions of a firm's knowledge and product domains (Grant and Baden-Fuller 1995). The greater the incongruity between the product domain of the firm and its knowledge domain, the greater the potential for inter-firm collaboration to increase the efficiency of knowledge utilization (Grant and Baden-Fuller 1995).

Whatever the reason for collaboration, studies show that a significant number of inter-firm collaborations fail in some sense (Inkpen and Beamish 1997; Lam 1997).

Consequently, much of the research on inter-firm collaboration focuses on understanding the reasons for such failure as well as the factors that can improve inter-firm collaboration (Kogut 1988; Cohen and Levinthal 1990; Hamel 1991; Mowery et al. 1996; Powell et al. 1996; Inkpen and Beamish 1997; Lam 1997; Dyer and Singh 1998; Kumar and Nti 1998; Larsson et al. 1998; Powell 1998). There are seven broad categories of factors influencing different types of outcomes in inter-firm collaborations:

- **Factors influencing the extent of technology transfer and knowledge sharing.**

- *Alliance contract/governance structure.* The amount of knowledge that gets shared depends on the governance structure of the agreement. E.g., equity joint ventures will lead to a higher degree of knowledge sharing than contract-based alliances (Kogut 1988; Mowery et al. 1996).
- *Partner's internal capabilities.* A firm's successful exploitation of technological capabilities or knowledge outside its boundaries depends on the firms' own internal capabilities. In particular the firm's ability to absorb such capability, i.e. a firm's absorptive capacity, plays a crucial role (Cohen and Levinthal 1990; Mowery et al. 1996; Dyer and Singh 1998; Kumar and Nti 1998; Larsson et al. 1998). Similarly, firms must develop internal capabilities to achieve firm-wide learning based on experiences in prior collaborative efforts (Dyer and Singh 1998; Powell 1998). These capabilities include creation of data banks, informal seminars, and multi-functional teams aimed at distributing the knowledge from each collaboration to the rest of the organization (Powell 1998).
- *Nature of Knowledge.* Because knowledge is tacit and socially embedded, its transfer across organizational (and especially national) boundaries is highly problematic (Lam 1997). For example, the Japanese model for organizing is based on a high degree of tacit knowledge diffused across organizational structure. At the same time, the British model emphasizes the value of codified knowledge and task specialization. As a result of these conflicting models, joint ventures may turn into arm's length relationships with poor project performance and asymmetry in knowledge transfer.
- *Collaborative Strategy.* The amount of learning that takes place in the relationship depends on each partner's collaborative strategy (Hamel 1991; Kumar and Nti 1998; Larsson et al. 1998). For example, partners in a relationship can make their knowledge widely accessible to each other (high degree of transparency) (Hamel 1991). At the same time they can show high or low degree of receptivity to the other partner's knowledge (Hamel 1991). In other words, similar to a negotiation process, partners may intend to collaborate (share and learn), compromise, accommodate, avoid, or compete (neither share nor learn) (Larsson et al. 1998).

The amount and direction of learning that takes place in a relationship depends on the two strategies adopted by each partner (Larsson et al. 1998). With a high number of learning barriers present in a relationship, over time most pairs of collaborative strategies disintegrate with little learning going on (Larsson et al. 1998). The barriers to learning were identified in the literature and include partners' lack of absorptive capacity and incentives for learning, changes in bargaining power, and the nature of knowledge. In addition to deterioration caused by nonfunctional collaborative strategies, partners may get dissatisfied with managerial mechanisms involved in the alliances governance (Kumar and Nti 1998).

- **Factors influencing the stability of the relationship.**
 - *Bargaining Power.* Based on the resource dependence model (Pfeffer and Salancik 1978), the possession or control of key resources by one entity may make other organizations dependent on that entity. Thus, if alliances are formed to access the other partners' resources (e.g. knowledge and skills), then once such dependencies change or disappear, the alliance may be terminated (Inkpen and Beamish 1997). Talking about international joint ventures formed to access local partner's knowledge, once the foreign partner learns what it needs from the local partner, the bargaining power shifts and the alliance is likely to become unstable (Inkpen and Beamish 1997). If local partners want to ensure alliance stability they should a) take measures to prevent foreign partners from learning all there is to learn; b) create new knowledge; c) consider the track record of their partners (Inkpen and Beamish 1997).
- **Factors influencing the ability of alliance partners to get a competitive advantage from their relationships**
 - *Management Processes.* Viewing alliance formation as a source of competitive advantage, it is critical for alliance partners to put in place such management mechanisms and routines that would sustain the alliance and would be hard to replicate (Dyer and Singh 1998). These include protections against opportunistic behavior in the relationship, high volume of information exchange, knowledge

sharing routines, and the development of self-enforcing safeguards (trust and incentives) for sharing (Dyer and Singh 1998).

- *Network Structure.* From the network theory perspective, the ability to occupy an information rich position in a socioeconomic network can provide network members with promising entrepreneurial opportunities (Powell et al. 1996; Dyer and Singh 1998). In the biotechnology industry, access to knowledge enabled by a resourceful network position combined with the firm's experience at managing ties was shown to lead to rapid firm growth (Powell et al. 1996). These factors were also likely to lead to more future collaboration opportunities (Powell et al. 1996).

Intra-Organizational Knowledge Sharing

Nonaka's (1994) seminal work on the importance of knowledge transfer and creation inside and outside an organization brought significant attention to the subject of knowledge sharing on different levels. Nonaka's (1994) spiral of organizational knowledge creation begins with sharing of tacit knowledge by groups of individuals and ends with the dissemination of knowledge inside organizations, with customers, and with market participants. Adoption of this framework calls for the understanding of processes influencing the facilitation of knowledge sharing on all levels of organization. There are five basic questions that frame research on intra-organizational knowledge sharing:

1. Who is involved in sharing the knowledge (the unit of analysis)?
2. What kind of knowledge is being shared?
3. How smooth was the sharing process?
4. How fast was the main productive task accomplished?

Much attention has focused on dyadic knowledge sharing that occurs between organizational units or groups (Nonaka 1995; Szulanski 1995; Szulanski 1996; O Dell and Grayson 1998; Hansen 1999). Practitioners devote much of their attention to the topic of sharing best practices across the organization. Szulanski (1995; 1996) identified four sets of factors that influence intra-organizational knowledge stickiness (von Hippel 1994). These factors pertained to 1) characteristics of knowledge (causal ambiguity, unprovenness); 2) sources of knowledge (lack of motivation, not perceived as reliable); 3)

recipient of knowledge (lack of motivation, lack of absorptive capacity, lack of retentive capacity); 4) transfer context (barren organizational context, arduous relationships) (Szulanski 1995; Szulanski 1996). A multi-organizational survey data indicated that a recipient's lack of absorptive capacity, causal ambiguity of the knowledge being transferred, and arduous relationships between the parties were the strongest impediments to the smooth transfer of best practices. While earlier literature emphasized the motivational factors, they turned out to be less important in determining knowledge stickiness. Despite these results, practitioner-oriented literature keeps emphasizing the role of motivational factors in facilitating dissemination of best practices (O Dell and Grayson 1998). Based on industry examples, such factors as supportive organizational culture, facilitation of contacts and relationships, emphasizing the value of tacit knowledge, and rewarding people for sharing are seen as critical in facilitating such dissemination (O Dell and Grayson 1998).

Another focus of research attention was on the impact of different ways of sharing project-based technological knowledge on project effectiveness. Nobeoka (1995) studied the influence of timing of the technology transfer process between project teams on the efficiency of that transfer. In a multi-company, multi-national survey he found that a concurrent design transfer strategy that involved the transfer of knowledge to the new project before the base project was completed took less engineering hours than a sequential design transfer strategy. He attributed this effect to the advantages offered by planned learning, the possibility of adjusting technology design between two projects when problems were discovered during the transfer process, the currency of methodology and policies used in the base project, and the increased likelihood that the same general manager will oversee both projects.

In a similar vein, Hansen (1999) focused on understanding the effect of weak ties and knowledge characteristics in sharing knowledge on the project completion time. Analyzing incidents of knowledge sharing across sub-units from different divisions, his survey results indicated that weak inter-unit ties were beneficial for sharing knowledge

that was highly codified and independent from other sub-unit's projects. At the same time, weak ties resulted in longer project completion time when knowledge to be shared was highly noncodified and dependent on other sub-unit's knowledge. Weaker sub-unit ties resulted in shorter project completion time because they took less effort to maintain, i.e. they didn't require reciprocal knowledge sharing from the partner. Finally, weaker ties were not sufficient for transferring tacit and dependent knowledge where strong personal relationships and frequent communication was required.

Complementing research on timing and channels for knowledge transfer is the research on the actual means used to sharing knowledge (Boland and Tenkasi 1995). However, instead of focusing on an organizational unit or practice as a unit of analysis, this research looks at the communities of knowing -- groups of specialized knowledge workers who develop unique social and cognitive repertoires, which guide their interpretation of the world. Narratives are seen as the dominant form of knowledge sharing within a community of knowing used extensively for perspective making or knowledge creation. Boundary objects (Star 1989) in the form of visible representations of an individual's knowledge are helpful in reflecting upon and representing knowledge to other communities of knowing. Finally, much of explicit knowledge transfer in and outside communities of knowing takes place through message transmission in a conduit.

Electronic Communications and Information Technology

One of the implications of the recent interest in knowledge sharing issues is in the area of electronic communications and Information Technology (IT) research. For example, Blackler's (1995) categorization of different types of knowledge allowed him to reinterpret Zuboff's (1988) study of information technology implementation in a manufacturing setting as saying that action oriented skills (embodied knowledge) were being displaced by computer technologies (encoded knowledge). Thus by encoding information, technology disrupts existing knowledge bases. Not only does it have an effect on the embodied knowledge, but it also affects embrained knowledge (through the development of expert computer systems and widening information access), encultured

knowledge (through the introduction of communication systems and groupware), and embedded knowledge (through the development of integrated enterprise systems).

Another way of looking at the role of information technology in knowledge sharing is through the lens of communication theories. Invoking the notions of genres and genre repertoires Orlikowski and Yates (1994) analyzed how a community of artificial intelligence researchers developed communication structures that enabled them to do their work. Based on structuration theory, the genres and genre repertoires that were developed by the community, including email memos, ballots, etc. were enabling, but also constraining community members in their actions.

By far the largest stream of research on electronic communications focuses on the issue of media choice for transferring information. In their seminal work Daft and Lengel (1987) outlined the main ideas behind information richness theory. The theory holds that highly equivocal tasks call for information-rich media that allow or even encourage a high degree of personal interaction. The choices available for communication usually include face-to-face meetings, emails, telephone, voice-mail, fax, memos, or letters. According to the information (also called media) richness theory different media can be ordered on the richness scale with face-to-face being the richest medium, whereas email is a leaner medium. Over the past 15 years, media richness theory has been developed extensively and was compared and complemented by other media choice views (for review see Straub and Karahanna 1998; Carlson and Zmud 1999).

One of the early criticisms of the media richness theory was based on its lack of attention to social aspects of communication (Markus 1987). In an attempt to compensate for this deficiency media choice researchers attempted to compare / combine media richness theories with the social influence theory. Social influence theory (Fulk et al. 1987) explains the choice of media through the influence of social forces such as work group norms and co-worker and supervisor attitudes and behaviors. Another socially based explanation of media choice is based on the role of symbolic cues. It posits that media

choice depends on socially constructed symbolic meaning conveyed by the choice of a particular medium (Trevino et al. 1987). Webster and Trevino (1995) conducted an empirical investigation in a "policy capturing" survey, where respondents were presented with multiple scenarios that varied the factors of interest to researchers. They found that message equivocality, the distance between communication partners, and the number of message recipients as well as social influences and symbolic cues had a role to play in explaining media choice.

Straub and Karahanna (1998) divided media choice explanations into four categories:

- **Task-medium fit:** These explanations include a media richness theory that proposes that characteristics of the chosen medium should match information requirements of the task at hand. They also include social presence theory which argues that communicators match the degree of social presence required by the task to that provided by the medium (Rice et al. 1992).
- **Task:** These explanations are based on the urgency associated with task-related communication.
- **Medium:** These explanations focus on the inherent characteristics of the medium itself. For example, they address the degree of medium accessibility in an organization.
- **Social Environment:** These explanations look at the components of social environment including: (1) presence of a critical mass of users (Markus 1987) and (2) temporal availability of the recipient.

Using survey methods similar to Webster and Trevino (1995) (and many other media choice researchers), Straub and Karahanna (1998) found that recipient availability and proximity were good predictors of the media choice. At the same time social presence factors gained predictive power only when combined with recipient availability variables.

Another example of a theory explaining media choices comes from the channel expansion theory (Carlson and Zmud 1999). Channel expansion theory concerns itself with people's perceptions of the channel and identifies certain experiences as important in shaping how

an individual develops richness perceptions for a given channel. These experiences include experience with the channel, experience with the messaging topic, experience with the organizational context, and experience with communication co-participants. Through these experiences communication participants develop associated knowledge bases that may be used to more effectively encode and decode rich messages on a channel. In this way the channel can become increasingly rich. In a survey conducted at a university, Carlson and Zmud (1995) found general support for the channel expansion theory; specifically, they found that a set of evolving, knowledge-based experiential factors can positively influence media richness perceptions.

As most explanations focus on the media choice, the importance of what kind of knowledge (and in what form) is represented in a given communication episode is often overlooked. Boland and Tenkasi's (1995) analysis of perspective making and perspective taking in knowledge intensive firms suggested several ways in which different types of information technology could be used to support different kinds of knowledge sharing tasks. Based on different modes of knowledge sharing inside and outside communities of knowing (language games, message transmission, and boundary objects), it is possible to design electronic communication forums such as a Task Narrative Forum, a Knowledge Representation Forum, an Interpretive Reading Forum, a Theory-building Forum, and an Intelligent Agent Forum to assist communities in their knowledge sharing tasks. These forums might be indistinguishable from the standpoint of medium choice theories, yet they serve very different purposes and represent knowledge in different ways.

Human Resource Management

While information technology can be useful in facilitating knowledge sharing inside and outside organizational boundary, the actual knowledge creation and integration processes are accomplished by individuals. The resource-based view of the firm points out the importance of human capital to the competitive advantage of firms (Barney 1991). Human assets are hard to imitate because they are difficult to understand and observe due to scarcity, specialization, and tacit knowledge. In fact, some knowledge-based theorists

view individual knowledge as the primary source of organizational knowledge creation (Nonaka 1994; Grant 1996b). Given the importance of human assets in the knowledge-based theory of the firm, the issue is how to manage firm's human resources and how to decide when to grow personnel internally and when to look for people outside firm's boundaries.

Internal employment provides a number of benefits to firms including higher stability and predictability of a firm's stock of knowledge, better coordination and control, enhanced socialization, and lower transaction costs (Lepak and Snell 1999). However, use of external labor such as contingent workforce or partner's employees offer decreased administrative costs and enhanced organizational flexibility. The goal is to balance the advantage and disadvantages of these alternative employment modes. From the standpoint of a resource-based view of the firm, firms need to pay attention to two strategic determinants of employment modes: 1) the value to the firm and 2) the uniqueness of assets. A tradeoff matrix for HR architecture can be designed by analyzing the tradeoffs of the employment modes with respect to these dimensions. Thus, if uniqueness of the human asset is high and the value to the firm is high, the firm should develop this asset internally, building a long-term relationship based on mutual commitment (e.g. Intel engineers). If the uniqueness of the asset is low, but the value to the firm is still high, then the firm should acquire the human asset from the market paying the market rate for it and devising a compensation structure that is based on mutual benefits (e.g. UPS drivers). If both uniqueness and value to the firm indicators are low, then glove-in-hand sub-contracting of labor is sufficient (e.g. clerical work). Finally, if the value to the firm low, but the uniqueness of human asset is high, then firms should form collaborative alliances with partners, which would allow them to tap into partner's valuable personnel skills (e.g. attorneys). Since different functions of the firm would call for different kinds of human assets, firms should combine different employment modes. Moreover, as requirements change, the HR architecture deployed by the firm should change as well.

Lepak and Snell's (1999) view on human assets is a direct interpretation of the make vs. buy decision making under the postulates of the resource-based view of the firm: If the asset is contributing to the core competence of the firm it should be owned; otherwise, it should be outsourced. However, with the growth of contingent workforce in the United States, more and more companies are using contingent workers in their core functions (outsourcing). Matusik and Hill (1998) offered a knowledge-based perspective on why the use of contingent workforce might be beneficial to an organization in its core competitive areas. In addition to the cost saving factors associated with the use of contingent workers observed by Lepak and Snell (1999), another set of benefits associated with contingent workers has to do with the public knowledge brought by these workers into the firm. First, contingent workers, who change jobs often and are pressed to keep their skills current, may bring the knowledge of industry and occupational best practices to the firm. Second, the introduction of contingent workers into the workplace may ask for knowledge explication that simulates exploration necessary for innovative activities. Finally, the knowledge that contingent workers bring into the firm may be integrated with firm's existing knowledge base to create new knowledge. However, both direct cost savings and knowledge benefits offered by contingent workforce must be balanced against the often high hourly rates and private knowledge leakage that is associated with this employment mode. From the standpoint of knowledge advantages and disadvantages brought by contingent workers, they should be used most extensively when the environment is dynamic (increased need for skill upgrading and decreased level of harm caused by knowledge leakage). From the standpoint of direct cost savings, contingent workers should be more useful when the firm experiences high competitive pressures. If neither of these conditions apply, the firm should rely on an internal workforce.

The focus on whether to grow firm's own workforce or outsource is important, yet the critical issue facing the firms is how to manage their internal or external workers. Indeed the very same characteristics that make human assets hard to replicate make these assets hard to manage (Coff 1997). Human assets exhibit management dilemmas associated

with voluntary turnover and with information problems (moral hazard and adverse selection). Extensive Human Resource Management literature suggests that firms can devise a number of strategies for coping with these dilemmas for internal employment (Coff 1997). These include:

1. *Retention strategies*: Pleasant work environment, interesting job assignments, and firm-specific compensation schemes and routines.
2. *Rent-sharing strategies*: Paying above-market wages, and individual, group, and organization-based performance reward plans.
3. *Organizational design*: Employee participation in firm governance, flattening organizational structures and using flexible job titles, building a culture of shared values and beliefs.
4. *Information strategies*: Employee monitoring and feedback systems as well as acquiring competencies in interpreting tacit knowledge in the labor market.

While economic theories of organization such as theories on careers, signal theory, agency theory, and others have been used extensively to devise internal human resource management strategies, recently these theories have also been applied to the management of the external workers. For example, Sharma (1997) used agency theory to analyze the incentive issues between firms and professional service providers that they hire. Firms often hire professionals to obtain their unique knowledge (Matusik and Hill 1998; Lepak and Snell 1999). Yet the fact that these professionals possess knowledge that the hiring firms don't have creates serious risks. To mitigate against the risk of opportunism in such relationships firms should look for or develop four types of restraints:

1. *Self-control*: The hiring firm has high degree of involvement in the co-production of services
2. *Community control*: There is a well-defined professional code of conduct and a high degree of interaction and solidarity among hiring parties
3. *Bureaucratic control*: The professional firm employs professional super-ordinate supervisors and uses behavior-based controls

4. *Client control*: The hiring firm has alternative access to relevant knowledge and is able to make professionals invest in relationship-specific assets.

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