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Building Successful Knowledge Management Projects

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As knowledge management transitions from concept to practice, attention has turned to the ways in which practitioners can operationalize the growing body of theory. This paper contributes to this process by reporting on the results of research focused squarely on how knowledge gets managed in organizations—the knowledge management project.

It is widely acknowledged that developed economies have gradually been transformed over the past fifty years. Scholars and observers from disciplines as disparate as sociology, economics, and management science generally agree that knowledge has been at the center of this change.[1] Knowledge could be defined as information that has been combined with experience, context, interpretation, and reflection. Given the value of this asset to organizations, it is not surprising that greater attention is being paid to the subject of knowledge: what it is, how it differs from the related concepts of information and data, and how to begin to create, transfer, and use it more effectively. The subject of knowledge management, in particular, has had a recent flowering.[2]

Unfortunately, discussions of knowledge, its use, and management too easily devolve into highly abstract musings on the importance of knowledge, or on the emergence of knowledge-based economies and organizations. While certainly necessary in the early days of investigating a new subject area, this type of conceptual analysis is of little use to the practitioner faced with the task of what, specifically, he or she should do as a manager of knowledge.

This article addresses the practical realities of the sometimes heady subject of knowledge management by focusing on a tangible and pragmatic entity—the knowledge management project. Such projects are attempts to "do something useful" with knowledge, to accomplish organizational objectives through the structuring of people, technology, and knowledge content. These projects are now appearing throughout the business world, and we believe no attempt has been made until now to examine and learn from them.

Based on the conversations at our research sites, we think there is a pressing need for research of this type. After all, it is through projects and initiatives, however disjointed, that most significant change gets created. Through our study of practices and practitioners at the vanguard of knowledge management, we hope to provide background to the uninitiated as well as guidelines for practice for those more involved with the subject.

Of course, by selecting the knowledge management project as the unit of analysis, we gain some benefits while forgoing others. None of these projects is optimal. Some beg the question of whether it is really "knowledge" that is being managed, and many are quite limited in their impacts. Very few contribute to the much touted goal of "organizational transformation." As might be expected, it is proving far easier to talk and write about such transformations than it is to achieve them. Nevertheless, for many industries the importance of knowledge as the basis of future competition is well established. Setting hyperbole and theoretical fantasies aside, the question now is: how do organizations actually begin using knowledge more effectively?

To understand how knowledge is really being managed in companies today, we studied 31 different knowledge management projects in 23 companies. In most companies we addressed only one project, but to get an in-depth look at the breadth of knowledge management in a single firm, we collected data from nine projects in one company. We made site visits to four of the firms and interviewed the rest by telephone. Our sources were typically the managers of the knowledge projects, or of the knowledge management function across the organization. Many of these firms were participants in a sponsored research program on multiple aspects of knowledge management, of which this was only one focus.[3] Our ideas were refined in two review sessions with the program participants.

In the first section of the paper, we briefly discuss the many differences, as well as some of the similarities of these initiatives

before presenting a high-level typology of knowledge management projects. We then attempt to shed some light on what makes for a "successful" knowledge project. Success and failure are ambiguous terms when applied to so nascent a field as knowledge management; but we identified eight key characteristics that are found in successful knowledge management projects. We conclude the paper by discussing some differences between success factors for knowledge management projects and those for other types of initiatives, e.g., information or data management efforts.

Types of Knowledge Management Projects

Knowledge management is an evolving practice. Even the most developed and mature knowledge management projects we studied were unfinished. In every case, however, a manager was able to articulate specific business and knowledge management objectives, and some had already achieved some of their goals.

There were many differences found among these 31 projects. They attempted to manage many different types of knowledge, from R&D to sales to production. Some were self-funding, using a market-based approach that charges users for knowledge services. Others were funded out of overhead. Some took a hybrid approach, for example, relying on corporate funding during roll-out but requiring a transition to self-funding after some period of time. Some projects were managed or coordinated by a centralized corporate knowledge management function, while others occurred in a more bottom-up and decentralized fashion. Where some initiatives were fundamental to the very purpose and existence of a firm, others were of a peripheral nature; some defied economic justification and others actually generated revenue from external customers.

In some general ways, of course, these projects were alike. They all had an individual responsible for the initiative, and they all demonstrated some commitment of human and capital resources. This investment, however, ranged from a direct marketing firm that appointed a chief knowledge officer (CKO) with no formal budget to a consulting firm with more than 70 positions designated to support knowledge management and an annual budget of more than $10 million. The projects also had similarities with respect to their objectives, which all explicitly focused on knowledge, as opposed to information or data. Four broad types of objectives were identified: creating knowledge repositories, improving knowledge access, enhancing cultural support for knowledge use, and managing knowledge as an asset.

Knowledge Repositories

Much of the energy in knowledge management has been spent on treating knowledge as an "it," an entity separate from the people who create and use it. The typical goal is to take documents with knowledge embedded in them—memos, reports, presentations, articles, etc.—and store them in a repository where they can be easily retrieved. Another less structured form of knowledge as an "it" is the discussion database, in which participants record their own experiences on an issue and react to others' comments. In our research, the three basic types of repositories we found were for (1) *external knowledge*, e.g., competitive intelligence; (2) *structured internal knowledge*, e.g., research reports, product-oriented marketing materials, and techniques and methods; and (3) *informal internal knowledge*, e.g., discussion databases full of know-how, sometimes referred to as "lessons learned." Some firms are also using "artificial intelligence" software to manage knowledge, particularly in relatively narrow domains such as customer technical support. These might be classified as repositories of structured internal knowledge.

Competitive intelligence systems may often be overlooked as knowledge management systems, but most effective ones will filter, synthesize, and add context to information from the external environment which qualifies them for this category. An automobile manufacturer, for example, had a repository of external competitive intelligence knowledge based on a detailed business model that identified what information should be collected. This repository included analyst reports and external market research on competitors in the automobile industry. Using a tool called GrapeVINE, the "knowledge managers" for this project not only interpreted raw information, providing context and synthesis that made it more valuable, but then routed the knowledge on different topics to managers with a specified interest in the subject. Items that were viewed as particularly important could be upgraded in priority and sent to everyone.

Both knowledge and information were stored in the internal structured knowledge repository projects that we studied. If the knowledge vs. information distinction is considered a continuum instead of a dichotomy, then projects that focus on structured internal knowledge deal with the middle of the continuum. They usually contain document-based information that represents knowledge to some. For example, at one high-technology firm there was a very large and successful project called Electronic Sales Partner, a system that provided technical product information, sales presentations, sales and marketing tactics, customer/account information, and anything else that might benefit

field sales personnel in the sales process. The leaders of this project, who had "knowledge manager" on their business cards, tried to add value to their repository through careful categorization and pruning. Calling it the "most successful implementation of software I have seen in 20 years," the manager of the sales support area reported "phenomenal feedback from both submitters [of knowledge] and users."

Finally, there is the knowledge that resides in the minds of people in an organization but has not been put in structured, document-based form. This type of knowledge is often called "tacit" (versus explicit) knowledge; the different management approaches for tacit and explicit knowledge have been described elsewhere.[4] To transfer tacit knowledge from individuals into a repository, some sort of community-based electronic discussion is often employed. For example, in the corporate education division at one of our research sites, a project was in progress that attempted to capture tips, tricks, insights, experiences, and so forth onto a Lotus Notes database and have this available to all 2,000 of the firm's trainers and educators, who were scattered throughout the corporation's many sites and could not easily share their knowledge. This type of knowledge repository is an attempt to accelerate and broaden the traditional knowledge sharing that happens with the socialization of newcomers, the generation of myths and stories within communities of practice, and the general transmission of cultural rituals and organizational routines.[5]

Knowledge Access

While capturing knowledge is the objective of the knowledge repository, other projects focus on providing access to knowledge or facilitating its transfer among individuals. These projects recognize that finding the person with the knowledge one needs, and then successfully transferring it from one person to another, are difficult processes. If the metaphor of a library is useful for conceptualizing knowledge repository projects, then the Yellow Pages represents the purpose of knowledge access projects. Managers who were involved in these projects commonly used phrases like, "get at the knowledge we know we have," "sharing our knowledge," and so forth—phrases which connote a need for, and emphasis on, connectivity, access, and transfer.

For example, we came across several instances of companies that were building and managing expert networks. At one firm, the expert network was not simply an improvement targeted at some segment of the operation, it comprised the primary business. The company, Teltech Resource Network Corp., provides a technical

expert referral service by maintaining a comprehensive database of external technical experts. The service is provided to the engineers, researchers, scientists, etc. in companies who have an occasional need for expert knowledge. This company motivates experts to participate in the network by paying them to answer client questions once they are contacted. The firm markets its services to technical managers and professionals within their client companies, constantly trying to remind potential customers that they are also an available resource. Apparently it's not natural for engineers to ask for help, so Teltech works hard to overcome this predisposition.

Microsoft has developed a form of expert network designed to make explicit the types of knowledge competencies necessary for software development projects, and to create better matches between software development teams needing people with certain expertise, and those possessing that expertise. This project has described over 300 knowledge competencies, both general and technology-specific. The project is unusual in the knowledge management context because of its close tie to the staffing process for internal systems development projects. There are plans to extend the use of the system to software product development. It uses a database and Web interface to store the knowledge competency categories and personal profiles. The database currently provides a means of balancing employee educational and training objectives against current and projected job requirements.

BP Exploration (BPX), a division of the large oil firm, successfully completed a pilot of a more internal and infrastructural approach to achieving knowledge access and transfer. In its "Virtual Teamwork" project, BPX managers felt that much of the important knowledge in the organization was unstructured knowledge in people's heads. Rather than extract the knowledge to put it in a repository, the organization's goal was to facilitate the exchange of tacit knowledge. To transfer knowledge across this global organization, each BPX site was equipped with at least one desktop videoconferencing system, document scanning and sharing tools, and the requisite telecommunications networks. There was also substantial education and coaching on how the system might be used to solve real BPX problems. The system quickly proved its value when a compressor in an oil field in Colombia, South America, stopped functioning. The only internal expert was on the North Slope of Alaska, while the vendor's expert was in Italy. Through the desktop videoconferencing system, however, the knowledge on how to fix the compressor was delivered to the Colombian site in a matter of hours rather than days.

Other projects took a lower-tech, but even more proactive approach to improving knowledge access and transfer. These projects focused on the face-to-face communication of knowledge between people who did not otherwise have the occasion to work together. At Sematech, the semiconductor research consortium in Austin, Texas, formal practices were put in place for knowledge transfer to make certain that the results of research were fed back to representatives from the sponsoring companies. The organization has a knowledge transfer organization and several formal roles for that purpose, and holds many sessions whose primary objective is knowledge transfer.

Knowledge Environment

A third type of knowledge management project involves attempts to establish an environment conducive to more effective knowledge creation, transfer, and use. In this category we saw projects that were intended to *build awareness and cultural receptivity to knowledge*, initiatives attempting to *change behavior relating to knowledge,* and attempts to *improve the knowledge management process.*

Several firms were engaged in high-level and general efforts to change the organizational norms and values related to knowledge. At one large computer firm a series of ongoing efforts encouraged the reuse of a particular kind of knowledge: component designs. Over the years, there has been a gradual shift in the attitudes of engineers to value time to market more than (or at least as much as) originality of design. At a direct marketing firm, the goal of knowledge management efforts was to increase awareness of the knowledge embedded in client relationships and engagements that could enhance organizational performance if it was shared.

Some companies make knowledge-related employee behavior a specific target of their projects. A large consulting firm was making significant inroads toward changing employee perceptions of their jobs—from deliverers of consulting services to creators and distributors of management knowledge. One way they did this was by making significant changes to the performance appraisal system so contributions to the firm's structured knowledge base became a significant factor in compensation decisions.

Finally, some companies addressed the processes by which knowledge is created, shared, and used. At a general level, a process orientation meant developing measures of the speed, cost, impact, and customer satisfaction of the knowledge management activities. After interacting with one of Teltech's experts, for example, customers are called to assess the quality of the expert

and the expertise offered. At a more detailed level, the approaches of process improvement and reengineering were also applied to knowledge management in some projects. These approaches involved describing the desired steps to be followed in the process of knowledge management. At Teltech, an extensive thesaurus of technical terms allows browsing and searching of the expert network through terms that make sense to users. Teltech employees capture the terms users employ in searches, and add them to the thesaurus daily. Therefore, the structure of the knowledge is always changing with current usage. Any knowledge manager should be prepared to redefine the structure frequently.

Knowledge Assets

A fourth type of project focuses on managing knowledge as an asset. One way this is being done is to begin treating knowledge like any other asset on the organization's balance sheet. For example Skandia, the large Swedish financial services company, takes an internal audit of the company's intellectual capital every year and includes this information in its annual report to stockholders. One goal of this analysis is to persuade investors of the value of Skandia's knowledge capital. This also focuses the organization's attention on how it is increasing or decreasing its effective use of knowledge assets over time.

Another approach is to focus on managing specific knowledge-intensive assets more effectively to improve their return. By carefully reviewing and managing its patents, Dow Chemical, for example, saved $40 million in the first year of its new program, and the company expects to generate more than $100 million in licensing revenues that might otherwise have been forgone.

Projects with Multiple Characteristics

The four categories of objectives described in our typology are treated as "ideal" types. In real life, of course, such ideals rarely exist. Almost all the projects we studied had, in practice, a combination of objectives represented by the four project types. At the direct marketing firm, for example, the CKO strove to inculcate a knowledge-friendly culture, while at the same time improving knowledge access by setting up formal face-to-face knowledge transfer programs. At the consulting firm, capturing structured and unstructured knowledge, as well as improving access were objectives for a portfolio of projects undertaken, which included the development of an expert network, as well as the creation of internal document repositories and unstructured lessons learned knowledge bases. While it is too early to tell for sure, we expect that knowledge management initiatives working along multiple

fronts will be more effective than those that seek only one objective.

This typology is useful because it can help managers organize their thinking about specific approaches to knowledge management, identifying ways in which knowledge use can actually be improved. It also shows that, in reality, most projects have mixed objectives and suggests there is value in this integration. For example, a company could profit from combining the creation of a repository with improvement of the knowledge management environment to motivate people to contribute to and access the repository. The framework does not, however, provide insights about where knowledge management resources should be allocated. Those decisions should be driven by overall business strategy along with the identification of core competencies and knowledge resources.

The different intentions highlighted by the typology do raise questions about how to assess a project's effectiveness, particularly in light of mixed objectives. How do we measure value created by a knowledge repository, for example? Should we simply count "hits on the data base"? And how do we assess a project striving to provide improved access to knowledge or a more knowledge-oriented culture? This evaluation or measurement issue is made more salient because the project's benefits for the business are usually indirect, and establishing the link between knowledge and financial performance is, at best, tricky.[6] But shareholders do not invest in companies to have a knowledge-sharing culture or a knowledgeable sales force. They expect firms to make money. In the next section, the topics of performance measurement specifically, and success more generally, are discussed.

What Constitutes Success in Knowledge Management Projects?

We needed to assess the performance of existing knowledge management projects before we could identify the characteristics associated with success. Economic returns on knowledge are difficult to quantify and compare across organizations, so we used additional indicators of success to evaluate the projects in our sample. Of course, we observed these projects at only one point in time, and we cannot predict whether current indicators of performance will persist. Still, the success indicators we used are not that different from those used to assess the effectiveness of other types of business change projects. The indicators of effectiveness that we used included:

- Growth in the resources attached to the project, including people, money, etc.;

- Growth in the volume of knowledge content and usage (i.e., the number of documents or accesses for repositories, or participants for discussion-oriented projects);
- The likelihood that the project would survive without the support of a particular individual or two, i.e., the project is an organizational initiative, not an individual project;
- Some evidence of financial return, either for the knowledge management activity itself (e.g., that it was a profit center) or for the larger organization; this linkage need not be rigorously specified and may be only perceptual.

In interviewing the managers of knowledge projects, we didn't ask if they felt their projects were successful. We did, however, ask about the indicators of success described above. The presence or absence of these indicators allowed us to differentiate clearly successful projects from those that were not successful, i.e., likely to fail or not *yet* showing signs of success. We classified 18 projects as successful, 5 projects as unsuccessful, and 8 projects as too early to determine whether or not they will be successful.

The projects we defined as successful had virtually all of these indicators present. Several had failed to demonstrate financial benefits to date, but there were plans to show them in the future. In contrast, the unsuccessful, or not yet successful projects, had few or none of these characteristics. They had to scrounge for resources. They struggled to get members of the organizations to contribute to repositories or use discussion databases. These projects were championed by one or a few visionary—but lonely—individuals. And any sense that the projects would make or save money for themselves or their firms was either not under consideration or a long way off. While conditions might change in the future, these projects were not succeeding at present.

In our data, we observed projects that contributed to successful knowledge management on two levels. The most ambitious type produced organization-wide impacts credited with either transforming the way a firm operated or simply allowing it to survive. Impacts at this level, however, were rare.

At the large consulting firm we studied, knowledge was at least partially responsible for a major transformation of the firm. The transformation was extensive in both depth and breadth of impact, and financial results improved markedly during the period of knowledge management. Line consultants drew heavily from the firm's centralized knowledge centers, accessing previous presentations to other clients, process and system design specifications, workplans, and other project-oriented collateral and

artifacts. One indicator of the initiative's impact was that the firm increased its "win rate" in client proposals.

At the Sematech R&D consortium, knowledge creation and sharing was critical to the organization's existence. Since it had employed approaches to knowledge management from its inception, it is hard to argue that these tactics led to transformation, but survival is an equally important form of success. The Sematech organization had another nearby organization from which it could learn: Microelectronics and Computer Corporation (MCC), also based in Austin, Texas, had substantial difficulties in knowledge transfer, partly because it did not devote as much attention to the issue as did Sematech.[7] Another firm where knowledge management was critical to survival was Teltech. The knowledge management approaches it had adopted seemed to be working, as the company was growing and was about to have an initial public offering at the time of our research.

Transformation and survival notwithstanding, the more common type of success in knowledge management involves operational improvements limited to a particular process or function. The projects we studied were intended to improve new product development, customer support, education and training, software development, patent management, and many other functions and processes. This was the primary form of success we found, but it is difficult to evaluate how improvement in these relatively narrow areas translates into broader organizational performance.

Factors Leading to Knowledge Project Success

Once we found the "successful" projects in our sample, we tried to identify the major factors that contributed to their effectiveness. Because these are fundamentally change management projects, many generic critical success factors are also relevant. For example, the broader the initiative, the more critical executive sponsorship is to its success. But setting aside the well-known change management homilies, we found eight specific factors that were common to the successful knowledge projects we studied. Because this was an exploratory effort, however, the association of these factors with effectiveness in knowledge management should be viewed as hypothesized, not a proven result. With this provision, we will describe each of the eight factors below. They are:

- Link to economic performance or industry value
- Technical and organizational infrastructure
- Standard, flexible knowledge structures

- A knowledge-friendly culture
- Clarity of purpose and language
- Different motivational practices
- Multiple channels for knowledge transfer
- Senior management appreciation and support

A Link to Economic or Industry Value

The easiest and most impressive benefits from knowledge management projects involve money saved or earned. At Dow Chemical, for example, a key focus of the knowledge management initiative was better management of company patents. A specific goal was lowering patent taxes paid on patents that were no longer useful—an initiative that saved $40 million in the first year. At Texas Instruments, a strategic focus was increasing revenues through licensing of patents and intellectual property; in 1995 TI reportedly earned nearly $200 million—more than half its total profit—from patent licensing.[8]

Benefit calculations may also be indirect, perhaps through improvements in measures like cycle time, customer satisfaction, or even phone calls averted. Hoffmann-LaRoche has engaged in projects designed to produce significant reductions in time-to-market for new drugs in an industry where every day's delay can represent $1 million in lost revenues. Several knowledge management projects in the customer support process attempted to improve customer satisfaction by reducing waiting time for phone support, or even obviating the need for customers to call by providing on-line knowledge. At Hewlett-Packard, for example, a support team paid close attention to the actual problems experienced by dealers as revealed in their phone calls, and then preempted many potential support calls by alerting its customers to most frequently asked questions and providing solutions through a Lotus Notes database. Another project at HP in the customer support area reduced the cost of answering customer calls by 50% in two years, and allowed hiring less technically-experienced support analysts.

Buckman Laboratories, a specialty chemicals firm, believes that it spends 2.5% of its revenues on knowledge management; Ernst &Young calculates 6% of its revenues, and McKinsey & Co.10%. Knowledge management can be expensive, so it inevitably gets more traction and support in a firm when it is somehow linked to economic benefit or competitive advantage. In industries like consulting (often described as "knowledge businesses"), where

knowledge is the key to success with customers, the payoff from knowledge management projects remains largely perceptual. Still, attempts are made to demonstrate economic returns. E&Y, for example, tries to measure the amount of knowledge it reuses in the form of proposals, presentations, and deliverables, as well as the contributions made by its knowledge repository to closing sales.

Technical and Organizational Infrastructure

Knowledge projects are more likely to succeed when they can take advantage of a broader infrastructure of both technology and organization. Technological infrastructure is the easier of the two. It consists partially of technologies that are knowledge-oriented (e.g., Lotus Notes and the World Wide Web). If these tools and the skills to use them are already in place, a particular initiative will have an easier time getting off the ground. Most of the companies we interviewed employed multiple tools, which can either provide opportunities for organizational learning or increase functional specialization. At National Semiconductor, for example, engineers gravitated toward the Web, while sales and marketing personnel preferred Notes.

Another aspect of technology infrastructure for knowledge management projects is a common, pervasive set of technologies for desktop computing and communications. At the simplest level, this means a capable, networked PC on every desk or in every briefcase, with standardized personal productivity tools (e.g., word processing, presentation software) so that documents can be exchanged easily throughout a company. More complex and functional desktop infrastructures can be the basis of some types of knowledge management projects, as was noted above in the case of BP with its videoconferencing technology.

Building an organizational infrastructure for knowledge management means establishing a set of roles and organizational groups whose members have the skills to serve as resources for individual projects. The companies we interviewed often found this difficult to do, in part because it involves spending money on new roles. In some firms, however, there were multiple levels of new roles, from chief knowledge officers to knowledge project managers to knowledge reporters, editors, and knowledge network facilitators. In Ernst & Young's consulting business, for example, there are facilitators of 22 different knowledge networks, managers of several new knowledge-oriented organizations that create or distribute knowledge, a CKO, and several new committees to prioritize knowledge projects and set knowledge strategy. Although these new roles and structures are expensive, they mean

that any new project can take advantage of them for support and get up and running quickly. BP has created a team of "coaches" to facilitate the effective use of a sophisticated telecommunications infrastructure worldwide consisting of realtime desktop video via satellite, supporting document imaging, electronic white boards, etc. These coaches were responsible for working with end-users to create value from the technology. In the first five sites, the only unsuccessful effort was where no coaches were present, and a more laissez-faire approach to adoption was taken.

Some Level of Knowledge Structure

A critical factor for many projects is finding the right balance of knowledge structure. Knowledge is fuzzy and closely linked to the people who hold it, and its categories and meanings change frequently. Thus, knowledge resists engineering. The expert systems movement of the 1980s confirmed this problem; it proved to be difficult to create a set of rules that covered even narrow knowledge domains, and then even more difficult to update and modify the structure.

If a knowledge repository has no structure, however, it is too difficult to extract knowledge from it. One professional services firm attempted to create a wholly unstructured knowledge repository, searchable on all words in the database. A pilot system was virtually unusable, always yielding either too many or too few items. Firms building a knowledge base or expert network must create some categories and key terms. An important issue that arises is who controls definition of the knowledge structure. In an international engineering firm, the manager of the knowledge base created a relatively unstructured repository, while the company's engineers worked with a very hierarchical mental models and were very frustrated by the knowledge structure imposed on them.

Another factor is the continual evolution of a knowledge structure. It is often useful to employ a thesaurus to connect the terms by which users search for knowledge to those used in categorizing it. At Teltech, for example, an extensive thesaurus of technical terms allows browsing and searching of the expert network through terms that make sense to users. Teltech employees capture the terms that users employ in searches, and add them to the thesaurus daily. Therefore, the structure of the knowledge is always changing with current usage. Any knowledge manager should be prepared to redefine the structure used in the knowledge base frequently.

Knowledge-Oriented Culture

A "knowledge-friendly" culture is clearly one of the most important factors contributing to the success of a project. Culture

is perhaps the most difficult constraint that knowledge managers must deal with, and it has several relevant components:

- A positive orientation to knowledge, e.g., employees are bright, intellectually curious, willing and free to explore, and their knowledge creation activities are encouraged by executives;
- Absence of knowledge inhibitors in the culture, e.g., people are not alienated or resentful towards the company, and do not fear that sharing knowledge will cost them their jobs;
- Fit of the knowledge management project type with the existing culture.

A culture that is positively oriented toward knowledge is one where learning on and off the job is highly valued, and where hierarchy takes a back seat to experience, expertise, and rapid innovation. This positive orientation is inevitably reinforced by the type of people who are attracted to and hired by a firm. It is possible, of course, to pursue knowledge at the expense of work-related objectives, and this could be a downside of an overly knowledge-oriented culture. While it is always hard to generalize about culture in large, diverse organizations, we found strong evidence of this positive orientation toward knowledge in several of the firms we studied—from large consulting companies and high tech manufacturers to small knowledge-oriented firms like Teltech.

Given the downsizings in many American firms over the past decade, it is not uncommon to find negative aspects of organizational cultures with respect to knowledge. For example, individuals may feel that their knowledge is critical to maintaining their value as an employee, thus linking it directly to job security. Under these circumstances employees will be reluctant to share their knowledge with others. Although we found little evidence of this in our sample among successful projects, there were frequent examples among firms with unsuccessful knowledge management projects. For example, one large engineering firm found employees unwilling to share knowledge for two reasons. In some cases, employees, fearing layoffs, were reluctant to share any information about mistakes or failures even though this knowledge was very valuable to the firm and could prevent others from making the same error. In other cases, employees were reluctant to share positive knowledge feeling that their value to the firm and, therefore, their job security was inextricably tied to their personal knowledge and expertise.

And there were other notable examples where culture seemed to inhibit a project's objectives. At an advertising agency, the chief knowledge officer (CKO) related to us that on the creative side of the business, there was great pressure to be creative and original; the attitude was one of "derogating the derivative" and, thus, a disinterest in sharing and using already-created knowledge. In that industry, trade journals and industry awards reinforce the value of creativity, giving less prestige to work based on campaign efficacy—getting a consumer to buy your client's product or service. In order to get the creative people to share their knowledge with their peers, incentive and reward systems changes were needed.[9] But it remains to be seen if and how internal systems of the agency can be changed to overcome the norms and values that exist at an industry level. High-technology firms also struggle mightily with this problem. At a large telecommunications firm, engineers had the "hero" mentality, respecting only individual design achievements. Top engineers viewed it as a sign of weakness to use an existing design, an admission of not being able to do it themselves.

A third issue is the fit between an organization's culture and its knowledge management initiatives. At Hewlett-Packard, knowledge management projects are popping up all around the firm, but they are highly decentralized. Top management realizes the firm's culture of highly autonomous business units would not support a coordinated, top-down project at the corporate level, or even a corporate-level senior knowledge executive. Projects that don't fit the culture probably won't thrive, so management needs to align its approach with its existing culture, or be prepared for a long-term culture change effort.

Clarity of Purpose and Language

Clarity of purpose and terminology is an issue with any type of organizational change project, but is particularly important for knowledge management. The terms used in this realm—"knowledge," "information," "organizational learning"—are subject to varied use and interpretation. The successful knowledge management projects we found had paid attention to this issue, often by excluding some issues and concepts from their charters. As noted above, some were careful to exclude the idea of "data." One automobile manufacturer, for example, tried to ensure that raw data and information did not get put into its repositories of knowledge about engineering and design of key automobile components. When an engineer asked to include crash test information in the repository of chassis design knowledge, the project manager encouraged him to turn the information into knowledge by adding historical context, implications of the findings, comparisons to other cars or competitors, and learnings from the crash test process.

"Normal business language gives the impression of being fact-based, often drawing on military and natural science metaphors," said an experienced knowledge manager. "But knowledge management deals with things like complexity, uncertainty, and organic growth. That calls for a new vocabulary and managers aren't used to it. The language is more probing; it invites debate; and it exposes the uncertainty we all have." Effective knowledge use implicitly means changing the way people think about knowledge, which almost always means changing the language they use. But gaining acceptance for the more conceptual, abstract vernacular of knowledge-based competition can prove to be a barrier in many ways. Managers at one large engineering firm developed a detailed knowledge management strategy but the firm's engineering culture rejected it as sounding too grandiose and abstract. Although senior management was supportive of the overall initiative, their "eyes tended to glaze over" when presented with the details of the implementation process. As a result, budgets and political sponsorship dwindled.

Thus, knowledge managers must decide when and how to most effectively communicate their objectives. Some actively avoid using the term "knowledge" and frame their project only in already accepted business terms. (e.g., "We're going to reduce cycle time by finding new ways to reuse our engineering designs.") Others confront the language problem head on, as at Skandia, where the "director of intellectual capital" conducts an ongoing educational process. Knowledge managers must address the language issue in a

way that fits their culture. Regardless of their approach, however, they must also develop an understanding of what differentiates their work from more traditional information managers, and seek to clarify this boundary in senior management's mind.

Different Motivational Practices

Because knowledge is intimately and inextricably bound up with people's egos and occupational meanings, it does not emerge or flow easily across role or functional boundaries. Therefore, the presence of motivation to create, share, and use knowledge is an intangible critical success factor for virtually all knowledge management projects. Finding new sources of motivation to increase participation in knowledge sharing systems is a constant challenge. The motivational aids or incentives used cannot be trivial, as some of project managers had learned. One gave out airline frequent flyer mileage for browsing or contributing to a discussion database. He found that the free miles were enough to prompt an initial use of the system, but insufficient to drive ongoing activity. Another manager of an expert network planned to give out chocolate-covered ice cream bars—admittedly high-quality ones—to any expert who contributed a biography to the system. Needless to say, this incentive was insufficiently motivating.

Motivational approaches to encourage more effective knowledge behaviors should be long-term and tied in with the rest of the evaluation and compensation structure. At both E&Y and McKinsey and Co., for example, consultants are evaluated partially on the knowledge they contribute to repositories and human networks. If incentives are short-term, they should be highly visible. Shortly after Buckman Laboratories introduced a new knowledge sharing network, the best 150 "knowledge sharers" were rewarded with an elaborate company trip to a resort. The high profile event generated considerable discussion among those not chosen and immediately increased participation on the new knowledge sharing network. Texas Instruments recently created an annual "Not Invented Here But I Did It Anyway" award to acknowledge both those who borrow good ideas from within and outside the company, and also those who shared them.

Multiple Channels for Knowledge Transfer

Successful knowledge managers recognize that knowledge is transferred through multiple channels that reinforce each other. Some of the firms that had knowledge repositories realized that they had to get contributors together in a face-to-face setting on a regular basis. In that "high bandwidth" situation, trust can be

established, structures for knowledge developed, and difficult issues resolved. MIT researcher Tom Allen has found in many studies that scientists and engineers exchange knowledge in direct proportion to their level of face-to-face contact.[10] In this day of the Internet, Lotus Notes, and global communication systems, it is easy to devalue the need for face-to-face interaction. But at Sematech, the semiconductor research consortium, a premium is placed on face-to-face meetings among researchers and research sponsors. Sematech has many channels for knowledge transfer—paper documents, a Web site, document databases—but its knowledge managers feel that the human channels are the most effective. Successful knowledge projects usually address knowledge transfer through a variety of channels, recognizing that each adds value in different ways, and that their synergy enhances knowledge use.

Senior Management Support

Like almost every other type of change program, knowledge management projects benefited from senior management support. We found that strong support from executives was critical for transformation-oriented knowledge projects, but less necessary in efforts to use knowledge for improving individual functions or processes. The types of support that were helpful included the following:

- Sending messages to the organization that knowledge management and organizational learning are critical to the organization's success;
- Providing funding and other resources for infrastructure;
- Clarifying what types of knowledge are most important to the company.

We found that several of the executives who championed knowledge initiatives were themselves relatively cerebral and conceptual. They were well-read and well-educated, and set the tone themselves for a knowledge-oriented culture. A strong personal orientation to knowledge may not be absolutely necessary for a senior manager to champion knowledge management, but it surely helps.

There are doubtless other factors affecting the success of knowledge projects, but firms working on these eight are clearly on their way to succeeding. While it is impossible to prioritize among these factors based on our qualitative observations of the research sites, we do have an intuitive feel for the factors that matter most. Unfortunately, they also tend to be the factors that are most difficult to develop. These include developing a knowledge-

oriented culture, creating an organizational infrastructure, finding effective motivational tools, and developing senior management support if it is not already present. Obviously, these topics are related. A senior management team that is truly committed to knowledge management will probably already have created some aspects of a knowledge-oriented culture, and will support changes in performance measurement, which are key to changing motivation. In addition, they are more likely to allocate the resources needed to create an organizational infrastructure for knowledge management. Without proactive top management support to address these three factors, a firm should only begin knowledge management on a small scale, with objectives focused on improving the effectiveness of a single knowledge-oriented function or process.

The sequence in which these factors are addressed should also be considered. There may be a life cycle to building effective knowledge management practices and processes. As with physical construction, a foundation needs to be built. While not value adding in and of itself—no one ever lived in a foundation—a certain amount of infrastructure is needed in order to create value later. Thus, the knowledge environment projects establish the conditions necessary for subsequent projects to actually leverage knowledge.

How Are Knowledge Projects Different?

Managers are becoming increasingly involved with change programs of various types, and certainly some of the success factors described above are similar to those of information systems projects, reengineering projects, empowerment programs, etc. In this concluding section we consider how knowledge projects differ from other more familiar types of change initiatives.

All projects benefit from senior management support, but the attributes of executives who support knowledge projects are different in our research. Several of the CEOs in the firms we studied made frequent public comments such as, “We’re in the knowledge business.” or “Our intellectual capital is at least as important as our financial capital.” These executives seemed to be more conceptual and have an implicit faith that knowledge management will benefit their organizations, although they usually also want to see measurements of the benefit where possible.

All change projects also benefit from a culture aligned to support its objectives. But the more knowledge-oriented cultures being pursued in conjunction with successful knowledge management projects require more fundamental behavioral shifts than most

other change efforts. Because knowledge is closely linked to power in organizations, these projects can have significant implications for the firm's power structure.

Most change projects can profit from a process orientation, but there seem to be more obvious limits to the value of a process focus in knowledge projects. One firm in our study took the process approach to an extreme, defining one "organizational learning" process, 4 sub-processes, 15 sub-sub-processes, and 53 sub-sub-sub-processes. After the first year, however, only about 5% of the new processes had been implemented. The knowledge management project manager will find it useful to have a good sense of his or her customer, the customer's level of satisfaction, and the productivity and quality of services offered. But project managers generally did not find it practical to describe the detailed process steps used in knowledge management. This is consistent with previous findings on improving knowledge work processes. (It is perhaps safe to conclude that "knowledge management" is "knowledge work.")[11]

The need for a combination of technical and human elements is something information systems projects, in particular, have in common with knowledge projects. But, in knowledge management initiatives, we observed that the complexity of human factors to be managed was much greater than for most data or information management projects. Because of the human element in knowledge, a flexible, evolving structure for knowledge is desirable, and the motivational factors in creating, sharing, and using knowledge are very important. Data and information are constantly transferred electronically, but knowledge seems to travel most felicitously through a human network.

Recent popular change and improvement techniques have had life cycles beginning with revelation and ending with revilement. Hailed at the beginning—"now we finally get it"—as a bold break from the stodgy past, after only a few years the approach may be viewed with disdain, often because it is implemented in a half-hearted, or even cynical fashion. Let us end with the observation that effective knowledge management is neither panacea nor bromide; it is one of many components of effective management. Sound planning, savvy marketing, high-quality products and services, attention to customers, the efficient structuring of work, and the thoughtful management of a firm's human resources—none of these is diminished in importance by the acknowledgment that knowledge is critical to success and needs to be managed. At the margin, however, when a firm is faced with competitors that already perform well on these other dimensions,

the difference between success and failure may well turn on how effectively an organization manages its knowledge.

Endnotes

[1] Harvard sociologist Daniel Bell presented one of the earliest analyses of the changes that might accompany the increase in knowledge in *The Coming of Post-Industrial Society*, 2nd Edition, (New York: BasicBooks, 1973, 1976). Peter Drucker, in *Post-Capitalist Society*, (New York: Harper Collins, 1993) provides a historical perspective into which the most recent economic changes can be framed and understood and speculates about their implications for business. Stanford economist Paul M. Romer has provided the first quantitatively rigorous treatment of how knowledge intensiveness affects economic growth. See, for example, "Human Capital and Growth: Theory and Evidence," *Carnegie-Rochester Conference Series on Public Policy 32*, (1990), 251-286.

[2] For example, Ernst & Young and the Planning Forum jointly hosted a conference in Boston in 1994 called *The Knowledge Advantage*; the popular reception was so great that follow-up conferences were held in 1995 and 1996. Thomas Stewart has written extensively about the subject in *Fortune* magazine; see, for example, "Your Company's Most Valuable Asset: Intellectual Capital," *Fortune*, October 3, 1994. Recent books include, *The Knowledge Creating Company*, Ikujiro Nonaka and Hirotaka Takeuchi, (New York: Oxford University Press, 1995); Joseph L. Badaracco, Jr., *The Knowledge Link: How Firms Compete Through Strategic Alliances*, (Boston, MA: Harvard Business School Press, 1991); Dorothy Leonard-Barton, *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation*, (Boston, MA: Harvard Business School Press, 1995).

[3] The broader project, *Managing the Knowledge of the Organization*, is managed by Ernst & Young's Center for Business Innovation in Boston. 17 companies sponsored this program in 1996.

[4] Ikujiro Nonaka, "A Dynamic Theory of Organizational Knowledge Creation," *Organization Science*, February 1994, Volume 5, Number 1, pp. 14-37.

[5] Lynne G. Zucker, "The Role of Institutionalism in Cultural Persistence," in *The New Institutionalism in Organizational Analysis*, eds. Walter W. Powell and Paul J. Dimaggio, (Chicago, IL: University of Chicago Press, 1991), pp. 83-107. Brown, J.S. and P. Duguid, "Organizational Learning and Communities of Practice:

Toward a Unified View of Working, Learning, and Innovation," *Organization Science*, 2 (1991):40-57.

[6] Robert G. Eccles, "The Performance Manifesto," *Harvard Business Review*, January-February 1991, pp. 131-137. Robert S. Kaplan and David P. Norton, "The Balanced Scorecard—Measures that Drive Performance," *Harvard Business Review*, January-February 1992, pp. 72-29.

[7] David V. Gibbons and Everett M. Rogers, *R&D Collaboration on Trial*, (Boston, MA: Harvard Business School Press, 1994).

[8] Seth Shulman, "Patent Medicine," *Technology Review*, November December 1995, pp. 28-36.

[9] Randall H. Russell, "Providing Access: The Difference Between Sharing and Just Reporting Corporate Information," *Information Strategy*, Winter 1996, pp. 28-33.

[10]Many of these studies are reported in Thomas J. Allen, *Managing the Flow of Technology* (Cambridge, MA: MIT Press, 1977).

[11]Thomas H. Davenport, Sirkka Jarvenpaa, and Michael C. Beers, "Improving Knowledge Work Processes," *Sloan Management Review*, Summer 1996, pp. 53-65.

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