

Knowledge sharing

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Almeida, P. and B. Kogut (1999). "Localization of knowledge and the mobility of engineers in regional networks." Management Science **45**(7): 905-917.

Knowledge, once generated, spills only imperfectly among firms and nations. We posit that since institutions and labor networks vary by region, there regional variations in the localization of spillovers. We investigate the relationship between the mobility of major patent holders and the localization of technological knowledge through the analysis of patent citations of important semiconductor innovations. We find that knowledge localization is specific to only certain regions (particularly Silicon Valley) and that the degree of localization varies across regions. By analyzing data on the interfirm mobility of patent holders, we empirically show that the interfirm mobility of engineers influences the local transfer of knowledge. The flow of knowledge is embedded in regional labor networks.

Amit, R. and P. J. H. Schoemaker (1993). "Strategic assets and organizational rent." Strategic Management Journal **14**(1): 33-46.

We build on an emerging strategy literature that views the firm as a bundle of resources and capabilities, and examine conditions that contribute to the realization of sustainable economic rents. Because of (1) resource-market imperfections and (2) discretionary managerial decisions about resource development and deployment, we expect firms to differ (in and out of equilibrium) in the resources and capabilities they control. This asymmetry in turn can be a source of sustainable economic rent. The paper focuses on the linkages between the industry analysis framework, the resource-based view of the firm, behavioral decision biases and organizational implementation issues. It connects the concept of Strategic Industry Factors at the market level with the notion of Strategic Assets at the firm level. Organizational rent is shown to stem from imperfect and discretionary decisions to develop and deploy selected resources and capabilities, made by boundedly rational managers facing high uncertainty, complexity, and intrafirm conflict.

Appleyard, M. M. (1996). "How does knowledge flow? Interfirm patterns in the semiconductor industry." Strategic Management Journal **17**: 137-154.

Although knowledge spillovers between firms play a critical role in the evolution of technology, little is known about such spillovers. By examining knowledge sharing patterns in the semiconductor industry, a study seeks to answer the questions of: 1. how knowledge flows across company boundaries, 2. how industry characteristics and national institutions shape knowledge diffusion, and 3. to what extent companies direct knowledge flows. The research shows that public sources of technical data play a larger role in knowledge diffusion in Japan than in the US and in semiconductors relative to steel. By understanding the mechanisms and determinants of knowledge flows, company managers and public policy makers can influence knowledge diffusion more effectively.

Argote, L. (1999). Organizational Learning: Creating, Retaining, and Transferring Knowledge. Boston, Kluwer Academic.

Argote, L. and P. Ingram (2000). "Knowledge transfer: A basis for competitive advantage in firms." Organizational Behavior and Human Decision Processes **82**(1): 150-169.

This concluding article in the special issue of Organizational Behavior and Human Decision Processes on the foundations of knowledge transfer in organizations argues that the creation and transfer of knowledge are a basis for competitive advantage in firms. The article builds on a

framework of knowledge reservoirs to show why knowledge transfer can be difficult and to identify the kinds of knowledge that are most difficult to transfer to different contexts. The article develops the proposition that interactions among people, tasks, and tools are least likely to fit the new context and hence are the most difficult to transfer. This theoretical result illuminates how organizations can derive competitive advantage by transferring knowledge internally while preventing its external transfer to competitors. Because people are more similar within than between organizations, interactions involving people transfer more readily within than between firms. By embedding knowledge in interactions involving people, organizations can both effect knowledge transfer internally and impede knowledge transfer externally. Thus, knowledge embedded in the interactions of people, tools, and tasks provides a basis for competitive advantage in firms.

Argote, L., P. Ingram, et al. (2000). "Knowledge transfer in organizations: Learning from the experience of others." Organizational Behavior and Human Decision Processes **82**(1): 1-8.

In the introduction to this special issue of *Organizational Behavior and Human Decision Processes* on the psychological foundations of knowledge transfer in organizations, we argue that knowledge transfer is becoming increasingly important in organizations. Organizations that are able to transfer knowledge effectively from one unit to another are more productive and more likely to survive than those that are less adept at knowledge transfer. Although organizations are able to realize remarkable increases in performance through knowledge transfer, successful knowledge transfer is difficult to achieve. The articles in this special issue identify factors affecting knowledge transfer in organizations. These articles provide empirical evidence about effective mechanisms for transferring knowledge as well as about barriers to and facilitators of knowledge transfer. By focusing on the psychological processes that underlie knowledge transfer within a unit and between units within a firm, this special issue complements work in cognitive psychology on knowledge transfer at the individual level of analysis as well as work in strategy and organizational theory on knowledge transfer at the firm or industry levels of analysis. This special issue opens up the "black box" of knowledge transfer in organizations by providing new theory and empirical evidence on the psychological processes that are the foundations for knowledge transfer in organizations.

Athanassiou, N. and D. Nigh (1999). "The impact of US company internationalization on top management team advice networks: A tacit knowledge perspective." Strategic Management Journal **20**(1): 83-92.

This study surveys 37 U.S. multinational corporations (MNCs) to examine the effect of internationalization on one dimension of the top management team's (TMT's) character: international business advice network density. This study draws on international business (IB) theory, the resource-based view of the firm, and philosophy of science and its view of tacit knowledge. Results show that both the firm's internationalization extent and the interdependence that exists across its country-market activities, are positively related to the TMT's IB advice network density. As the extent of the MNC's business outside the United States grows and the linkages among its IB units intensify, the demand for IB expertise within the TMT increases, TMT members share each other's knowledge of IB more extensively and the TMT's IB advice network density increases. Copyright (C) 1999 John Wiley & Sons, Ltd.

Badaracco, J. L. (1991). The Knowledge Link: How Firms Compete Through Strategic Alliances. Boston, MA, Harvard Business School Press.

Book Description: In 1971, General Motors bought 34 percent of Isuzu, then a producer of small trucks, marking the beginning of GM's journey into alliances with a wide range of companies, including Toyota, Suzuki, and Fuji. Why would such a successful company let down its corporate walls, exposing its organization and strategies to competitors? The answer, according to Joseph Badaracco in this pathbreaking study, is that corporations enter into strategic alliances to capitalize on knowledge: migratory knowledge, often technical in nature, which can be transferred easily between people or organizations in a formula or product, and embedded knowledge, which defines how a particular company organizes itself to do business. In today's business environment,

companies need to utilize each type of knowledge to sustain their competitive advantage. The formidable length of time and start-up costs needed to develop new products and enter new markets are forcing companies to enter into these alliances. But Badaracco argues that management should not only use alliances reactively to match a competitor's products or plug gaps in its own product line. The long-term opportunity created by alliances lies in management's learning about a partner's unique manufacturing processes, or other sources of competitive advantage. Absorbing this embedded knowledge offers management a cost-effective way to transform its core operations and strengthen the organization

Barab, S. A., K. E. Hay, et al. (2001). "Constructing virtual worlds: Tracing the historical development of learner practices." Cognition and Instruction **19**(1): 47-94.

This study explores learning and instruction within a technology-rich, collaborative, participatory learning environment by tracking the emergence of shared understanding and products through student and teacher practices. The focus is not only on the interactions among students or between students and teachers, but on student-resource interactions, especially student-technology interactions. In a 1-week camp, students worked in activity groups with 3-dimensional modeling software to develop virtual worlds. Holistic accounts of 2 activity groups in the camp are presented, emphasizing the focus of the activity, group dynamics including the role of the teacher, and the historical development of learner practices. Then, a network methodology is used to trace the history of interactions accounting for the emergence, evolution, and diffusion of learner practices. The findings suggest that becoming knowledgeably skillful with respect to a particular practice or concept is a multigenerational process, evolving in terms of contextual demands and available resources. The tracings further reveal the reciprocal nature of learning and doing, with building conceptual understanding occurring in relation to local conditions and practices, and doing practices being a part of student learning. We are so accustomed to the separation of knowledge from doing and making that we fail to recognize how it controls our conceptions of mind, of consciousness and of reflective inquiry.

Birkinshaw, J., R. Nobel, et al. (2002). "Knowledge as a contingency variable: Do the characteristics of knowledge predict organization structure?" Organization Science **13**(3): 274-289.

This paper examines the validity of knowledge as a contingency variable. Building on recent advances in thinking about the dimensions of knowledge assets (Winter 1987, Zander and Kogut 1995), we argue that such dimensions might have an important influence on organization structure. More specifically, we focus on two dimensions of knowledge—observability and system embeddedness—and their influence over the level of unit autonomy and interunit integration in an international network of R&D units. Statistical analysis of questionnaire responses from 110 R&D unit managers show strong association between the dimensions of knowledge and organization structure. It also indicates partial support for the "fit" hypothesis in contingency theory. The paper makes two important contributions to the knowledge management literature. First, we find support for the contingency logic, suggesting that effective organization design has to take into account the underlying characteristics of the firm's knowledge base. Second, we shed light on a relatively neglected dimension of knowledge that we call system embeddedness. This is the extent to which knowledge is a function of the social and physical system in which it exists. In the statistical analysis it emerges as a strong predictor of organization structure. Moreover, it also appears to be conceptually distinct from the tacit-articulate dimension that is normally emphasized. This allows us to speculate on four generic forms that a firm's knowledge might take, that we label integrated, isolated, opaque, and transparent. These are discussed using example, from the data.

Black, J. A. and K. B. Boal (1994). "Strategic resources - traits, configurations and paths to sustainable competitive advantage." Strategic Management Journal **15**(Summer): 131-148.

The resource-based view (RBV) of the firm holds that certain assets with certain characteristics will lead to sustainable competitive advantage. All the traits are required to be present to result in sustainable competitive advantage. Such a trait approach overlooks the dynamics of the creation of firm resources especially the strategically important factors as identified by the resource based

view theory. We propose that the resources are made up of factor networks which have specific interfactor and inter-resource relationships that result in the characteristic traits being evidenced. These strategic resource factor relationships include network type, available substitutes and cogency relationships (compensatory, enhancing and suppressing.) Specific configurations that lead to high or very high support of sustainable competitive advantage are proposed. Twenty-two specific paths to sustainable competitive advantage for a factor, contingent on resource factor traits and relationship configurations, are proposed. The implications, upon confirmation of these configurations, are discussed.

Boland, R. J., J. Singh, et al. (2001). "Knowledge representations and knowledge transfer." Academy of Management Journal 44(2): 393-417.

Cognitive and learning theories were used to develop a framework in which different knowledge representations prime recipients with different schemata and thereby differentially affect their decision making. We evaluated interpretive, general, and particular knowledge representations in a laboratory experiment with managers. The hypotheses received mixed support, with significant results indicating the importance of particular knowledge representations in managerial decision making and an intriguing role for interpretive knowledge representations.

Bresman, H., J. Birkinshaw, et al. (1999). "Knowledge transfer in international acquisitions." Journal of International Business Studies 30(3): 439-462.

This paper reports on a multimethod study of knowledge transfer in international acquisitions. Using questionnaire data we show that the transfer of technological know-how is facilitated by communication, visits & meetings, and by time elapsed since acquisition, while the transfer of patents is associated with the articulability of the knowledge, the size of the acquired unit, and the recency of the acquisition. Using case study data, we show that the immediate post-acquisition period is characterized by imposed one-way transfers of knowledge from the acquirer to the acquired, but over time this gives way to high-quality reciprocal knowledge transfer.

Brown, J. S. and P. Duguid (2001). "Knowledge and organization: A social-practice perspective." Organization Science 12(2): 198-213.

While the recent focus on knowledge has undoubtedly benefited organizational studies, the literature still presents a sharply contrasting and even contradictory view of knowledge, which at times is described as "sticky" and at other times "leaky." This paper is written on the premise that there is more than a problem with metaphors at issue here, and more than accounts of different types of knowledge (such as "tacit" and "explicit") can readily explain. Rather, these contrary descriptions of knowledge reflect different, partial, and sometimes "balkanized" perspectives from which knowledge and organization are viewed. Taking the community of practice as a unifying unit of analysis for understanding knowledge in the firm, the paper suggests that often too much attention is paid to the idea of community, too little to the implications of practice. Practice, we suggest, creates epistemic differences among the communities within a firm, and the firm's advantage over the market lies in dynamically coordinating the knowledge produced by these communities despite such differences. In making this argument, we argue that analyses of systemic innovation should be extended to embrace all firms in a knowledge economy, not just the classically innovative. This extension will call for a transformation of conventional ideas coordination and of the trade-off between exploration and exploitation.

Cohen, M. D. and P. Bacdayan (1994). "Organizational Routines Are Stored as Procedural Memory - Evidence from a Laboratory Study." Organization Science 5(4): 554-568.

Organizational routines-multi-actor, interlocking, reciprocally-triggered sequences of actions-are a major source of the reliability and speed of organizational performance. Without routines, organizations would lose efficiency as structures for collective action. But these frequently repeated action sequences can also occasionally give rise to serious suboptimality, hampering performance when they are automatically transferred onto inappropriate situations. While the knowledgeable design and redesign of routines presents a likely lever for those wishing to enhance

organizational performance, the lever remains difficult to grasp because routines are hard to observe, analyze, and describe. This paper argues that new work in psychology on "procedural" memory may help explain how routines arise, stabilize and change. Procedural memory has close links to notions of individual skill and habit. It is memory for how things are done that is relatively automatic and inarticulate, and it encompasses both cognitive and motor activities. We report an experiment in which paired subjects developed interlocked task performance patterns that display the chief characteristics of organizational routines. We show evidence from their behavior supporting the claim that individuals store their components of organizational routines in procedural memory. If routines are stored as distributed procedural memories, this may be the source of distinctive properties reported by observers of organizational routines. The paper concludes with implications for both research and practice.

Cohen, S. (1998). "Big ideas for trainers in small companies." Training & Development **52**(4): 26+.

Big firms like AT&T and Hewlett-Packard spend millions of dollars on training, but what if your company has 150 employees or fewer and you are the training department? Does that mean that you can't offer the same kind of training solutions as the industry giants do? Probably not. But you can assess your training needs and start searching out some creative options. Much training in small firms is done on an informal basis by people who aren't traditional trainers. For example, the IS department may conduct soft-ware training. But there are alternatives. Cohen talked with trainers in small companies to learn their creative solutions to lack of training resources. One suggested recruiting volunteers from local colleges and universities, the local chamber of commerce, and professional associations. Many professionals are willing to conduct free seminars in exchange for free publicity of their services. Employees can meet for brown bag lunches to share knowledge in such areas as using new software or handling difficult customers. Or, small firms can form a consortium to pool training resources and share costs. The article points out that email, listservs, and discussion groups on the Internet have made it easier for professionals to share problems and collaborate on solutions. Last, the article shows how even a small firm can have a big training strategy by developing a training philosophy.

Cox, T. H., S. A. Lobel, et al. (1991). "Effects of ethnic group cultural differences on cooperative and competitive behavior on a group task." Academy of Management Journal **34**(4): 827-847.

Empirical evidence is found that ethnic group differences affect at least some aspects of behavior in task groups. In the study, student subjects were assigned to ethnically diverse or all-Anglo groups, and a Prisoner's Dilemma task was used in which participants could choose to compete or cooperate with another party. It is found that at an individual level, Asian, black, and Hispanic individuals have a more collectivist-cooperative orientation to a task than do Anglo individuals. The analysis also finds that the knowledge of this individual-level difference can be drawn on to predict differences in group behavior on a group decision-making task. Behavioral differences tend to increase when the situational cues favor cooperation. Since the workforce will increasingly be composed of members of non-Anglo groups in the future, the behavioral differences that were found may have a significant impact on how work is done in organizations

Cramton, C. D. (2001). "The mutual knowledge problem and its consequences for dispersed collaboration." Organization Science **12**(3): 346-371.

This paper proposes that maintaining "mutual knowledge" is a central problem of geographically dispersed collaboration and traces the consequences of failure to do so. It presents a model of these processes which is grounded in study of thirteen geographically dispersed teams. Five types of problems constituting failures of mutual knowledge are identified: failure to communicate and retain contextual information, unevenly distributed information, difficulty communicating and understanding the salience of information, differences in speed of access to information, and difficulty interpreting the meaning of silence. The frequency of occurrence and severity of each problem in the teams are analyzed. Attribution theory, the concept of cognitive load, and feedback dynamics are harnessed to explain how dispersed partners are likely to interpret failures of mutual knowledge and the consequences of these interpretations for the integrity of the effort. In

particular, it is suggested that unrecognized differences in the situations, contexts, and constraints of dispersed collaborators constitute "hidden profiles" that can increase the likelihood of dispositional rather than situational attribution, with consequences for cohesion and learning. Moderators and accelerators of these dynamics are identified, and implications for both dispersed and collocated collaboration are discussed.

Cross, R., A. Parker, et al. (2001). "Knowing what we know: Supporting knowledge creation and sharing in social networks." *Organizational Dynamics* 30(2): 100-120.

Despite the ubiquity and increasing ease of access to vast stores of data, people still rely heavily on other people for information and problem solving. Executives must pay more attention to the sets of relationships that people rely on for these purposes. This article reports results from a research program designed to help managers probe knowledge creation, sharing and learning in strategically important networks of employees.

Crosswaite, C. and L. Curtice (1994). "Disseminating Research Results - the Challenge of Bridging the Gap between Health Research and Health Action." *Health Promotion International* 9(4): 289-296.

Dissemination is now acknowledged as an important component of the research process. A Scottish-based project has researched theoretical and practical aspects of dissemination for health promotion research. This project included: a literature review, annotated bibliography, guideline document and a series of workshops in Scotland. Dissemination is about the communication of innovation, this being either a planned and systematic process or a passive, unplanned diffusion process. The utilization of research findings in policy or practice is in many instances a subtle and indirect process. Effective communication is an important aspect of dissemination. However, because the audience for health promotion research is heterogeneous, dissemination has to meet the various requirements of different users. There are many barriers to effective communication between researchers and users. These include: career structures, institutional barriers, ownership issues, barriers relating to the protracted process of publishing in academic journals, technical barriers and problems related to secrecy and lack of trust. Enhancing dialogue between researchers and users, developing new contacts and networks, the creation of Research Liaison Officers and developing effective dissemination strategies can bridge the communication gap. The current contract culture in which health promotion research is commissioned could result in a more controlled and limited dissemination stage. It is argued that researchers have a duty to share new knowledge with a wider audience including the general public. Effective dissemination requires an active and systematic approach which is adequately resourced throughout.

Cummings, J. L. (2002). Knowledge Transfer Across R&D Units: An Empirical Investigation of the Factors Affecting Successful Knowledge Transfer Across Intra- and Inter-Organizational Units. *School of Business and Public Management*. Washington, DC, George Washington University: 271.

The importance of effective organizational learning to sustainable competitive advantage has received increased attention recently in many disciplines. This study examined one aspect of organizational learning, namely, the contextual factors that impact upon the intra- and inter-firm transfer of knowledge. The research model for this study draws on the organizational learning theories of Nonaka (1994), Dixon (1994) and Yeung, Ulrich, Nason & von Glinow (1999) and integrates several conceptual models related to knowledge transfer at different levels of analysis (Argote & Ingram, 2000) and within different organizational governance modes (Kostova, 1999; Inkpen, Dinur & Hamilton, 1998; Dixon, 2000; Choi & Lee, 1997; Lyles & Salk, 1996). A synthesis of these literatures resulted in a research model that includes ten factors affecting transfer success. These ten factors include two related to the knowledge transferred, (1) articulability and (2) embeddedness; five related to the distance between the units, including (3) organizational distance, (4) physical distance, (5) institutional distance, (6) knowledge distance, and (7) relationship distance; one related to the transfer actions undertaken to support knowledge transfer, (8) transfer activities; and two related to the recipient unit, namely, (9) motivation of the recipient, and (10) organizational learning culture. This study used the Total Design Method mail-survey questionnaire approach (Dillman, 1978) to sample technology executives in large and

medium sized companies operating in high technology sectors. Based on preliminary data analysis, a revised set of twelve hypothesized main-effect relationships was tested using hierarchical multiple regression analysis of the 69 usable responses obtained. Seven of these hypotheses, at least one from each of the knowledge, distance, transfer activities, and recipient contexts, were found statistically significant. Specifically, knowledge articulability, knowledge embeddedness, norm distance (a sub-variable within relationship distance), and basic transfer activities were each supported at the 0.01 level; knowledge distance was supported at the 0.05 level; and organizational distance and recipient motivation were each supported at the 0.1 level. Since many of these factors are within the realm of managerial control, identification of their relative influence on transfer success could prove vital in the development of effective knowledge transfer protocols.

Cummings, J. N. (2001). *Work Groups and Knowledge Sharing in a Global Organization*, Carnegie Mellon University.

Groups incur a number of internal costs when members work in different geographic locations and represent different functional areas. For example, it can be difficult for distributed group members to develop a common understanding of the task, or for cross-functional group members to reconcile dissimilar points of view. Relatively little scholarly attention, however, has been given to the external benefits that distributed or cross-functional group members have available to them. These include access to diverse sources of knowledge, such as customers in a variety of locations or non-group employees from different functions. Past studies have shown a positive relationship between external knowledge sharing and work group performance. This thesis extends previous research by examining whether distributed or cross-functional groups benefit from external knowledge sharing more than co-located or functionally homogeneous groups. I surveyed 182 work groups in a Fortune 500 corporation to assess how often members shared general overviews, specific requirements, analytical techniques, progress reports, and project results within and outside of the group. Members were located around the world, they represented numerous functional areas, and they worked on tasks ranging from product development to manufacturing operations. Senior managers in the company rated each work group on their performance. I hypothesized and found that both internal and external knowledge sharing were positively related to group performance. Building on social network theory, I also hypothesized and found that as geographic distribution and cross-functionality increased, the relationship between external knowledge sharing and group performance became even stronger. These results suggest that external networks can provide distributed or cross-functional group members with access to unique task information, know-how, and feedback.

Cummings, J. N. (in press). "Works groups, structural diversity, and knowledge sharing in a global organization." *Management Science*.

Work groups in organizations must exchange information, know-how, and feedback among members and with the outside to be effective. Moreover, external knowledge sharing is likely to increase in importance as organizations create work groups with diverse structures – members who are dispersed across different geographic locations, who represent different functional assignments, who report to different managers, or who reside in different business units. Building on social network theory, this paper argues that variation in features of group structure, termed structural diversity, can increase the value of external knowledge sharing by exposing members to unique sources of knowledge. Using corporate database records, group member surveys, and senior executive's ratings of performance, a field study of 182 work groups in a global organization reveals that external knowledge sharing is more strongly associated with performance when groups have greater structural diversity. In contrast, groups with greater demographic diversity, such as member differences in sex, age, and tenure, do not reap the same performance benefits from external knowledge sharing.

Darr, E. D., L. Argote, et al. (1995). "The acquisition, transfer, and depreciation of knowledge in service organizations: Productivity in franchises." *Management Science* 41(11): 1750-1762.

The paper examines the acquisition, depreciation and transfer of knowledge acquired through learning by doing in service organizations. The analysis is based on weekly data collected over a one and a half year period from 36 pizza stores located in Southwestern Pennsylvania. The 36 stores, which are franchised from the same corporation, are owned by 10 different franchisees. We find evidence of learning in these service organizations: as the organizations gain experience in production, the unit cost of production declines significantly. Knowledge acquired through learning by doing is found to depreciate rapidly in these organizations. Knowledge is found to transfer across stores owned by the same franchisee but not across stores owned by different franchisees. Theoretical and practical implications of the work are discussed.

Darr, E. D. and T. R. Kurtzberg (2000). "An investigation of partner similarity dimensions on knowledge transfer." Organizational Behavior and Human Decision Processes **82**(1): 28-44.

Learning from the experiences of others can provide significant benefits for an organization, but it can be difficult to know who has the most useful or applicable knowledge. Knowledge is acquired from many sources: from within the firm; from other firms; or from competitors, customers, suppliers, and channel partners. Managers must decide how to efficiently search through a universe of potential knowledge sources to select the knowledge that will be the most useful to them. This research examines the conditions under which partner similarity enhances knowledge transfer. Previous research has argued that partner similarity influences knowledge sharing through attraction. Building on past work, our research argues that attraction is only one mechanism by which partner similarity affects knowledge transfer and introduces the idea that partner similarity aids the search through a universe of potential knowledge sources. The dimensions of partner similarity that allow more efficient search will facilitate knowledge transfer, while those similarity dimensions that do not aid search will have a less important impact on transfer. Data from both quantitative and qualitative sources support these hypotheses.

Quantitative analyses show that strategic similarity emerges as a more important dimension than customer or location similarities as a significant predictor of knowledge transfer. Qualitative interview data show that businesses are conscious of the strategic similarities within their industry and choose transfer partners accordingly.

Davenport, T. H. and L. Prusak (2000). Working Knowledge: How Organizations Manage What They Know. Boston, Harvard Business School Press.

Broad definition of knowledge, concept of knowledge markets. How to generate, codify, coordinate, and transfer knowledge. KM technologies overview

Dickstein, R. and K. B. McBride (1998). "Listserv lemmings and fly-brarians on the wall: A librarian-instructor team taming the cyberbeast in the large classroom." College & Research Libraries **59**(1): 10-17.

Computer technologies, in both the library and the classroom, have the potential to serve the aims of liberatory pedagogies, especially when used creatively to empower students in the shared construction of knowledge. However, such empowerment can happen only if students are given the tools to find their way through the ever-increasing complexity of print and online resources. This article shows how a reference librarian and a faculty member can team up effectively to teach research strategies and critical thinking skills (including analysis and evaluation of resources, so necessary for the Internet) in a large classroom through careful use of a list (e-mail forum) and focused research assignments. Such strategies revolutionize the ways that reference librarians do their work, greatly increasing their interaction with students by overcoming students' reluctance to seek help and their fear of computerized resources. Librarian, instructor, and student become partners in the creation, evaluation, and dissemination of scholarly information.

Dixon, N. M. (2000). Common knowledge: How companies thrive by sharing what they know. Boston, MA, Harvard Business School Press.

Dyer, J. H. and K. Nobeoka (2000). "Creating and managing a high-performance knowledge-sharing network: The Toyota case." Strategic Management Journal **21**(3): 345-367.

Previous research suggests that knowledge diffusion occurs more quickly within Toyota's production network than in competing automaker networks. In this paper we examine the 'black box' of knowledge sharing within Toyota's network and demonstrate that Toyota's ability to effectively create and manage network-level knowledge-sharing processes at least partially explains the relative productivity advantages enjoyed by Toyota and its suppliers. We provide evidence that suppliers do learn more quickly after participating in Toyota's knowledge-sharing network. Toyota's network has solved three fundamental dilemmas with regard to knowledge sharing by devising methods to (1) motivate members to participate and openly share valuable knowledge (while preventing undesirable spillovers to competitors), (2) prevent free riders, and (3) reduce the costs associated with finding and accessing different types of valuable knowledge. Toyota has done this by creating a strong network identity with rules for participation and entry into the network. Most importantly, production knowledge is viewed as the property of the network. Toyota's highly interconnected, strong tie network has established a variety of institutionalized routines that facilitate multidirectional knowledge flows among suppliers. Our study suggests that the notion of a dynamic learning capability that creates competitive advantage needs to be extended beyond firm boundaries. Indeed, if the network can create a strong identity and coordinating rules then it will be superior to a firm as an organizational form at creating and recombining knowledge due to the diversity of knowledge that resides within a network.

El Sawy, O. A., I. Eriksson, et al. (2001). "Understanding shared knowledge creation spaces around business processes: precursors to process innovation implementation." International Journal of Technology Management 22(1-3): 149-173.

The thesis of this paper is that the implementation success of process innovations is facilitated by having an organizational environment that is conducive to effective shared knowledge creation around the process that is being improved. The paper describes a research study to better understand shared knowledge creation around business processes by developing a model of shared knowledge spaces that includes catalysts, organizational values, information technology infrastructure, and SKC processes. The context used is the new product development process in two high technology companies in Finland. Findings are presented and implications for creating effective shared knowledge creation environments are drawn. The paper ends with a call for creating such spaces as precursors to process innovation implementation.

Epple, D., L. Argote, et al. (1991). "Organizational learning curves: A method for investigating intra-plant transfer of knowledge acquired through learning by doing." Organization Science 2(1): 58-70.

This paper illustrates how a learning-curve model can be generalized to investigate potential explanations of organizational learning. The paper examines the hypothesis that knowledge acquired through by learning by doing is embodied in an organization's technology by analyzing the amount of transfer that occurs across shifts within a plant. If knowledge becomes completely embodied in technology, transfer across shifts should be complete since both shifts use the same technology. Methods that can be used for studying intra-plant transfer of knowledge are presented. The methods are illustrated by analyzing data from a plant that began production with one shift and then added a second shift several months into the production program. Three aspects of transfer are analyzed: (1) carry forward of knowledge when the plant makes the transition from one to two shifts, (2) transfer across shifts after both shifts are operating, and (3) transfer across time. Results indicate that substantial, but less than complete, transfer of knowledge occurred when the second shift was introduced. Once both shifts were operating, partial transfer across them occurred. Implications of the results for a theory of organizational learning and practical applications are discussed.

Gruenfeld, D. H., P. V. Martorana, et al. (2000). "What do groups learn from their worldliest members? Direct and indirect influence in dynamic teams." Organizational Behavior and Human Decision Processes 82(1): 45-59.

This study investigated the consequences of temporary membership changes for itinerant members (who leave their group of origin temporarily to visit a foreign work group) and indigenous

members of those origin and foreign groups, We tested the hypothesis that itinerant members' unique knowledge and experience can be transferred from the group where it originated to another group engaged in the same activities. Results showed that all members produced more unique ideas after itinerant members returned to their group of origin than before they left or while they were away; however, the ideas of itinerant members were significantly less likely to be utilized by the group in an essay on group work. After their return, itinerant members were perceived as highly involved in group activity, but also more argumentative, and although they produced more unique ideas than indigenous members, their essay contributions were perceived as less valuable. As a result, itinerant group members had less direct influence after changing groups than they did prior to the membership change. (C) 2000 Academic Press.

Hamel, G. (1991). "Competition for Competence and Inter-Partner Learning within International Strategic Alliances." Strategic Management Journal **12**: 83-103.

Global competition highlights asymmetries in the skill endowments of firms. Collaboration may provide an opportunity for one partner to internalize the skills of the other and thus improve its position both within and without the alliance. Detailed analysis of 9 international alliances yielded a fine-grained understanding of the determinants of inter-partner learning. The study suggests that not all partners are equally adept at learning and that asymmetries in learning alter the relative bargaining power of partners. It also is suggested that stability and longevity may be inappropriate metrics of partnership success, that partners may have competitive as well as collaborative aims in relation to each other, and that process may be more important than structure in determining learning outcomes. There appear to be 2 mechanisms for extracting value from an alliance: 1. bargaining over the stream of economic benefits that issues directly from the successful execution of joint tasks, and 2. internalizing the skills of partners.

Hamel, G. and C. K. Prahalad (1993). "Strategy as Stretch and Leverage." Harvard Business Review **71**(2): 75-84.

Signs of revolutionary transformation in the global computer industry are everywhere. A roll call of the major industry players reads like a waiting list in the emergency room. The usual explanations for the industry's turmoil are at best inadequate. Scale, friendly government policies, manufacturing capabilities, a strong position in desktop markets, excellent software, top design skills - none of these is sufficient, either by itself or in combination, to ensure competitive SUCCEsSs in information technology. A new paradigm is required to explain patterns of success and failure. Simply stated, success flows to the company that manages to establish proprietary architectural control over a broad, fast-moving, competitive space. Architectural strategies have become cruCial to information technology because of the astonishing rate of improvement in microprocessors and other semiconductor components. Since no single vendor can keep pace with the outpouring of cheap, powerful, mass-produced components, customers insist on stitching together their own local systems solutions. Architectures impose order on the system and make the interconnections possible. The architectural controller is the company that controls the standard by which the entire information package is assembled. Microsoft's Windows is an excellent example of this. Because of the popularity of Windows, companies like Lotus must conform their software to its parameters in order to compete for market share. In the 1990s, proprietary architectural control is not only possible but indispensable to competitive success. What's more, it has broader implications for organizational structure: architectural competition is giving rise to a new form of business organization.

Hansen, M. T. (1999). "The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits." Administrative Science Quarterly **44**(1): 82-111.

This paper combines the concept of weak ties from social network research and the notion of complex knowledge to explain the role of weak ties in sharing knowledge across organization subunits in a multiunit organization. I use a network study of 120 new-product development projects undertaken by 41 divisions in a large electronics company to examine the task of developing new products in the least amount of time. Findings show that weak interunit ties help a

project team search for useful knowledge in other subunits but impede the transfer of complex knowledge, which tends to require a strong tie between the two parties to a transfer. Having weak interunit ties speeds up projects when knowledge is not complex but slows them down when the knowledge to be transferred is highly complex. I discuss the implications of these findings for research on social networks and product innovation.

Hansen, M. T. (2002). "Knowledge networks: Explaining effective knowledge sharing in multiunit companies." *Organization Science* **13**(3): 232-248.

This paper introduces the concept of knowledge networks to explain why some business units are able to benefit from knowledge residing in other parts of the company while others are not. The core premise of this concept is that a proper understanding of effective interunit knowledge sharing in a multiunit firm requires a joint consideration of relatedness in knowledge content among business units and the network of lateral interunit relations that enables task units to access related knowledge. Results from a study of 120 new product development projects in 41 business units of a large multiunit electronics company showed that project teams obtained more existing knowledge from other units and completed their projects faster to the extent that they had short interunit network paths to units that possessed related knowledge. In contrast, neither network connections nor extent of related knowledge alone explained the amount of knowledge obtained and project completion time. The results also showed a contingent effect of having direct interunit relations in knowledge networks: While established direct relations mitigated problems of transfer-ring noncodified knowledge, they were harmful when the knowledge to be transferred was codified, because they were less needed but still involved maintenance costs. These findings suggest that research on knowledge transfers and synergies in multiunit firms should pursue new perspectives that combine the concepts of network connections and relatedness in knowledge content.

Hargadon, A. and R. I. Sutton (1997). "Technology brokering and innovation in a product development firm." *Administrative Science Quarterly* **42**(4): 716-749.

We blend network and organizational memory perspectives in a model of technology brokering that explains how an organization develops innovative products. The model is grounded in observations, interviews, informal conversations, and archived data gathered during an ethnography of IDEO, a product design firm. This firm exploits its network position, working for clients in at least 40 industries, to gain knowledge of existing technological solutions in various industries. It acts as a technology broker by introducing these solutions where they are not known and, in the process, creates new products that are original combinations of existing knowledge from disparate industries. Designers exploit their access to a broad range of technological solutions with organizational routines for acquiring and storing this knowledge in the organization's memory and, by making analogies between current design problems and the past solutions they have seen, retrieving that knowledge to generate new solutions to design problems in other industries. We discuss the implications of this research for understanding the individual and organizational processes and norms underlying technology and knowledge transfer more generally.

Hoopes, D. G. and S. Postrel (1999). "Shared knowledge, 'glitches', and product development performance." *Strategic Management Journal* **20**(9): 837-865.

Much recent thought in strategy has stressed the importance of organizational integration for competitive advantage. Empirical studies of product development have supported this emphasis by correlating integrating practices and superior performance. We propose, from a resource-based or capability view, that this correlation results from integration leading to patterns of shared knowledge among firm members, with the shared knowledge constituting a resource underlying product development capability. To explore this connection, we examine the product development efforts of a scientific software company. We define the glitch as a costly error possible only because knowledge was not shared, and measure the influence of glitches on firm performance. At this company, gaps in shared knowledge did cause the company to incur significant excess costs.

We also identify a set of syndromes that can lead to glitches, and measure the relative importance of these syndromes. The glitch concept may offer a general tool for practical measurement of the marginal benefits of shared knowledge.

Horem, T., G. von Krogh, et al. (1996). Knowledge-based strategic change. Managing Knowledge: Perspectives on Cooperation and Competition. G. von Krogh and J. Roos. London, Sage.

Kale, P., H. Singh, et al. (2000). "Learning and protection of proprietary assets in strategic alliances: Building relational capital." Strategic Management Journal 21(3): 217-237.

One of the main reasons that firms participate in alliances is to learn know-how and capabilities from their alliance partners. At the same time firms want to protect themselves from the opportunistic behavior of their partner to retain their own core proprietary assets. Most research has generally viewed the achievement of these objectives as mutually exclusive. In contrast, we provide empirical evidence using large-sample survey data to show that when firms build relational capital in conjunction with an integrative approach to managing conflict, they are able to achieve both objectives simultaneously. Relational capital based on mutual trust and interaction at the individual level between alliance partners creates a basis for learning and know-how transfer across the exchange interface. At the same time, it curbs opportunistic behavior of alliance partners, thus preventing the leakage of critical know-how between them. Copyright (C) 2000 John Wiley & Sons, Ltd.

Kim, P. H. (1997). "When what you know can hurt you: A study of experiential effects on group discussion and performance." Organizational Behavior and Human Decision Processes 69(2): 165-177.

This study compares several mechanisms that might affect the tendency of groups to focus on common rather than uniquely held information. It uses this framework to investigate how this discussion bias and, ultimately, task performance might change as groups initially gain experience with the team and/or task. Groups with both task and team experience were found to display a larger bias toward discussing common information and achieve lower task performance than groups with only task experience, only team experience, or neither task nor team experience. Increases in the discussion bias were also found to lower task scores. Finally, even when all items of information (both common and unique) were mentioned (and regardless of the experience gained), delays in mentioning the first unique item of information were found to significantly lower performance.

Kogut, B. (2000). "The network as knowledge: Generative rules and the emergence of structure." Strategic Management Journal 21(3): 405-425.

The imputation problem is how to account for the sources of the value of the firm. I propose that part of the value of the firm derives from its participation in a network that emerges from the operation of generative rules that instruct the decision to cooperate. Whereas the value of firm-level capabilities is coincidental with the firm as the unit of accrual, ownership claims to the value of coordination in a network pit firms potentially in opposition with one another. We analyze the work on network structure to suggest two types of mechanisms by which rents are distributed. This approach is applied to an analysis of the Toyota Production System to show how a network emerged, the rents were divided to support network capabilities, and capabilities were transferred to the United States.

Kogut, B. and U. Zander (1992). "Knowledge of the firm, combinative capabilities, and the replication of technology." Organization Science 3(3): 383-397.

How should we understand why firms exist? A prevailing view has been that they serve to keep in check the transaction costs arising from the self-interested motivations of individuals. We develop in this article the argument that what firms do better than markets is the sharing and transfer of the knowledge of individuals and groups within an organization. This knowledge consists of information (e.g., who knows what) and of know-how (e.g., how to organize a research team). What is central to our argument is that knowledge is held by individuals, but is also expressed in

regularities by which members cooperate in a social community (i.e., group, organization, or network). If knowledge is only held at the individual level, then firms could change simply by employee turnover. Because we know that hiring new workers is not equivalent to changing the skills of a firm, an analysis of what firms can do must understand knowledge as embedded in the organizing principles by which people cooperate within organizations. Based on this discussion, a paradox is identified: efforts by a firm to grow by the replication of its technology enhances the potential for imitation. By considering how firms can deter imitation by innovation, we develop a more dynamic view of how firms create new knowledge. We build up this dynamic perspective by suggesting that firms learn new skills by recombining their current capabilities. Because new ways of cooperating cannot be easily acquired, growth occurs by building on the social relationships that currently exist in a firm. What a firm has done before tends to predict what it can do in the future. In this sense, the cumulative knowledge of the firm provides options to expand in new but uncertain markets in the future. We discuss at length the example of the make/buy decision and propose several testable hypotheses regarding the boundaries of the firm, without appealing to the notion of "opportunism."

Kogut, B. and U. Zander (1996). "What firms do? Coordination, identity, and learning." Organization Science 7(5): 502-518.

Firms are organizations that represent social knowledge of coordination and learning. But why should their boundaries demarcate quantitative shifts in the knowledge and capability of their members? Should not knowledge reside also in a network of interacting firms? This line of questioning presents the challenge to state an alternative view to the "theory of the firm," a theory that has moved from Cease's early treatment of what firms do to a concern with ownership, incentives, and self-interest. We return to Cease's original insight in understanding the cost and benefits of a firm but based on a view that individuals are characterized by an "unsocial sociality." Does the perception of opportunism generate the need to integrate market transactions into the firm, or do boundaries of the firm lead to the attribution of opportunism? This basic dichotomy between self-interest and the longing to belong is the behavioral underpinning to the superiority of firms over markets in resolving a fundamental dilemma: productivity grows with the division of labor but specialization increases the costs of communication and coordination. The knowledge of the firm has an economic value over market transactions when identity leads to social knowledge that supports coordination and communication. Through identification, procedural rules are learned, and coordination and communication are facilitated across individuals and groups of diverse specialized competence. A firm is distinct from a market because coordination, communication, and learning are situated not only physically in locality, but also mentally in an identity. Since identity implies a moral order as well as rules of exclusion, there are limitations and costs to relying upon a firm for exchange as opposed to the market. These costs are not necessarily those traditionally assigned to the category of decreasing returns to hierarchy. For example, an identity implies that some practices, and business, may be notionally inconsistent with each other. Norms of procedural justice that are identified with a firm imply that not all technically feasible complements are permissible within the logic of a shared identity. There is consequently a cost to an identity that offsets the benefits. Because the assemblage of elements that compose an organization are subject to requirements of consistency, identities rule out potentially interesting avenues of innovation and creativity. We illustrate these ideas by returning to the original prisoners' dilemma game and by an analysis of the coherence of a firm as a search for complements that are consistent with norms of procedural justice. We argue that the underlying dynamic of a prisoners' dilemma game reveals the problems of coordination, communication, and conflicts in norms of justice when players are deprived of social knowledge and shared identity. Similarly, the determination of a firm's coherence arises out of the demand for a moral and notional consistency in the "categorization" of its activities, as opposed to a technological necessity. These ideas are illustrated through an empirical examination of logical complements in high performance work systems.

Kostova, T. (1999). "Transnational transfer of strategic organizational practices: A contextual perspective." Academy of Management Review **24**(2): 308-324.

To examine the phenomenon of the transnational transfer of strategic organizational practices within multinational companies, I use a cross-disciplinary approach. After conceptualizing the success of a transfer as the institutionalization of the practice at the recipient unit. I develop a multilevel model of transfer success, based on the notion of the contextual embeddedness of the process of transfer. I propose that three sets of factors at three levels- country, organization and individual-affect transfer success reflecting social, organizational. and relational embeddedness. Finally, I discuss the theoretical and practical implications of this research.

Kriwet, C. K. (1997). *Inter- and Intraorganizational Knowledge Transfer*, University of St. Gallen.

Langan-Fox, J., S. Code, et al. (2000). "Team mental models: Techniques, methods, and analytic approaches." Human Factors **42**(2): 242-271.

Effective team functioning requires the existence of a shared or team mental model among members of a team. However, the best method for measuring team mental models is unclear. Methods reported vary in terms of how mental model content is elicited and analyzed or represented. We review the strengths and weaknesses of various methods that have been used to elicit, represent, and analyze individual and team mental models and provide recommendations for method selection and development. We describe the nature of mental models and review techniques that have been used to elicit and represent them. We focus on a case study on selecting a method to examine team mental models in industry. The processes involved in the selection and development of an appropriate method for eliciting, representing, and analyzing team mental models are described. The criteria for method selection were (a) applicability to the problem under investigation; (b) practical considerations - suitability for collecting data from the targeted research sample; and (c) theoretical rationale - the assumption that associative networks in memory are a basis for the development of mental models. We provide an evaluation of the method matched to the research problem and make recommendations for future research. The practical applications of this research include the provision of a technique for analyzing team mental models in organizations, the development of methods and processes for eliciting a mental model from research participants in their normal work environment, and a survey of available methodologies for mental model research.

Langan-Fox, J., A. Wirth, et al. (2001). "Analyzing shared and team mental models." International Journal of Industrial Ergonomics **28**(2): 99-112.

In recent years, there has been a resurgence of interest in the notion of shared cognition. Subsequent to this interest, two similar yet distinct concepts have emerged: 'shared mental models' and 'team mental models'. A 'shared mental model' can be described as the extent to which a dyad of individuals possesses a similar cognitive representation of some situation or phenomenon. The notion of 'team mental model', is distinct from that of a shared mental model in that it refers to shared cognition in a team as a collectivity, not shared cognition among dyads of individuals, which the alternative phrase 'shared mental models' does allow. While a number of techniques have been developed to measure mental model similarity dyadically, appropriate measures of team mental models have eluded researchers. This issue presents a problem for the evolution of the team mental model concept in psychology and the establishment of its validity, for example, as a predictor of team performance. The primary aim of the current paper was to describe the application of randomization tests as a new method for measuring mental model similarity at the team level, that is the measurement of team mental models. A secondary aim was to apply this technique to examine team mental models (of team functioning) in shop floor teams and shared mental models (of team functioning) among shop floor team members, teamwork 'experts' and managers. The advantages and disadvantages of the technique are discussed.

Lee, J. N. (2001). "The Impact of Knowledge Sharing, Organizational Capability and Partnership Quality on IS Outsourcing Success." Information & Management **38**(5): 323-335.

In recent studies, there has been much interest in knowledge sharing between the service receiver and provider through an outsourcing partnership and its effect on Information Systems (IS) outsourcing success. This study examines the relationship between knowledge sharing and outsourcing success. The effect of the ability of the service receiver to absorb the needed knowledge and of companies to build a partnership on these relationships are modelled and hypotheses defined. These were tested using a sample of 195 public sector organizations in Korea. Findings indicate that all hypothesized paths in the model are significant. (C) 2001 Elsevier Science B.V. All rights reserved.

Leonard-Barton, D. (1995). Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation. Boston, Harvard Business School Press.

Part One: The nature of core capabilities and rigidities

Core capabilities

Core rigidities

Part Two: Key innovation activities

Shared problem solving

Implementing and integrating new processes and tools

Experimenting and prototyping

Importing and absorbing technological knowledge from outside of the firm

Learning from the market

Part Three: Growth and renewal

Transferring product development capabilities into developing nations

Continuous wellsprings

Levesque, L. L., J. M. Wilson, et al. (2001). "Cognitive divergence and shared mental models in software development project teams." Journal of Organizational Behavior **22**: 135-144.

This study examined the development of shared mental models in software development teams over time. Contrary to predictions, team members' mental models about the group's work and each other's expertise did not become more similar over time. Structural equation modelling revealed that as role differentiation increased in these teams, it led to a decrease in interaction and a corresponding decline in shared mental models. Implications for research on shared cognition and team development are explored. Copyright (C) 2001 John Wiley & Sons, Ltd.

Liyanage, S., P. F. Greenfield, et al. (1999). "Towards a fourth generation R&D management model-research networks in knowledge management." International Journal of Technology Management **18**(3-4): 372-393.

Research and development (R&D) management is increasingly about managing knowledge rather than simply managing its generation. Better management of knowledge is a key success factor for industry competitiveness through continuous innovation. R&D management processes developed in the past which can be described as the first, second or third generation models deal with concepts, techniques and tools for managing research as an investment portfolio of the firm. These models focus on the creation and diffusion of knowledge internal to the firm. Management of R&D is also about managing knowledge external to the firm and it involves the management of complementary skills, technological dependencies, and knowledge transfers across research links. This paper addresses the concept of research management as the generation of intellectual capital, which drives future businesses and new products. It examines, as a case study, research management practices employed by biotechnology and pharmaceutical research groups in industries and universities and outlines a fourth generation approach to managing research.

Malhotra, Y., Ed. (2000). Knowledge Management and Virtual Organizations. Hershey, London, Idea Group.

The first section covers frameworks, models, analyses, case studies and research on the integration of KM within virtual organizations, virtual teams and virtual communities of practice. Key themes covered in this section include business model innovation; design of virtual organization forms,

including virtual corporations, net-based models, virtual teams and inter-organizational networks; strategies and technologies for KM; tools, techniques and methodologies for enabling knowledge capture, knowledge sharing and knowledge transfer as well as related collaboration, competition and co-opetition at intra- and inter-organizational levels.

The focus of the second section is on key success factors that are important for enabling knowledge management and realizing virtual models of business transformation. Key KM themes addresses in this section relate to organizational transformation; analysis and design of knowledge systems and processes; role of organizational control systems; creating successful communities of practice; role of internal and external employees and customers in creation of organizational knowledge; knowledge acquisition and management, and information quality issues.

Mathieu, J. E., T. S. Heffner, et al. (2000). "The influence of shared mental models on team process and performance." Journal of Applied Psychology **85**(2): 273-283.

The influence of teammates' shared mental models on team processes and performance was tested using 56 undergraduate dyads who "flew" a series of missions on a personal-computer- based flight combat simulation. The authors both conceptually and empirically distinguished between teammates' task- and team-based mental models and indexed their convergence or "sharedness" using individually completed paired-comparisons matrices analyzed using a network-based algorithm. The results illustrated that both shared-team- and task-based mental models related positively to subsequent team process and performance. Furthermore, team processes fully mediated the relationship between mental model convergence and team effectiveness. Results are discussed in terms of the role of shared cognitions in team effectiveness and the applicability of different interventions designed to achieve such convergence.

McDermott, R. (1999). "Why information technology inspired but cannot deliver knowledge management." California Management Review **41**(4): 103-117.

Recent developments in information technology have inspired many companies to imagine a new way for staff to share knowledge and insights. Instead of storing documents in personal files and sharing personal insights with a small circle of colleagues, they can store documents in a common information base and use electronic networks to share insights with their whole community, even people scattered across the globe. However, most companies soon discover that leveraging knowledge is actually very hard and is more dependent on community building than information technology. This is not because people are reluctant to use information technology, rather it is because they often need to share knowledge that is neither obvious nor easy to document, knowledge that requires a human relationship to think about, understand, share, and appropriately apply. Ironically, while information technology has inspired the "knowledge revolution," it takes building human communities to realize it.

McEvily, S. K., S. Das, et al. (2000). "Avoiding competence substitution through knowledge sharing." Academy of Management Review **25**(2): 294-311.

Causal ambiguity protects distinctive competencies from imitation but might increase a firm's vulnerability to substitution. We suggest that firms can manage this tension by identifying the causes of superior performance and using this knowledge to make their commitments to key stakeholders more credible. Credible commitment allows a firm to influence its stakeholders and thereby simultaneously delay substitution and control the threat of imitation.

Moenaert, R. K., F. Caeldries, et al. (2000). "Communication flows in international product innovation teams." Journal of Product Innovation Management **17**(5): 360-377.

Recently, we have witnessed a strong growth in the internationalization of many firms' product development activities. However, the lack of attention devoted by scientific research to the management of international innovation contrasts sharply with the importance attached to it as a cornerstone of international business success. Although several empirical studies and normative theories have specified the communication requirements in innovation teams, an empirically based insight is definitely needed on the communication requirements and requirements that prevail in

the complex context of international innovation teams, in which the participants are located in different company units, countries, and cultures. This article addresses the following research question: viewing international innovation as an interfunctional activity, what are the communication requirements an international innovation team is facing, and what are the communication capabilities (interface mechanisms) that may be adopted to initiate develop, and launch the new product effectively and efficiently? An extensive case study, research project was designed to develop a comprehensive theoretical framework. Over a two year time period the research team has investigated selected innovation projects in four European multinational corporations. The analysis of the case study data suggests five requirements that determine the effectiveness and efficiency of communication in international product development teams: network transparency, knowledge codification, knowledge credibility, communication cost, secrecy. To cope with these communication requirements, organizations may create firm level capabilities (parallel structures, cross-functional and inter-unit climate, communication infrastructure, goal congruence) and team level capabilities (core team, team leadership, formalization, procedural justice). The evidence from the in-depth case study research indicates that these mechanisms provide a parsimonious and powerful approach to address the communication requirements in international product innovation teams. After the information processing framework proposed by Tushman and Nadler [124], the adoption of these mechanisms is expected to improve innovation effectiveness. This holds important consequences for the management of international product innovation projects. First, the innovating firm must balance centralization and decentralization, employ formal as well as informal strategies, and integrate ad-hoc and permanent strategies. Second, it highlights the critical role of the project leader. Given the fact that companies often select the most available person, rather than the best person for the job, the allocation of light weight project leaders may create heavyweight problems in international teams. Third, following the argument in favor of procedural justice, the absence of involvement may severely hinder cross-functional commitment to international innovation projects. Fourth, the innovating firm must also actively manage the communication flows with external parties. Failure to do so may result in flawed specifications, and a limited understanding about product design and market strategies. (C) 2000 Elsevier Science Inc.

Mohammed, S. and B. C. Dumville (2001). "Team mental models in a team knowledge framework: Expanding theory and measurement across disciplinary boundaries." Journal of Organizational Behavior 22: 89-106.

Because research on team mental models is still in its formative stages, there is a need for continued conceptual development of the construct and direct empirical support linking team mental models to team outcomes. Researchers in other fields have developed concepts that are distinct from, but clearly related to team mental models, including information sharing, transactive memory, group learning, and cognitive consensus. Although these research streams currently exist in parallel with little cross-fertilization, there is much to be gained from integration across disciplinary boundaries. Therefore, the purpose of this paper is to enrich the theoretical understanding of team mental models and to broaden the empirical research base by adopting a cross-disciplinary focus and incorporating related team knowledge domains from other literatures. Based on a synthesis of various literatures, we develop a framework that delineates the relationships among team knowledge constructs. Copyright (C) 2001 John Wiley & Sons, Ltd.

Morales, A., C. Marrero, et al. (1999). "Management knowledge and the technical information center of PDVSA-Intevep." Vision Tecnologica 7(1): 47-52.

Knowledge derived by companies from their operations, K and the timely utilization they might get, provides competitive advantages for the companies. These advantages will mean a better positioning against their competitors. To this end, a capacity to create, capture, handle, inventory transfer information, generate knowledge and implement best practices, in order to add value to the production process, is required. This framework constitutes a transcendental step for the systematic and useful application of knowledge management. Role of Technical Information Centers within knowledge management process of PDVSA is very important, since they provide

and integrate information and knowledge. This paper presents the Technical Information Center (TIC) of PDVSA-Intevep and its contribution to strengthen the corporate technological intelligence. TIC is in charge of the information analysis and technical-scientific knowledge diffusion. Tools created to transfer information and obtain knowledge are described. They are: The petrochemical and oil information network and its data base RIPPET, coordinated by the CIT and CIT EN LINEA, a virtual organization, which offers information services and products, based on client needs.

Mowery, D. C., J. E. Oxley, et al. (1996). "Strategic alliances and interfirm knowledge transfer." Strategic Management Journal **17**: 77-91.

A paper examines interfirm knowledge transfers within strategic alliances. Using a new measure of changes in alliance partners' technological capabilities, based on the citation patterns of their patent portfolios, changes are analyzed in the extent to which partner firms' technological resources "overlap" as a result of alliance participation. This measure allows hypotheses from the literature on interfirm knowledge transfer in alliances to be tested. Support is found for some elements of this "received wisdom:" Equity arrangements promote greater knowledge transfer, and "absorptive capacity" helps explain the extent of technological capability transfer, at least in some alliances. However, the results also suggest limits to the "capabilities acquisition" view of strategic alliances. Consistent with the argument that alliance activity can promote increased specialization, it is found that the capabilities of partner firms become more divergent in a substantial subset of alliances.

Nahapiet, J. and S. Ghoshal (1998). "Social capital, intellectual capital, and the organizational advantage." Academy of Management Review **23**(2): 242-266.

Scholars of the theory of the firm have begun to emphasize the sources and conditions of what has been described as "the organizational advantage," rather than focus on the causes and consequences of market failure. Typically, researchers see such organizational advantage as accruing from the particular capabilities organizations have for creating and sharing knowledge. In this article we seek to contribute to this body of work by developing the following arguments: (1) social capital facilitates the creation of new intellectual capital: (2) organizations, as institutional settings, are conducive to the development of high levels of social capital: and (3) it is because of their more dense social capital that firms, within certain limits, have an advantage over markets in creating and sharing intellectual capital. We present a model that incorporates this overall argument in the form of a series of hypothesized relationships between different dimensions of social capital and the main mechanisms and processes necessary for the creation of intellectual capital.

Nobeoka, K. (1995). "Inter-project learning in new product development." Academy of Management Journal Best Paper Proceedings: 432-436.

It is important for manufacturers to learn technical knowledge in a product development project and to transfer and utilize it in other subsequent projects. Using survey results, a study discusses the advantage of concurrent design transfer strategy in inter-project learning, which provides a more efficient learning setting than does sequential design transfer strategy. It is argued that organizational structures and processes that are inappropriate for inter-project learning may not be a traditional functional approach.

Osterloh, M. and B. Frey (2000). "Motivation, knowledge transfer, and organizational forms." Organization Science **11**(5): 538-550.

The importance of knowledge for gaining competitive advantage is widely accepted. The authors distinguish between explicit and tacit forms of knowledge and argue that different kinds of motivation (extrinsic and intrinsic) are crucial for generating and transferring the two forms of knowledge. They analyze various organizational and motivational devices with respect to their suitability for making use of explicit and tacit knowledge. In so doing they particularly emphasize

that some organizational forms can crowd out intrinsic motivation and thus have detrimental effects on the transfer of knowledge.

Paulus, P. B. and H. C. Yang (2000). "Idea generation in groups: A basis for creativity in organizations." Organizational Behavior and Human Decision Processes **82**(1): 76-87.

Knowledge or idea exchange is an important function of groups in organizations. Much research has demonstrated that idea sharing in groups involves relatively inefficient processes. Some of these processes are briefly summarized. It is proposed that there are conditions under which idea sharing in groups can be productive. One important factor is the extent to which group members carefully process the ideas exchanged in the group (attention), Another is the opportunity for group members to reflect on the ideas after the exchange process (incubation). These factors were examined by using a "brainwriting" paradigm. Evidence was obtained for enhanced performance of sharing groups in comparison to nonsharing or nominal groups both during the idea-generation session and in a second individual idea-generation session. This study suggests that, under the right conditions, the idea exchange process in groups may be an important means for enhancing creativity and innovation in organizations.

Postrel, S. (2002). "Islands of shared knowledge: Specialization and mutual understanding in problem-solving teams." Organization Science **13**(3): 303-320.

Where should the boundaries of knowledge between economic actors be located in order to maximize the efficiency of their interactions? In particular, what circumstances determine whether it makes sense for adjacent stages in the value chain to invest in the development of common understanding, and when does it make sense for them to operate in mutual ignorance? To address these questions, it is necessary to construct a kind of production function which takes different forms of knowledge- specialist capability and trans-specialist understanding-as inputs and relates them to problem-solving output. Using a simple model of product design as a template, it is possible to derive such a production function. One can then use its properties in conjunction with plausible assumptions about the cost of acquiring different kinds of knowledge to develop general principles that explain when efficiency requires costly learning across specialties and when it is better to allow specialties to operate in mutual ignorance of one another's domains. The derived production function, contrary to some intuition and previous literature, implies that specialist capability can substitute for knowledge shared across specialties, This result in turn implies that the nature of learning costs, rather than the shape of knowledge benefits, plays the predominant role in determining when mutual ignorance is a good idea. The analysis also helps resolve the following paradox: The economy depends for its efficiency upon a drastic separation of knowledge across individuals and organizational units, yet studies of product development find that greater knowledge commonality is associated with better firm performance. An implication of the substitutability of specialized and trans-specialty knowledge is that situations where learning across specialties, is desirable seem relatively rare in the economy as a whole. These situations are disproportionately common, however, in those areas where important managerial activity takes place. A key role of management is to attend to the strategic, operational, and governance needs of these "islands of shared knowledge in a sea of mutual ignorance."

Powell, W. W. (1998). "Learning from collaboration: Knowledge and networks in the biotechnology and pharmaceutical industries." California Management Review **40**(3): 228-240.

The biotechnology and pharmaceutical fields are rife with a wide range of collaborative relationships intended to access knowledge, skills, and resources that cannot be produced by organizations internally in a timely fashion. As more firms rely on external relationships for knowledge, the ability to process, transfer, and transmit knowledge gained in one context to other activities becomes critical. This article examines the capability for learning both how and what to learn in the context of these inter-organizational relations, and it surveys various practices developed by companies for accessing and distributing knowledge. The key challenge in innovation-intensive fields is to develop organizational routines for learning that are robust, flexible, and durable.

Reed, R. and R. J. DeFillippi (1990). "Causal ambiguity, barriers to imitation, and sustainable competitive advantage." Academy of Management Review 15(1): 88-102.

This article addresses the issues of competitive advantage and competitor imitation. It is argued that tacitness, complexity, and specificity in a firm's skills and resources can generate causal ambiguity in competency-based advantage, and thus raise barriers to imitation. Reinvestment in causally ambiguous competencies is necessary to protect the advantage. Without reinvestment, additional effects of continued competitive action will cause decay in the barriers to imitation. From this theorizing, research propositions are suggested, which, ultimately, will lead to an improved understanding of competitive advantage sustainability.

Richards, D. (2001). "Coordination and shared mental models." American Journal of Political Science 45(2): 259-276.

Preferences may be structured by social constraints, by institutional procedures, or, as in the focus of this article, by knowledge representations. This article explores the prospects for successful coordination when players have conflicting preferences but have similar cognitive representations of the decision context. A "knowledge-induced equilibrium" is a stable outcome reached under players' mutual understandings of the empirical context. The purpose of this article is to develop a formal framework that combines strategic rationality with social or cognitive components of knowledge.

Richter, F. J. and K. Vettel (1995). "Successful Joint Ventures in Japan - Transferring Knowledge through Organizational Learning." Long Range Planning 28(3): 37-45.

This article describes a new approach to managing joint ventures by knowledge transfer and sets out the conditions necessary to realize such a managerial process. Companies must undergo a learning sequence consisting of the perception, internalization and abstraction of the partner firm's knowledge resources to expand their own corporate knowledge base. Only the permanent extension of the corporate knowledge base guarantees the organizational renewal of the cooperating firm. Case studies of three German firms--Bosch, Hoechst, and Huls-- engaged in joint ventures with Japanese partners are described to demonstrate the relevance of the approach.

Roberts, J. (2000). "From know-how to show-how? Questioning the role of information and communication technologies in knowledge transfer." Technology Analysis & Strategic Management 12(4): 429-443.

This paper explores and critically reviews the ability of Information and Communication Technologies (ICTs) to improve the transferability of knowledge. The aim here is to look beyond knowledge transfer at a general level. By distinguishing between codified knowledge and tacit knowledge, a more thorough understanding of knowledge transfer is sought, and in particular of the role of ICTs in this process. ICTs favour the transfer of knowledge that can be codified and reduced to data. Of central concern here is what role, if any, do ICTs have in the transfer of tacit knowledge? This paper raises issues concerning the relationship between knowledge transfer, ICTs and trust.

Roth, W. M. (1996). "Knowledge diffusion in a grade 4-5 classroom during a unit on civil engineering: An analysis of a classroom community in terms of its changing resources and practices." Cognition and Instruction 14(2): 179-220.

This study was designed to investigate the adoption of different types of knowledge, resources (facts and objects), and tool- and concept-related practices in a Grade 4-5 classroom studying a unit on civil engineering. Based on the detailed analysis of videotaped student-student interactions and fieldnotes, this article documents how a classroom was transformed as a tool (glue gun) and associated practices came to be shared by the members of the classroom community. The data suggest that the process of learning a tool-related practice was a trajectory from limited peripheral participation to full participation in the practice as newcomers learned by working at the elbows of their more competent peers. This process always involved transformations associated with the

embodiment of practices in individuals. The adoption of a tool also transformed the very setting in which students learned. The transformation of the classroom community in terms of resources (factual knowledge) and intellectual practices is illustrated by means of two comparison cases. An actor network theory is used to account for the near effortless student-centered adoption of resources and tool-related practices and for the effort-consuming teacher-centered change of a concept-related practice. The strength of the actor network approach lies in its ability to account for unsuccessful adoption of resources and practices. A researcher in this lab was instructed in [polymerase chain reaction (PCR)] by going to a colleague's lab.... Despite this training, the researcher had a difficult time getting PCR to work, and it seems that much of her struggle had to do with developing singular applications of the technique for her lab's research. She relied on word of mouth, customised primers produced at the university facility outside the lab, standard equipment, and formal recipes, and was largely left to wade through a morass of possibilities for adapting these resources to the task at hand.

Rulke, D. L. and J. Galaskiewicz (2000). "Distribution of knowledge, group network structure, and group performance." Management Science 46(5): 612-625.

This study investigates the effect of knowledge distribution and group structure on performance in MBA game teams. We found that group performance was contingent on the distribution of knowledge within the group and networks of social relationships among group members. Studying 39 teams of MBA students in two management simulation games, we found that, in general, groups that had broadly distributed knowledge, i.e., groups made up of members who had general knowledge, outperformed groups that had knowledge concentrated in different members, i.e., groups made up of members who had specialized or both specialized and general knowledge. However, the advantage that the former enjoyed over the latter disappeared when groups of specialists or mixed groups had decentralized network structures.

Sackmann, S. A. (1992). "Culture and subcultures - an analysis of organizational knowledge." Administrative Science Quarterly 37(1): 140-161.

This study investigated the potential existence and formation of subcultures in organizations, using an inductive research methodology to study the extent to which four different types of knowledge were shared by organization members. Fifty-two interviews were conducted in three different divisions of the same firm. These were content-analyzed and compared with data obtained from observations and written documents. A number of cultural subgroupings were found to exist in regard to two kinds of cultural knowledge, while an organization-wide cultural overlay was identified for a different kind of cultural knowledge. The implications for the concept of culture in organizational settings and future research on this topic are discussed.

Saxonhouse, G. R. (1999). "Technological and information transfer: how do some nations learn what other nations know? Japan's experience." Pacific Review 12(2): 225-247.

The returns to the rapid acceleration in the growth of gross global product per capita in the past century and a quarter have been very inequitably distributed across nations. Nations that were already relatively wealthy in 1870 have received most of the benefits of this increase in material well-being. Japan is thus far the only major example of a country that has been able to fully traverse the vast gulf that separates poorer from wealthier nations. Lately other economies in East Asia have experienced such sustained high rates of growth in gross domestic product per capita as to suggest they too will join Japan as non-Western examples of the world's wealthiest nations. Some doubt has been cast on these optimistic projections by findings that economies such as Taiwan and Korea have grown rapidly, seemingly Soviet-bloc style, without the benefit of rapid growth in total factor productivity change. Characterizing growth without total factor productivity change as Stalinist, however, is ahistorical. The United States, the United Kingdom and Japan among other nations, all experienced long periods of rapid growth in per capita GDP without simultaneously experiencing rapid increases in total factor productivity. In each instance, such phases were succeeded by periods where per capita GDP growth was increasingly augmented by improvements in total factor productivity. One puzzle here is that the periods characterized by

little total factor productivity change do appear to be times when substantial technological improvement was taking place. In the case of the United States there is considerable evidence that the extraordinary increases in factor accumulation were driven by what appear to be substantial advances in technology. A case study presented for the cotton textile industry suggests much the same may have been true in Japan. The character of the product markets and the factor markets faced by the Japanese cotton-spinning industry in the Meiji period created an environment within which technological adaptation and innovation came to be a network phenomenon with the industry's trade association and the industry's prime machinery supplier serving as a critical link. Later with product market and credit market changes the role these institutions played diminished to be replaced by information transfers that were the byproduct of a very well-functioning market in experienced, and by the standards of other nations, very well-educated textile engineers. In the half-century after 1945, the rise of permanent employment practices in Japan has created barriers to information flows and collective technological innovation and adaptation that were so much a part of the experience of Japan's leading industry in the early twentieth century. Curiously, this is just the time when total factor productivity change has become an important component of Japan's very rapid growth in per capita GDP. The past half-century has also been a time when the Japanese government has been actively involved in attempting to shape industrial structure in an otherwise market-based economy. One set of policy instruments that have attracted particular attention overseas have been government-sponsored R&D consortia. These consortia can be thought of as government programs designed to break down the walls preventing information flows among Japanese firms. Japan's cooperative R&D projects can be thought of as ways to capture some of the benefits of American-style and pre-war Japanese-style labor markets, even while continuing to avoid some of the costs associated with relatively high labor mobility. There is great disagreement as to the efficacy of these Japanese government programs with overseas firms looking enviously at projects that Japanese industry sees as having only minor significance or worse. A study presented here of the impact of two Japanese government-sponsored optoelectronics projects on Japanese and American equity markets confirms these differing perceptions, confirms that the speed with which information diffuses back from Japan to the United States has increased substantially over the past decade, but does not suggest which of the two differing perceptions is correct. Knowledge-based growth may have proceeded this last half-century in Japan with less interfirm diffusion of technology than was characteristic at some points earlier in Japan's history. In the very late twentieth century, changes in global markets and the uncertainty of life close to the technological frontier are forcing changes in Japanese institutions. Japanese firms of the future may prefer to have their labor force bear more both of the risks associated with specialized training and the risks associated with secular and cyclical demand shocks. Much as Japan's labor force did early in the twentieth century, such steps will require a change in the way in which training is provided and changes in the Japanese government's educational and social policies. At the same time the type of information flow problems the government-sponsored R&D consortia were once designed to address may well be as insignificant in the future as they once may have been in Japan's past. In contrast, the type of institutions supporting technological diffusion in Japan's textile industry in the 1920s and early 1930s may be part of Japan's future. On the basis of the evidence presented here, the answer to the question whether Taiwan, Korea and other East and Southeast Asian countries seeking to follow Japan's full transition to very high standards of material well-being and knowledge-based growth should avoid or emulate Japan's institutional set-up of the past half-century is not at all obvious.

Sharma, A. (1997). "Professional as agent: Knowledge asymmetry in agency exchange." Academy of Management Review 22(3): 758-798.

In this article I examine those business exchanges in which firms hire professional service organizations and give them limited decision-making authority to perform knowledge-intensive tasks. I frame such exchanges within agency theory perspective and invoke the extant literature on professions to delineate several attributes that make principal-professional exchanges intrinsically distinct from others, such as owner-manager agency. In doing so, I question and complement some key assumptions in agency theory and also discuss explicitly how the study of principal-

professional exchanges helps highlight important considerations not addressed in the mainstream theory. I then present an expanded framework that integrates agency theory and the literature on the professions and present several propositions to outline four types of restraints on potential opportunistic behavior of professional agents: (1) self-control. (2) community control. (3) bureaucratic control. and (4) client control. The article ends with theoretical and empirical implications.

Spencer, J. W. (2000). "Knowledge flows in the global innovation system: Do U.S. firms share more scientific knowledge than their Japanese rivals?" Journal of International Business Studies **31**(3): 521-530.

Storck, J. and P. A. Hill (2000). "Knowledge diffusion through "strategic communities"." Sloan Management Review **41**(2): 63-+.

When faced with a global IT infrastructure transition project, Xerox managers decided to launch a knowledge-sharing initiative called the Transition Alliance. When fully functional, the Alliance comprised fifty IT professionals responsible for managing 70,000 desktop workstations, nearly 1,200 servers, and networking hardware on five continents. Storck and Hill observed that community members provided high-quality, validated solutions, handled unstructured problems well, and dealt effectively with new developments in hardware and software. The authors also point out that the motivation for learning and developing at an individual level seemed greater in this community structure than in other organizational forms, which has important implications for the longer-term job performance of the participants. The Alliance was more than simply a group that met occasionally to discuss common issues related to a single functional or professional area, it had a defined relationship to formal organizational objectives yet was not formally required to report back to headquarters on its activities. Within the Alliance, the communication repertoire was built upon the leadership training required for all Xerox employees. Work processes that developed within the Alliance supplemented those used elsewhere in the organization. Handling action items, creating meeting agendas, and developing other processes were evidence of the self-directed nature of the group and provided a context for communication. Storck and Hill identified six guiding principles that were instrumental to Alliance success and are applicable whenever circumstances require organizational learning: Design an interaction format that promotes openness and allows for serendipity. Build upon a common organizational culture. Demonstrate the existence of mutual interests after the initial success at resolving issues and achieving corporate goals. Leverage those aspects of the organizational culture that respect the value of collective learning. Embed knowledge-sharing practices into the work processes of the group. Establish an environment in which knowledge sharing is based on processes and cultural norms that are defined by the community rather than other parts of the organization.

Subramaniam, M. and N. Venkatraman (2001). "Determinants of transnational new product development capability: Testing the influence of transferring and deploying tacit overseas knowledge." Strategic Management Journal **22**(4): 359-378.

Based on a survey of 90 transnational product introductions, we find that the transnational product development capabilities of organizations significantly depend upon their ability to transfer and deploy tacit knowledge concerning overseas markets. Specifically, we find that organizations which use cross-national teams, teams with members who have prior overseas experience, or teams whose members communicate frequently with overseas managers in order to acquire information about tacit differences among countries have greater transnational product development capabilities. This study contributes to our understanding of how organizations transfer and deploy knowledge across borders for competitive advantage and makes an important contribution to the literature on global strategy.

Szulanski, G. (1996). "Exploring internal stickiness: Impediments to the transfer of best practice within the firm." Strategic Management Journal **17**: 27-43.

The ability to transfer best practices internally is critical to a firm's ability to build competitive advantage through the appropriation of rents from scarce internal knowledge. Just as a firm's

distinctive competencies might be difficult for other firms to imitate, its best practices could be difficult to imitate internally. Yet, little systematic attention has been paid to such internal stickiness. A paper analyzes internal stickiness of knowledge transfer and tests the resulting model using canonical correlation analysis of a data set consisting of 271 observations of 122 best-practice transfers in 8 companies. Contrary to conventional wisdom, that blames primarily motivational factors, the findings show the major barriers to internal knowledge transfer to be knowledge-related factors such as the recipient's lack of absorptive capacity, causal ambiguity, and an arduous relationship between the source and the recipient.

Szulanski, G. (2000). "The process of knowledge transfer: A diachronic analysis of stickiness." Organizational Behavior and Human Decision Processes 82(1): 9-27.

Even though intrafirm transfers of knowledge are often laborious, time consuming, and difficult, current conceptions treat them as essentially costless and instantaneous. When acknowledged, difficulty is an anomaly in the way transfers are modeled rather than a characteristic feature of the transfer itself. One first step toward incorporating difficulty in the analysis of knowledge transfer is to recognize that a transfer is not an act, as typically modeled, but a process. This article offers a process model of knowledge transfer. The model identifies stages of transfer and factors that are expected to correlate with difficulty at different stages of the transfer. The general expectation is that factors that affect the opportunity to transfer are more likely to predict difficulty during the initiation phase, whereas factors that affect the execution of the transfer are more likely to predict difficulty during subsequent implementation phases. Measures of stickiness are developed for each stage of the transfer to explore the predictive power of different factors at different stages of the process. A cross-sectional analysis of primary data collected through a two-step survey of 122 transfers of organizational practices within eight firms illustrates the applicability of the model and suggests several issues for further research.

Takeishi, A. (2002). "Knowledge partitioning in the interfirm division of labor: The case of automotive product development." Organization Science 13(3): 321-338.

Drawing on an empirical study on automakers' management of supplier involvement in product development in Japan, this paper shows that when the design of a component is outsourced to a supplier, how much automakers know about the component matters for them to gain a better outcome. While the actual tasks of designing and manufacturing components could be outsourced, automakers should retain the relevant knowledge to obtain better component design quality. The paper argues that knowledge partitioning should be distinguished from task partitioning, and provides some implications for the knowledge-based theory of the firm. The results indicate that effective pattern of knowledge partitioning differs by the nature of component development project in terms of technological newness. For regular projects, it is more important for the automaker to have a higher level of architectural knowledge (how to coordinate various components for a vehicle) than of component-specific knowledge, which is supposed to be provided by the supplier. However, when the project involves new technology for the supplier, it is important for the automaker to have a higher level of component-specific knowledge to solve unexplored engineering problems together with the supplier. In innovative projects, effective knowledge partitioning seems to demand some overlap between an automaker and a supplier, rather than efficient and clear-cut boundaries that are optimal for regular projects. Such "fluid" nature of knowledge boundaries contingent on the project types poses a challenge for firms seeking both technological leadership and efficiency in established products. Developing and maintaining knowledge about an outsourced component is by no means easy. When the actual design tasks are outsourced, automakers miss substantial opportunities to gain relevant knowledge through learning by doing. Also, obtained knowledge may be diffused among competitors through shared suppliers. Another problem for automakers is that component-specific knowledge is important for only limited cases (innovative projects). Even worse, component-specific knowledge has a trade off relationship with architectural knowledge. Such an inherent dilemma of managing knowledge, however, may provide some automakers with the opportunity to achieve sustainable competitive advantage. Additional analysis shows that one automaker managed both types of

knowledge better than others in a manner that deals effectively with the dilemma. Its organizational mechanisms include career development policies, extensive documentation of technological information, internal training programs, and incentive schemes. The difficulty in implementing those mechanisms in a consistent and complementary manner seems to explain why there was a significant variance among automakers in knowledge level, even when the actual tasks were carried out by a shared supplier.

Tsai, W. P. (2001). "Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance." Academy of Management Journal **44**(5): 996-1004.

Drawing on a network perspective on organizational learning, I argue that organizational units can produce more innovations and enjoy better performance if they occupy central network positions that provide access to new knowledge developed by other units. This effect, however, depends on units' absorptive capacity, or ability to successfully replicate new knowledge. Data from 24 business units in a petrochemical company and 36 business units in a food-manufacturing company show that the interaction between absorptive capacity and network position has significant, positive effects on business unit innovation and performance.

Tsai, W. P. (2002). "Social structure of "cooptation" within a multiunit organization: Coordination, competition, and intraorganizational knowledge sharing." Organization Science **13**(2): 179-190.

Drawing on a social network perspective of organizational coordination, this paper investigates the effectiveness of coordination mechanisms on knowledge sharing in intraorganizational networks that consist of both collaborative and competitive ties among organizational units. Internal knowledge sharing within a multiunit organization requires formal hierarchical structure and informal lateral relations as coordination mechanisms. Using sociometric techniques, this paper analyzes how formal hierarchical structure and informal lateral relations influence knowledge sharing and how interunit competition moderates the association between such coordination mechanisms and knowledge sharing in a large, multiunit company. Results show that formal hierarchical structure, in the form of centralization, has a significant negative effect on knowledge sharing, and informal lateral relations, in the form of social interaction, have a significant positive effect on knowledge sharing among units that compete with each other for market share, but not among units that compete with each other for internal resources.

Wathne, K., J. Roos, et al. (1996). Towards a theory of knowledge transfer in a cooperative context. Managing Knowledge: Perspectives on Cooperation and Competition. G. von Krogh and J. Roos. London, Sage.

Weiss, L. M. (1998). Collection and Connection: Rationalized and Embedded Knowledge in Knowledge-Intensive Organizations. Department of Sociology, Graduate School of Arts and Sciences. Cambridge, MA, Harvard University: 270.

This dissertation addresses the fundamental processes of knowledge collection (accumulation and storage) and connection (identification and retrieval) in professional services firms. Given the importance of knowledge assets and these two processes in these organizations, surprisingly little is known about how they operate within a firm and the factors that affect them. To understand these processes I suggest extending current conceptualizations of knowledge, which focus on 'articulability,' to additionally consider the 'usability' of knowledge. To fill the existing gap between 'articulability' and 'usability,' I show that it is useful to think about knowledge as taking rationalized and embedded forms. I investigate the collection and connection of these forms of knowledge in consulting projects that vary in terms of the firm's level of experience with particular consulting problems and the degree to which the work is amenable to routinization, and also across the organizational hierarchy. Findings suggest that the key challenge for rationalized knowledge is collecting it, while the central challenge for embedded knowledge is connecting it; that the most effective knowledge sharing and learning strategies will depend on characteristics of consulting projects; that centralized electronic databases and personal relationships are

differentially effective for collecting and connecting rationalized and embedded knowledge; and that personal relationships based on solidarity transmit a wider spectrum of knowledge than relationships based on authority.

Williams, K. Y., D. H. Gruenfeld, et al. (1998). When social and knowledge ties are incongruent: Effects on group information sharing. Palo Alto, Graduate School of Business, Stanford University.

This study investigates how congruence between social and knowledge ties affect group information sharing, specifically, the bias against sharing unique information (Stasser & Titus, 1985). Three-person groups composed of two familiar individuals and a stranger participated in a complex decision making task in which some information was held by all group members, while some critical information was uniquely held by individuals (adopted from Stasser & Stewart, 1992). In the "congruent" condition, the two familiar members in each group possessed the same information while the stranger held unique information. In the "incongruent" condition, one of the familiar members held unique information while the second familiar member possessed the same information as the stranger. We hypothesized that whereas congruence between social and knowledge ties would enhance information sharing effectiveness by reinforcing cognitive schema and allowing members to focus on the task, incongruence would interfere with information sharing by upsetting the social order. Discussion content analyses supported this prediction. Congruent groups shared more unique information and solved the problem more effectively than incongruent groups. Implications for managing diversity in organizational work groups are discussed.

Winter, S. G. (1987). Knowledge and competence as strategic assets. The Competitive Challenge: Strategies for Industrial Innovation and Renewal. D. J. Teece. New York, Ballinger.