The Design and Implementation of Effective Knowledge Management Systems

Ford Motor Company MBA Fellowship

By Steve Morrissey
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Supervised by:
Professor Paul J.H. Schoemaker

“All companies face a common challenge: using knowledge more effectively than their competitors do.”

John Browne, BP Amoco
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Steve Morrissey
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Executive Summary

The field of knowledge management is the study of how firms manage the tacit and explicit knowledge and know-how their employees have about its products, services, organizational systems and intellectual property. Specifically, knowledge management embodies the strategies and processes that a firm employs to identify, capture and leverage the knowledge contained within its “corporate memory”.

It has been well documented that organizations with efficient communication linkages have higher “information flow, knowledge sharing, cooperation, problem-solving, creativity, efficiency, and productivity.”¹ Companies built on such well developed networks also “produce measurable business results, such as faster learning, quicker response to client needs, better problem-solving, less rework and duplication of effort, new ideas and more innovation. They enjoy higher sales, more profits, and superior market value.”² The following paper aims to explore the design and implementation of effective knowledge management systems for firms, specifically how companies can strategically manage their knowledge assets through the use of various knowledge management tools.

My study begins by providing a brief overview and background into the field of knowledge management. This section will also provide a definition of knowledge management, give a brief historical perspective on the field of knowledge management and discuss the current knowledge management environment.

Next, I will profile some of the primary categories of knowledge management tools. For purposes of this paper, I have classified knowledge management tools into two categories: (i) knowledge management techniques which focus primarily on collecting employees’ tacit knowledge and (ii) knowledge management technologies which attempt to capture employees’ explicit knowledge.

I then will discuss a seven step knowledge management implementation process that I have developed based on my research into successful knowledge management implementations. Importantly, this implementation strategy views knowledge management as a business process, rather than a technological solution. It attempts to integrate information technology, firm culture, organizational processes and senior management support into a cohesive system.

Following this section, I will present some common challenges in implementing a knowledge management system and discuss some common critiques that knowledge management skeptics offer. I will suggest recommendations for how knowledge management systems can be modified to address these shortcomings.

In the next section, I will profile several recent successful knowledge management applications and analyze why these firms have been successful in applying knowledge management. In each case, I will examine the benefits that firms have realized and discuss the challenges firms faced in their implementations of knowledge management. I will conclude this section with several lessons learned from these case studies.

The final section of my paper will present my views on the future of the knowledge management field.

¹ http://www.aventis.com/future/fut0102/social_capital/social_capital_1.htm
² http://www.aventis.com/future/fut0102/social_capital/social_capital_1.htm
Overview and Background of Knowledge Management

What is Organizational Knowledge?

Knowledge can be thought of as “information combined with experience, context, interpretation, reflection and is highly contextual. It is a high-value form of information that is ready for application to decisions and actions within organizations.”

In any organization, there are two primary types of knowledge: tacit knowledge and explicit knowledge.

- **Tacit knowledge.** Tacit knowledge can be defined as knowledge that “is subconsciously understood and applied, difficult to articulate, developed from direct experience and action, and usually shared through highly interactive conversation, storytelling and shared experience.” Examples of tacit knowledge include “‘best practice’ performed in an organization, management skills, technologies, customer, market and competitor intelligence.” Tacit knowledge is, by definition, hard to codify and store.

- **Explicit knowledge.** Explicit knowledge, on the other hand, “is more precisely and formally articulated, although removed from the original context of creation or use.” Explicit knowledge includes, for example, the content of spreadsheets, management reports, procedural and training manuals. In other words, explicit knowledge is any knowledge that can be codified and documented.

What is Knowledge Management?

The field of knowledge management is the study of how firms manage the tacit and explicit knowledge and know-how their employees have about its products, services, organizational systems and intellectual property. Specifically, knowledge management embodies the strategies and processes that a firm employs to identify, capture and leverage the knowledge contained within its “corporate memory”.

Some people think of knowledge management as a branch of information technology. However, “it is important to realize that there is much more to knowledge management than technology alone. Knowledge management is a business process. It is the process through which firms create and use their institutional or collective knowledge.” Thus, my study of knowledge management will emphasize that a knowledge management program will integrate information technology, firm culture, organizational processes and senior management support into a cohesive system.

While there is a substantial amount of variation in how firms define their knowledge management activities, I have identified several common features to all knowledge management systems. Regardless of the tools or techniques employed, a successful knowledge management system will: (i) identify critical knowledge within the firm that the firm wishes to retain or share internally or to external stakeholders; (ii) collect, store and organize such critical knowledge in a format and location; (iii) facilitate knowledge transfer and retention between users and (iv) utilize existing knowledge to drive new knowledge creation. I discuss these common features in more detail below:

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3 http://www.accaglobal.com/publications/studentaccountant/57627
4 http://www.accaglobal.com/publications/studentaccountant/57627
5 http://www.accaglobal.com/publications/studentaccountant/57627
Identification of critical knowledge. In any knowledge management system, a firm must first identify which knowledge and information is most critical to the success of the firm. For example, a pharmaceutical firm may recognize that embedded in its prior drug discovery research lays substantial research knowledge which, if properly utilized, could help speed new drug development. Identifying critical knowledge is essential so that the firm can properly structure systems, tools and processes aimed at retaining and sharing this knowledge.

Collection, storage and organization of critical knowledge. Once relevant critical knowledge has been identified, a firm must develop processes and tools in order to collect and store such knowledge and information. The pharmaceutical firm above may wish to invest in technology (knowledge databases; discussion and chat technologies; intranets; search, retrieval and data mining tools; project collaboration software tools; expert locators; etc.) and management techniques (communities of practice, mentoring, training, etc.) in order to institutionalize knowledge contained in prior drug research, although the specific choice of tools and processes will depend on the type, format and use of the desired knowledge. Regardless of the tools and processes involved, the critical knowledge must be stored in a location and format which can be easily found and accessed by users (employees or other external stakeholders).

Sharing relevant knowledge and information between users. Knowledge management systems must also facilitate the sharing of relevant knowledge between users. Thus, even if a firm has successfully collected, stored and organized critical firm knowledge, potential users of such knowledge must be made aware of its existence and encouraged to contribute and use knowledge within the firm’s knowledge repository.

Utilization of existing knowledge to drive new knowledge creation. Last, an effective knowledge management system will allow users to leverage existing knowledge within a firm’s knowledge system. By enabling cross fertilization of knowledge from disparate areas of the firm, users can drive innovation by building upon knowledge created by colleagues. In my hypothetical pharmaceutical firm example, the firm aims to use knowledge management to allow researchers in one area of the firm to leverage and build off of research conducted by others in another area of the firm. Clearly, this area of knowledge management can be the most elusive; however, it also has the greatest potential to deliver substantial gains to firms that can harness the benefits of knowledge management.

Collectively, these elements and the tools and processes which facilitate these features comprise a firm’s knowledge management system.

Knowledge Management From a Historical Perspective

The field of knowledge management has received increasing amounts of attention in recent years; however, the roots of the field can be traced back many years. In fact, “the concept of knowledge management is nothing new. Corporations have always had some process to synthesize their experience and integrate it with knowledge acquired from outside sources (e.g. inventions, purchased patents).”

In particular, firms have long employed various knowledge management techniques. Communities of practice, for instance, have been in existence for a great many years. “In ancient Rome, ‘corporations’ of metalworkers, potters, masons, and other craftsmen had both a social aspect and a business function. In

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the Middle Ages, guilds fulfilled similar roles for artisans throughout Europe."8 Firms have also long
invested in training, mentoring and other educational and knowledge sharing programs.

However, recent advancements in technology have enabled the knowledge management field to make
dramatic improvements in its ability to store, retrieve, capture and transfer knowledge from one area of
the firm to another. These recent technological developments have enabled firms to institutionalize their
knowledge management function and integrate the knowledge management techniques mentioned above
with new technologies in order to create integrated knowledge management programs. This development
has enabled the field of knowledge management to take off. This example of “technological speciation”
explains how advances in technological development often occur in rapid “bursts of evolutionary
activity” after a small improvement in a technology opens the door to a wider range of applications.9 For
example, consider the effects that the relatively small development of the web browser had on the
development of the internet. Once Netscape developed a user-friendly HTML interface, the web browser
brought about rapid advances in the mass market penetration of the internet.10

In this manner, technological speciation can also be used to analyze the development of the knowledge
management field. “Recent developments in information technology have an important role for the
sudden emergence of knowledge management. Information technology has provided new tools to better
perform the activity of building knowledge capital.”11 Specifically, the knowledge management field
witnessed substantial “evolution” after the introduction of Lotus Notes, which was one of the earliest
integrated email, database and document management applications. This software for the first time
allowed users to access, share information and communicate with employees across a global
organization.12 Netscape’s browser development had further ripple effects on the knowledge management
field as it also allowed for the development and deployment of corporate intranets, which have had a
substantial role in the further development of firms’ knowledge management and sharing efforts. More
recently, “two important areas in particular have contributed to the birth of modern knowledge
management systems: communication (or network technologies) and relational databases.”13 These
advanced communication technologies, which will be discussed in a later section, have enabled enhanced
collaboration between project teams. Relational databases, which allow data from different sources to be
linked together, have allowed firms to “link” data and knowledge from one area of the firm to another.
These knowledge “links” allow the firm to construct knowledge “bridges” which contribute to the firm’s
ability to use existing knowledge to generate new learning. Other notable technological advances which
have played a substantial role in the development of knowledge management include advances in file
storage, search and retrieval technologies.

This brief overview of knowledge management provides a summary background into the history of the
field. While recent history demonstrates the importance of information technology to the field, it is
important to remember that knowledge management is a business process. Technology is an important
enabler of knowledge management, but it is only one such component of an integrated knowledge
management system.

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11 Sarvary, Miklos. “Knowledge management and competition in the consulting industry.” California Management
13 Sarvary, Miklos. “Knowledge management and competition in the consulting industry.” California Management
DRIVERS BEHIND KNOWLEDGE MANAGEMENT

Why has there been an increasing interest in the field?
The field of knowledge management has become increasingly popular in recent years. I believe that there are several reasons behind the dramatic growth in interest in the field. On the “demand side”, there are several structural, demographic and economic factors which have driven the heightened interest in the field. On the “supply side”, recent advances in communication technologies, including the increased adoption of the internet, have allowed for the development of communication and knowledge sharing applications specifically adapted for knowledge management functions. This technology “speciation” has helped facilitate the increased adoption of knowledge management tools and technologies.

Demand drivers of knowledge management
Specifically, in the post-war era, the U.S. economy has undergone a dramatic structural shift from a manufacturing-based economy to that of a service-based economy, as the service sector now comprises 80% of U.S. employment and 63% of U.S. GDP. Since people are the primary asset in a service organization, firms have begun to recognize that retaining their employees’ knowledge will be increasingly important as firms grapple with how best to institutionalize the knowledge of their employees given the current high levels of employee turnover. The Bureau of Labor Statistics estimates that employees change jobs so frequently that 54% of all employees have been with their current employer for less than four years.14

A second structural shift in the labor force has been the increased globalization of business. Today, workforces can be geographically dispersed across the globe, making communication and knowledge sharing increasingly difficult. Firms have again recognized the need for tools and technologies which can facilitate the sharing of information between geographically disparate employees.

In addition, firms have also begun to grapple with how best to address the changing demographics of their labor forces. As the baby boomer generation reaches retirement age, firms will risk losing valuable knowledge contained within the experience of these baby boomer employees. To highlight the problem companies will face as large numbers of key employees reach retirement age, the Buckeye Institute reports that approximately 71% of all federal government employees will be eligible for retirement by 2010.15 Thus, finding tools and techniques that will aid in retaining and institutionalizing the knowledge maintained by these transitioning and retiring workers has become increasingly important for firms that wish to maintain their continued competitiveness.

Finally, in addition to the above demand factors, firms have also begun to recognize the other economic benefits that knowledge management can provide to firms. Specifically, knowledge management has the potential to improve firms’ competitiveness by: (i) fostering innovation by encouraging the free flow of ideas between areas of the firm; (ii) improving customer service by streamlining response time; (iii) boosting revenues by getting products and services to market faster; (iv) improving and lowering the costs of employee training and (v) streamlining operations by eliminating redundant processes. Therefore, those firms that properly view the retention and management of intellectual capital as a core competency will have a significant strategic advantage through their ability to retain, harness and draw upon their “corporate memory”.

Supply drivers of knowledge management
On the “supply side”, recent technological advances have facilitated the development and adoption of specialized knowledge management tools and technologies. As mentioned in the ‘Knowledge

14 http://www.bls.gov/news.release/tenure.t03.htm
15 http://www.buckeyeinstitute.org/Articles/2003_06-26Workforce.htm
Management From a Historical Perspective’ section, these recent advances have allowed for a “technological speciation” of the knowledge management industry, which has led to a burst of new knowledge management technologies. These new technologies have allowed unprecedented ability to access, store, search, organize, share information and communicate with colleagues across a global organization. These technological advances, while small advances in their own right, have led to a significant improvement in the collective technological ability of a firm to manage its knowledge capital.

THE CURRENT KNOWLEDGE MANAGEMENT ENVIRONMENT

As a result of these collective supply and demand drivers, the knowledge management field has been garnering increasing attention in the corporate world. IDC predicts that spending on knowledge management initiatives will increase by a compound annual growth rate of 40.7% from 2000-2005 to reach $12 billion worldwide by 2005.16

Both the public and private sectors have been investing in knowledge management initiatives. In the public sector, Dataquest estimates that government spending on knowledge management initiatives will account for about 30% of total knowledge management spending.17 Another research firm, INPUT, has forecast that U.S. federal government spending on knowledge management related technologies and projects will increase from $850 million in fiscal year 2004 to nearly $1.1 billion in fiscal year 2009.18 The projected increase is driven by heightened pressures to eliminate redundancies between agencies, to improve information sharing among agencies for improved homeland security purposes and to improve overall agency performance by leveraging a broader, inter-agency knowledge base.19 A detail of INPUT’s forecast of federal government knowledge management expenditures is shown in the table below.

![The top 10 agencies within the federal government in terms of current and future KM expenditures.](image)

In the private sector, however, there appears to be a higher concentration of expenditures in certain industries, as shown in the table below.

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18 http://www.cio.com/archive/111504/tl_km.html
19 http://www.meskill.net/archives/000790.html
As this data indicates, certain industries have more readily adopted and invested in knowledge management in recent years. In the consulting industry, for example, it has been estimated that the major firms may spend as much as 6-12% of revenues on knowledge sharing programs.20

Why have certain industries more readily adopted knowledge management as compared to other industries? My research indicates that industries which have aggressively invested in knowledge management have several commonalities. These industries: (i) are human and intellectual capital intensive; (ii) are all highly competitive; (iii) offer the potential for large rents to firms which are “first-to-market”; (iv) generally are comprised of firms with highly distributed organizations with operations across multiple geographic and business units; (v) often have a high percentage of repeat work product which potentially can be leveraged through re-use and (vi) have high turnover and/or pending labor force retirement issues. My findings indicate that these industry characteristics have forced firms in these industries to develop competencies in knowledge management or else risk being at a competitive disadvantage relative to other firms in their sectors.

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20 Garner Group, May 28, 1998
Knowledge management techniques and technologies

There are a wide range of knowledge management tools in use today by firms seeking to implement a knowledge management solution. These tools can be broadly classified into two distinct categories: (i) knowledge management techniques and (ii) knowledge management technologies. While most all successful implementations will utilize a combination of both knowledge management techniques and technologies (as will be discussed later in my case studies), this categorization presents a useful framework for a discussion of knowledge management tools.

**Knowledge Management Techniques**

Knowledge management techniques are most effective at capturing employees’ tacit knowledge, although many of the management techniques below also provide an explicit knowledge capture component. These management techniques are particularly effective at capturing tacit knowledge because many of the knowledge management techniques detailed below involve human interaction where contextual knowledge can be transferred. Under ideal circumstances, this type of contextual knowledge can be codified in a general form and shared with larger populations.

The more common knowledge management techniques, in increasing order of sophistication, include: (i) mentorship programs; (ii) after action reviews / project summaries; (iii) regular intra-office (or intra-division) meetings; (iv) storytelling; (v) communities of practice and (vi) centers of excellence. Each of these management techniques is discussed in greater detail below.

- **Mentorship programs.** One of the least sophisticated and easiest to implement forms of knowledge management is a mentorship program. A mentorship program allows experienced senior employees to share their knowledge and experience with junior employees. Junior employees can seek advice and counsel of their mentors when encountering a particular challenge which the mentor may have dealt with previously. While it is impossible to accurately estimate the number of firms which have established mentorship programs (let alone informal mentorship programs), many large corporations, including AT&T, Merrill Lynch, Federal Express, General Motors, J.C. Penny, Bell Labs, DuPont, and Sun Microsystems have acknowledged the benefits of their mentoring programs. “For the organization, mentoring serves to preserve ‘institutional memory’ by sharing information and experience from one to another. This need to pass along corporate learning and develop bench strength within the organization is particularly critical now that downsizing has created flat and lean organizations and as baby boomers begin to retire, taking their know-how with them. Mentoring programs are an inexpensive way to inspire future leaders, improve management and staff relationships and prepare people to succeed an aging workforce.”

  **Advantages:** Inexpensive; relatively easy to adopt; potentially improves morale, productivity and turnover.

  **Disadvantages:** Some mentor/mentee relationships will be more successful than others; not all employees will “buy-in” or desire to be a part of the program.

  [21](http://www.onbusiness.net/articles_html/ShawnKent%2CMS_522.html)
After-action reviews / project summaries. Originally developed and used extensively by the U.S. Army, an “after action review is a discussion of a project or an activity that enables the individuals involved to learn for themselves what happened, why it happened, what went well, what needs improvement and what lessons can be learned from the experience. The spirit of an after action review is one of openness and learning - it is not about problem fixing or allocating blame. Lessons learned are not only tacitly shared on the spot by the individuals involved, but can be explicitly documented and shared with a wider audience.”

Shell, Harley-Davidson and Geerlings & Wade are just three examples of firms which utilize after action reviews.

Project summaries entail having the project team write a synopsis of their project work upon completion. Such a synopsis may include an overview of the problem the team had to solve, the different solutions considered, the selected solution, challenges the team had to overcome and the names of the employees who worked on the project. Project summaries for multiple projects could be stored in a central location for all employees to be able to access. In this manner, future project teams could review past project summaries in attempt to find examples of similar projects or teams that faced similar challenges.

Advantages: The advantages of this technique are that it is relatively easy to implement and it addresses one way that an organization can leverage its past experience and alert employees to the vast amount of knowledge contained in the firm’s experience base. In addition, this technique is inexpensive and is suitable for a wide range of activities.

Disadvantages: It may be difficult to motivate employees to complete project summaries; project summaries can be limited by the information that can be recorded in writing.

Regular intra-office or intra-division meetings. Another technique which firms have used to get employees to share and transfer knowledge is through the use of regular intra-office or intra-division meetings. The purpose of these meetings is to bring together employees from different offices or different areas of the firm. Such interaction between disparate areas of the firm allows employees to exchange ideas and experiences and thus transfer knowledge between areas of the firm. In fact, “off-site meetings are a great way to get people together, away from the office, to discuss important topics and share information. They can prove really valuable for networking with colleagues and learning about what’s going on in other areas within the organization.”

Advantages: These meetings are relatively easy to conduct and such face-to-face interaction can help develop relationships between employees from different areas of the firm.

Disadvantages: Meetings can only be conducted on an infrequent basis, thus limiting the benefit of frequent interaction. Meetings only take place during scheduled meeting times, rather than during more pressing times when employees may have a greater need for interaction. The cost of holding off-site meetings can be expensive.

http://www.nelh.nhs.uk/knowledge_management/km2/aar_toolkit.asp
http://www.signetconsulting.com/aarsum.html
Sometimes these meetings are referred to as “offsite” meetings, although these meetings can take place at company facilities as well.
http://www.dmreview.com/article_sub.cfm?articleId=1011131
• **Storytelling.** Storytelling is another management technique which has been used to facilitate the exchange of knowledge between members of an organization. Robert McKee, a prominent screenwriting coach, says, “the best way to persuade people is by uniting an idea with an emotion.” By telling a compelling story “you not only weave a lot of information into the telling, but you also arouse your listener's emotions and energy.” Steve Denning, a leading advocate of storytelling, states: “storytelling relinquishes a straightforward journey from A to B, and in the end provides a vehicle for conveying unseen tacit knowledge. Storytelling draws on deep-flowing streams of meaning, and on patterns of primal narratives of which the listeners are barely aware, and so catalyzes visions of a different and renewed future.”

**Advantages:** Storytelling can create memorable learning experiences; storytelling can also be used to help more clearly communicate complicated ideas.

**Disadvantages:** Effective storytelling is a skill and not everyone can effectively communicate in this format; storytelling alone cannot convey the wealth of knowledge embedded in the firm’s entire knowledge base.

• **Communities of practice.** Communities of practice are “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis.” Communities of practice are formed around “a common sense of purpose and a real need to know what each other knows.” These communities may have many different purposes. They may create a forum for group members to document lessons learned or help create a standardized set of “best practices”. Alternatively, a community of practice may help to initiate new employees into a group or trade, serve as a source of advice to help solve common business problems, or function as a sounding board for new ideas. Haliburton, for example, is “using communities of practice to leverage the knowledge and experience of experts around the world to develop solutions that precisely meet the needs of customers for complex well designs and difficult well conditions. By helping to build these communities, we are not only realizing huge improvements in business processes and performance, but also providing employees with greater access to one of the most valuable learning resources: interaction with peers.”

**Advantages:** Communities can be successful forums in which to share common business problems, to vet new ideas, to develop business standards and to initiate new employees.

**Disadvantages:** Communities of practice have been implemented with varying degrees of success. Successful communities require strong leadership and an engaged membership. Unless a community has a leader who can devote a meaningful amount of time to maintain continued interest in the community, the interest and participation level of many communities tends to decline over time.

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29 [http://www.tcm.com/trdev/cops.htm](http://www.tcm.com/trdev/cops.htm)
Centers of excellence. Centers of excellence, or knowledge centers, are formal centralized “organizations whose job also consists of synthesizing and distributing the firm’s knowledge...[these knowledge centers] continually digest the firm’s experience.”\(^{31}\) These centers of excellence can help to centralize knowledge codification and help relieve some of the burden of knowledge capture from operating units. Additionally, centers of excellence often maintain databases of their work and sometimes publish their findings in white papers (or other similar publications) which are shared with the firms’ stakeholders as a means to transfer knowledge.

Advantages: Provide the firm with the opportunity for knowledge breakthroughs; enables the firm to formalize knowledge leadership in a particular area; centralizes knowledge capture; creates visibility for firm and experts in practice area.

Disadvantages: Maintaining centers of excellence can be expensive and benefits can be difficult to measure.

Knowledge Management Technologies

In addition to the above knowledge management techniques, there are also a host of knowledge management technologies. In contrast to knowledge management techniques, knowledge management technologies excel at capturing employees’ explicit knowledge, but have difficulty capturing tacit or contextual knowledge.

I have classified knowledge management technologies into the following broad categories: (i) knowledge storage tools; (ii) search and retrieval tools; (iii) collaboration tools and (iv) communication tools. These categories of knowledge management technologies are discussed below:

Knowledge storage tools. Knowledge storage tools, also known as content databases, allow a firm to electronically collect and store information. Examples of such storage tools include knowledge databases (Lotus Notes) as well as corporate intranets which serve as a repository of project files and other knowledge created by users. The latest knowledge storage tools differ from earlier database or file systems in that these newer tools have more sophisticated organizational structures which allow users to more easily identify and locate desired information. In addition, the internet has allowed for global access to such knowledge databases so that employees can store and retrieve information on a worldwide basis.

Advantages: Knowledge storage tools enable the firm to store explicit knowledge in multiple formats. Well designed tools also offer substantial flexibility and ability to integrate functionality with other knowledge management tools.

Disadvantages: These tools are often expensive and require substantial user training. If the tools are not easy to use, it may also be difficult to encourage employee use and adoption.

Search and retrieval tools. The second category of tools is the search and retrieval tools. These tools allow the user to easily search for and locate information within a knowledge database or other knowledge repository. These tools also include tools which allow users to

locate specific expertise within (or external to) a firm. For example, an employee may be working on a project which deals with a specific challenge. Using an expertise locator tool, the employee could query the expertise database and identify other employees (internal or external to the firm) who may have experience or expertise in this particular field. These tools are particularly useful in helping employees locate others within a dispersed organization who may possess valuable knowledge relevant to their work.

**Advantages:** Search and retrieval tools can offer a powerful tool to locate documents or other information within a firm’s knowledge base. Most tools require little training, are relatively easy to use and are inexpensive. These tools also integrate well into a firm’s database products.

**Disadvantages:** Most search and retrieval tools are passive in nature and require the user to specify search terms. Also, these tools usually cannot identify the specific knowledge context that the user is seeking.

- **Collaboration tools.** Collaboration tools allow employees to create a virtual, web-based workspace in which they can share files and interact in an electronic environment. Such tools can provide a “collaborative workplace which can enable distributed teams to work together to accelerate and improve development and delivery of products and services, optimize collaborative business processes, and improve innovation, problem-solving, and decision-making.” These tools allow dispersed project teams to exchange electronic files, discuss topics on-line, as well as store, retrieve and organize project work in a centralized location.

**Advantages:** Collaboration tools enable distributed learning and workflow. Most collaboration tools are relatively easy to use. These tools are flexible, can be used in a variety of situations and integrate well into a firm’s other knowledge management tools.

**Disadvantages:** The cost of some collaboration tools can be moderately expensive. Unless the firm is careful to embed collaboration tools into the work process, the firm may have difficulty encouraging employee use.

- **Communication tools.** Various communication tools can also help firms address their knowledge management issues. These communication technologies can be classified into asynchronous and synchronous tools. Asynchronous tools include technologies which allow communication between two or more users on a sequential basis. Examples of such technologies include email, wikis and weblogs. Synchronous tools are those technologies which facilitate communication between users on a real-time basis. Discussion and chat technologies and videoconferencing are examples of synchronous communication tools. Both asynchronous and synchronous tools help to improve the knowledge sharing, interaction and transfer of information between employees in an organization.

**Advantages:** Most communication tools are simple to use and these tools also allow enhanced communication. In general, employee adoption is high as employees enjoy the social aspect of these tools. Also, these tools are usually not cost-prohibitive and they complement and integrate well with other knowledge management tools. Communication tools also have a high degree of flexibility which makes them appropriate for a wide range of activities.

[32](http://www.documentum.com/products/glossary/eroom.htm)
Disadvantages: There are few effective search tools for communication technologies. Thus, knowledge storage and retrieval is challenging with these tools.

In the section on ‘Successful Knowledge Management Applications’, I will explore real world applications of some of these knowledge management techniques and technologies and draw lessons learned from these early success stories.
Steps In Implementing a Knowledge Management System

My study of knowledge management implementations has identified seven key steps in a knowledge management implementation. These seven steps, shown in the table below, are essential in order to maximize the potential for a successful implementation. Each step is discussed in detail below.

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<td>3. Obtain Senior Management Support</td>
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<td>4. Design Integrated System of Tools and Technologies</td>
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<td>5. Design Incentives for Use</td>
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<td>6. Measure Impact</td>
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<td>7. Promote and Advertise Success</td>
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**Assess What Knowledge Is Required**

The first step in any knowledge management implementation is to assess what knowledge an organization requires. Identifying critical knowledge is essential so that the firm can properly structure systems, tools and processes aimed at retaining and sharing this knowledge.

One way that a firm can assess what knowledge it may require in the future is to utilize scenario planning in order to develop a series of views about its future competitive environment. Based on these scenarios of its future, a firm can then develop a strategy which will best position it for competitive success. Once these views of the future are developed, a firm can then assess how various knowledge management initiatives might be instituted to assist the firm in achieving the strategy it develops. Improving a firm’s information flow, knowledge sharing, cooperation, problem-solving, creativity, efficiency, and productivity has the potential to add substantial value and can greatly assist a firm in achieving its strategic objectives.

Specifically, scenario planning “offers a framework designed to address complex and highly volatile environments by revealing and organizing the underlying uncertainties.” Thus, scenario planning is an analysis that has been developed to help managers develop a strategy in uncertain business environments. Professor Paul Schoemaker and V. Michael Mavaddat state:

“...the mind can only see what it is prepared to see. Scenario planning helps prepare the corporate mind so that it will recognize opportunities faster than rivals, and can move

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more quickly, with more resolve. Good scenarios help overcome strategic myopia and frame blindness by forcing organizations to scan beyond the boundaries of their current core business, in a systematic and purposeful manner.\textsuperscript{35}

Instead of planning for the future based on a single outcome, scenario planning develops “which set of multiple futures might be likely and how the company can best prepare for all of them.”\textsuperscript{36} This analysis develops several potential views of the future competitive environment and allows managers to craft a strategy which will best prepare the firm for any outcome. Such an analysis forces managers to think about multiple outcomes and helps minimize the likelihood of being caught off-guard by an unforeseen future.

Once a firm develops its scenarios of the future, the firm can then develop a strategy that it views will best prepare it for its future scenarios. Importantly, improvements in a firm’s knowledge management capacity have the potential to greatly assist the firm in achieving its strategic goals. For example:

“By painting a vivid, highly textured picture of the future, scenarios help managers better understand the commercial potential of emerging technologies and use this understanding to enhance their resource allocation process.”\textsuperscript{37}

Thus, scenario planning can be used to identify strategic opportunities where knowledge management initiatives can add substantial value in helping the firm achieve its strategic goals. In this manner, scenario planning “can help managers identify which technologies will be the base, key or pacing and thus help them make wiser, staged investment decisions.”\textsuperscript{38}

Finally, it is important to note that an added benefit of using scenario planning as a tool to determine future knowledge requirements is that this technique “forces” a firm’s knowledge management strategy to be in alignment with its business strategy. Failure to align business and knowledge management strategies often results in incongruent business decisions, employee confusion and an unsuccessful knowledge management implementation.

\textbf{Assess Degree of Organization Sharing and Retention}

After assessing what knowledge the organization requires, the next step in an implementation is to assess the degree to which the organization shares and retains knowledge. Such an assessment will reveal how much knowledge is retained and where any weaknesses might be in knowledge storage, sharing, retention and transfer. This diagnostic test will enable the designer of the knowledge management system to gain a better understanding into how best to design the organization’s knowledge management initiative.

A common diagnostic test used to assess a firm’s degree of connectivity, both internal and external to the organization, is a social network analysis. Social networks are networks of people inside and outside a company who have common goals and who share information, help one another, and learn from one another.\textsuperscript{39} To the extent that such an analysis reveals the potential for enhanced connectivity, then a case can be made that a knowledge management solution may be able to enhance a firm’s information sharing capacity and help realize the benefits mentioned above. The social network analysis will also reveal

\textsuperscript{39} \url{http://www.aventis.com/future/downloads/PDF/fut0102/social_capital.pdf}
where the organization’s knowledge sharing strengths and weaknesses may be located so that the proper knowledge management system can be designed.

Constructing a social network map involves identifying and measuring the normally invisible relationships between people inside and outside an organization. Such an analysis will provide “an organizational X-ray” of the communication linkages between the firm’s employees, offices, customers, suppliers, alliance partners and other stakeholders. As a simple example, consider the hypothetical social network map shown in the figure below:

**Example Social Network Map**

In the hypothetical social network shown above, the group’s communication linkages are visually displayed on a map. An analysis of this social network reveals several interesting items. First, Susan is very well connected within this group. In fact, she has direct communications with six of the nine other group members. Second, while Susan has the most direct “connections” with other members of the group, Sarah and Steven possess the only connections to the Claudia/Ben/Jennifer “arm” of the group. Thus, Sarah and Steven are in the only position to have knowledge of what is happening in both “arms” of the group. Last, Jennifer is isolated from the rest of the group and maintains little group connectivity.

If this hypothetical group were an organization, this social network map would reveal important knowledge management implications, depending on the structure and strategy of the firm. For example, suppose Claudia/Ben/Jennifer all worked on Product A in Country A. Meanwhile, Tom/Claire also worked on Product A, but were located in Country B. Both teams in this hypothetical example would be working on the same product (Product A), but happen to be located in different countries. Their geographic separation has limited their communication and, as shown in the network map above, information only flows between these two product teams by first flowing through Susan to Sarah/Steven and then to Claudia’s team. Such organizational “silos”, which are commonly formed around geography and/or product line, are a regular occurrence in firms, as this hypothetical example has attempted to illustrate. It certainly also is possible to imagine situations where a social network map may reveal “breaks” between such groups, whereby the two “arms” of an organization do not communicate at all.

I also want to emphasize that social network analysis should attempt to understand and map communication linkages external to the firm as well as internal. Lori Rosenkopf notes that “exploring knowledge flows in interorganizational networks...can help managers think systematically about

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targeting useful external sources of knowledge as well as mechanisms for obtaining this knowledge.”

It could be that a firm has efficient internal communication, but it is cut off from its external communication sources. For example:

“Mitsubishi had a peripheral network position among top Japanese semiconductor manufacturers in 1982. Through the strategic use of alliances, Mitsubishi developed its technological capabilities and occupied a much more central network position by 1992. This change in network position was accompanied by growth not only in patents and patent citations, but also market share.”

As this example demonstrates, the firm may be missing important value-enhancing opportunities if it is not also efficiently communicating, sharing and collaborating with its external stakeholders.

Such a social network map can reveal important communication linkages or weaknesses. If the network map shows that linkages between key groups within and outside the organization are not established or information flows are “siloed”, then a firm may look to knowledge management for ways “to increase betweenness centrality by bridging unconnected groups.” In other words, the social network map highlights areas of the firm which are not sharing or transferring knowledge efficiently. In these instances, a knowledge management initiative could be implemented in order to improve the communication flows between these groups and add substantial value to the organization.

**OBTAIN SENIOR MANAGEMENT SUPPORT**

Once a firm has identified its future knowledge requirements and assessed the degree to which the firm shares knowledge, the next step in my implementation process is to obtain senior management support. Obtaining such senior support is essential for two primary reasons: (i) it is generally necessary in order to justify an investment and (ii) junior employees will more likely adopt and endorse the project if they see the same support from their senior leadership. In addition, once senior level support has been achieved, some firms may wish to establish a senior knowledge officer position to provide management and oversight to the entire program.

**Justify an investment**

The first reason why senior management support is required is to justify an investment in a knowledge management system. There are several ways in which an investment in a knowledge management system can be justified: (i) traditional return on investment metrics; (ii) qualitative metrics and (iii) real options approach.

- **Traditional return on investment metrics.** One can use traditional return on investment metrics in order to justify an investment. Using this approach, one can attempt to quantify the incremental revenue generation or cost savings that a knowledge management system may generate. Sources of incremental revenue may include increased innovation by encouraging the free flow of ideas between areas of the firm, improved customer service by streamlining response time and higher revenues from getting products and services to market faster. Sources of cost savings may include time saved searching for information, decreased training and costs of employee turnover and elimination of redundant processes. To the extent that these incremental profits can be quantified, one can measure these profits in relation to the cost of the knowledge management system.

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Qualitative metrics. An investment in knowledge management can also be justified by evaluating qualitative factors. As mentioned above, scenario planning can be used to develop views of the future. An investment in knowledge management might then be justified for strategic reasons based on an assessment of how various knowledge management initiatives might assist the firm in achieving the strategy it develops based on these views of the future.

Social network analysis is another qualitative assessment that might be used to justify an investment in knowledge management. To the extent that such a social network analysis reveals the potential for enhanced connectivity, then a case can be made that a knowledge management solution may be able to enhance a firm’s information sharing capacity and help the firm realize meaningful benefits.

In addition, a firm may also wish to benchmark itself relative to the knowledge sharing efforts of its peers. If the firm is perceived to be behind its competition in its knowledge sharing capacity, then this observation could help justify an investment. Alternatively, if the firm is perceived to be ahead of its competition, then the firm may wish to further invest to maintain its leadership position.

Finally, proponents of an investment in knowledge management may wish to collect anecdotal evidence of knowledge sharing inefficiencies. Examples from the field which demonstrate opportunity for gains from knowledge sharing can provide a compelling case for an investment.

In summary, an investment in knowledge management is no different than attempting to justify an investment in any other intangible corporate asset, including investments in training, information technology or branding. While each of these types of intangible investments are difficult to quantify, at some level, sound business judgment which relies on relative value and benefits must factor into the investment decision. Improving the firm’s understanding of the relative value and benefits that a knowledge management investment can provide is exactly what such an assessment of qualitative factors aspires to do.

Real options approach. Real options analysis can also be used to make the business case for an investment in knowledge management. Unlike traditional valuation methodologies (NPV, ROI), the “strength of options-based analysis lies in its ability to account explicitly for the value of flexibility for which traditional metrics cannot account.” Real options analysis recognizes that an investment may have embedded options which allow the firm to either delay, discontinue or further invest in the project at various points in the future. By having the opportunity to re-evaluate a project’s prospects at a point (or points) in the future, a firm is able to capitalize on valuable embedded call options. Real options analysis recognizes this embedded option feature; whereas, traditional valuation approaches often ignore or have difficulty valuing such embedded options.

How might a firm use real options analysis to justify an investment in a knowledge management initiative? Because an implementation of a knowledge management system is often a multi-stage project, involving investments in information technology, management information systems, human resources and training, a real options approach, which views such an initiative as a series of smaller investments over a period of time, can be an important methodology to use to properly account for such an investment’s value. This ability to engage in “structuring decisions formally to create future managerial flexibility” can create value for the firm by allowing the investment decision to take place over a period of time after initial results are known.

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Junior employees will more likely adopt and endorse the project
The second reason why senior level support is essential is because projects which receive support from senior levels are generally more readily accepted, supported and adopted by junior employees. Thomas Stewart appropriately states the following:

“There’s no greater incentive than a boss who believes...If the boss happens to tell you that he saw something on an electronic forum that might help you with the problem you’re working on, you’ll no longer be a stranger to its precincts. If she makes it clear that she values sharing corporate knowledge, it will be shared.”

This passage captures the essence of why senior management support is essential for encouraging employee usage. Leadership begins at the top and once senior executives support a project, it is only natural for junior employees to follow suit. Ultimately, if the firm can encourage usage of its knowledge management program at all levels of the organization, beginning with the top, then this only increases the likelihood of success for the project.

Create senior management level position
Once senior level support has been achieved, some firms may wish to establish a senior level position to provide management and oversight to the entire program. The role of the chief knowledge officer, for example, may “involve overseeing efforts to use technology for knowledge capture and distribution.” Further, “Chief knowledge officers have three critical responsibilities: creating a knowledge management infrastructure, building a knowledge culture and making it all pay off.” Such senior level oversight can help provide direction, credibility and visibility to a firm’s knowledge management efforts.

DESIGN INTEGRATED SYSTEM OF TOOLS AND TECHNOLOGIES
Once senior management support has been achieved, the design of the knowledge management system can take place. Rather than attempt to deploy an entire knowledge management system all at once, I suggest that firms use a real options strategy in implementing their program. As mentioned above, such a real options approach will limit the financial and operational risk by enabling the firm to either delay, discontinue or further invest in the project at various points in the future. By having the opportunity to re-evaluate a project’s prospects at a point (or points) in the future, a firm is able to capitalize on valuable embedded call options. In addition, by rolling out the project in a staged format, the firm will be better able to manage the roll-out since it will be on a smaller scale and the firm will also be able to improve the program with feedback from early trials.

In a knowledge management implementation, a real options approach would suggest rolling out the program in stages, with the option to delay, discontinue or further invest at each stage. Thus, I have developed a three-stage knowledge management implementation:

- **Pilot stage.** During the pilot stage, the knowledge management program is first tested and deployed on a limited basis.

- **Roll-out stage.** During the roll-out stage, the firm first expands its knowledge management system to the firm as a whole.

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- **Institutionalization stage.** During the institutionalization stage, the knowledge management system has been up and running for a period of time and has reached a level of maturity.

**The pilot stage**
The pilot stage of a knowledge management implementation begins once the decision has been made to begin testing a knowledge management system. Typically, a firm conducts a test pilot on only a portion of the firm and may only include certain elements of its full knowledge management plan in its pilot. During this stage, the important decisions that need to be made concerning tools and technologies include: (i) which areas of the firm should test the pilot program; (ii) which knowledge management techniques and technologies should be implemented and (iii) how the success of the pilot program should be measured.

**Pilot program territory selection**
The choice of which areas of the firm should test the knowledge management pilot should not be made without due care. Possible candidates for the pilot program include areas of the firm which may have the most to gain from improved knowledge sharing. If the firm conducted a social network analysis, then it may be able to use this analysis to determine which areas of the firm are least connected and most likely to benefit from knowledge sharing. Another candidate for the pilot includes areas of the firm which have many proponents of the program.

**Selection of knowledge management techniques and technologies**
While the full knowledge management implementation will likely include an integrated suite of knowledge management techniques and technologies, the pilot program will likely include only a subset of the techniques and technologies eventually implemented. The primary reason for this reduction in complexity is because it is usually advantageous to keep the pilot program relatively simple in order to evaluate the effectiveness of certain critical aspects of the program. Thus, when selecting which knowledge management techniques and technologies to include in the pilot program, it is essential that the pilot include the tools which are most critical to the business and knowledge management strategy. Thus, if a firm has chosen to adopt knowledge management because it wishes to capture as much knowledge from its senior employees before they reach retirement age, then the firm may wish to include communities of practice and perhaps a content management database in its pilot program. Communities of practice would be one example of a tool to help capture these employees’ tacit knowledge while the content database could focus on capturing their explicit knowledge. Later, during the broader roll-out, the firm could supplement these tools with other knowledge management elements, including centers of excellence, mentoring, expertise locators, search and retrieval tools and storytelling, among others.

**Measurement**
Of course, the ultimate goal of the pilot stage should be to prove the knowledge management program’s worthiness such that the firm can justify rolling out the knowledge management program to the broader firm. In the ‘Measure Impact’ sub-section, I discuss some suggested measurement metrics for the pilot stage which can be used to help assess the performance of the pilot program.

**The roll-out stage**
The roll-out stage begins once the firm has made the decision to expand its knowledge management pilot to the broader firm. At this stage, both knowledge management technologies and techniques will be rolled-out to users and the firm will have begun accumulating, sharing and transferring knowledge. The goals of this stage should be to build awareness throughout the firm, educate users on how the knowledge management program can be of benefit to them, encourage usage and expand the knowledge and lessons learned contained within the firm’s corporate memory.
During this stage, the important decisions that need to be made concerning tools and technologies include: (i) how quickly should the firm roll-out its full program; (ii) which knowledge management techniques and technologies should be implemented and (iii) how the success of the roll-out program should be measured.

**Speed of program roll-out**

During the roll-out stage, the firm must decide how quickly it wishes to roll-out its full knowledge management program to the entire firm. Under ideal circumstances, I suggest continuing to apply real options analysis to the full roll-out. In other words, rather than deploy the knowledge management program to the entire firm in one deployment, the firm should consider structuring its roll-out in a series of smaller steps. Perhaps the firm could structure its roll-out in a manner which allows it to deploy its knowledge management program on a division by division basis. By structuring a roll-out in this manner, the firm would be able to capitalize on the valuable real option it structured in its roll-out. Further, the firm would be able to reduce its financial and operational risk and be able to incorporate lessons learned from early stages of the roll-out into later stages. This roll-out strategy would allow division employees to have access to the full suite of knowledge management tools upon roll-out to their division and employees would also more quickly become familiar with using the full package of knowledge management tools in conjunction with each other.

Alternatively, the firm could deploy individual knowledge management tools on a firm-wide basis one tool at a time. This roll-out strategy would also be able to take advantage of the benefits of incorporating real options. The firm would be able to incorporate feedback it receives from each roll-out into subsequent roll-outs, thereby improving the product offering. Furthermore, the full benefit of some tools, such as content databases, cannot be realized unless there is full participation across the firm. In this respect, a firm-wide roll-out of an individual knowledge management tool would enable the firm to capture greater benefits. In addition, rather than burden employees with having to learn many new tools all at once, this roll-out strategy would manage the amount of new tools employees would be required to learn.

However, it is not always possible or beneficial to use such a real options-based roll-out strategy. I have assumed that the knowledge management investment can be implemented in a staged approach, thereby maintaining the firm’s option to further invest, abandon or delay the project at a date in the future. However, these options may not exist in every case or may be difficult to structure into the investment. For example, if we are dealing with a small firm, then it may not be possible (or cost-efficient) to only implement the knowledge management system in a portion of the firm. Also, competitive factors may force the firm to act quickly, rather than extend the evaluation period of the knowledge management system over a period of time. Additionally, a firm may not be able to fully realize the benefits of its knowledge management program unless the system is fully implemented across the entire organization. In these instances, applying a real options approach may actually be limiting the system’s effectiveness.

**Selection of knowledge management techniques and technologies**

During the roll-out stage, the firm will deploy its full suite of knowledge management tools; although, as mentioned above, the timing of the roll-out of individual tools may vary. Nonetheless, when selecting which knowledge management techniques and technologies to deploy, it is again essential to include the tools which are aligned directly with the firm’s business and knowledge management strategy. For example, if a firm has chosen to adopt knowledge management because it wishes to capture knowledge from its senior employees before they reach retirement age, then the firm should seek to implement knowledge management tools which will directly assist it in accomplishing this goal. Specifically, the firm should thoughtfully design a knowledge strategy which attempts to capture its employees’ tacit and explicit knowledge. Such a design would likely include an integrated system of knowledge management
techniques and technologies. In order to capture its employees’ tacit knowledge, a firm may wish to implement a combination of mentorship programs, regular intra-office or intra-division meetings, storytelling, communities of practice and/or centers of excellence. These tools individually, or ideally in combination, will help the firm codify the valuable tacit knowledge contained in the experience of its senior employees.

To capture its employees’ explicit knowledge, the firm should implement a combination of knowledge management technologies. Knowledge storage tools, search and retrieval tools, communication tools (email, wikis, weblogs, etc.) and discussion and chat technologies are all examples of knowledge management technologies which can be used to help capture the explicit knowledge retained by the firm’s senior employees.

Measurement
In order to assess the success of the roll-out stage, the firm should select relevant performance metrics and evaluate the program’s performance. In the ‘Measure Impact’ sub-section, I discuss some suggested measurement metrics for the roll-out stage which can be used to help assess the performance of the program.

The institutionalization stage
After the roll-out stage has been completed and been in operation for a period of time (perhaps 1-2 yrs), the institutionalization stage begins. During the institutionalization stage, the knowledge management program will have coverage of the entire firm, the knowledge management tools and technologies will have become part of employees’ regular work functions, employee usage will be frequent and the firm will have accumulated a wealth of knowledge and success stories stemming from employee use of such knowledge.

The goals of this stage should be to translate awareness of the program into increased usage of the knowledge management techniques and technologies, continue to educate users on how the knowledge management program can be of benefit to them, further encourage usage and continue to expand the knowledge and lessons learned contained within the firm’s corporate memory.

During this stage, the important decisions that need to be made concerning tools and technologies include: (i) assessments of whether the firm is keeping its corporate memory current; (ii) assessments of the firm’s knowledge management integration and (iii) how the success of the roll-out program should be measured.

Assessments of whether the firm is keeping its corporate memory current
Because a knowledge management program is a continual effort to add, delete and update knowledge contained in the firm’s corporate memory, it is essential that the firm constantly update its knowledge database. Because employees will draw on the knowledge management system in order to leverage the knowledge contained in the firm’s corporate memory, it is essential that the firm’s knowledge repositories are kept current. The more frequent employees use their knowledge management tools, the greater the likelihood that the database will be kept current. If a firm finds that its knowledge system is not being updated as regularly as is ideal, then there are several measures that the firm can take. The firm can employ measures to further encourage use of its knowledge management tools (see ‘Design Incentives for Use’ sub-section) or it can increase awareness of its knowledge management tools and their benefits (see ‘Promote and Advertise Success’ sub-section).

Furthermore, there may be additional ways in which a firm can increase its knowledge capture. Establishing a senior management position, such as a chief knowledge officer who can oversee the firm’s knowledge management program, can help stimulate greater knowledge capture by creating greater
visibility and attention on the firm’s knowledge collection efforts. Additionally, the firm may also wish to create various knowledge centers of excellence. These centers of excellence can help to centralize knowledge codification and help relieve some of the burden of knowledge capture from operating units.

**Assessments of the firm’s knowledge management integration**

It is also important for a firm to assess the degree to which its knowledge management program is tightly integrated. In order to maximize the value a firm realizes from its knowledge management program, the firm’s knowledge management tools need to be interwoven. For example, if an employee desires to locate information on topic XYZ, he can conduct a content database search using the database’s search and retrieval tools. Within the database, the employee can identify relevant content related to topic XYZ. In an integrated system, the content database will also be able to function as an expertise locator and refer the employee to colleagues or other external professionals who have expertise in topic XYZ. The content database might also refer the employee to a community of practice or a center of excellence within the firm that has expertise in this area. If the firm offers a training course in this area, this information can be displayed as well. In this manner, the full arsenal of the firm’s knowledge management system can be brought to bear on knowledge management questions.

As another example of an integrated knowledge management system, consider a firm that has implemented communities of practice. To augment its community of practice, the firm may consider developing training programs in the community’s area of specialty. The firm may also wish to implement a mentor program as a means to build community participation and support. Furthermore, as the community matures, the firm may wish to recognize the community’s accomplishments and create a more formal center of excellence around the community. As the community develops expertise, its leadership can be added to an expertise locator in order to channel questions from the field to its knowledgeable community members. Finally, as the community’s knowledge grows, the firm may wish to store its knowledge and learnings in its content database so that other areas of the firm may have access to the community’s knowledge base. These are just two examples of how firms can integrate their knowledge management tools.

**Measurement**

In order to assess the success of the firm’s knowledge management program during the institutionalization stage, the firm should select relevant performance metrics and evaluate the program’s performance. In the ‘Measure Impact’ sub-section, I discuss some suggested measurement metrics for the institutionalization stage which can be used to help assess the performance of the program.

**DESIGN INCENTIVES FOR USE**

Once a knowledge management program has been created, it is important to design incentives to encourage use. There are several different ways in which a firm can encourage the use of its knowledge management program.

The first way that firms can motivate employees to use and share knowledge is through the use of performance evaluations. By incorporating a knowledge sharing component into an employee’s performance review, employees will be more likely to value and participate in knowledge sharing activities.

A second incentive that firms can use to encourage increased usage of a knowledge management system is through the use of training. By training employees how to effectively use the knowledge management tools at their disposal, firms will be educating their employees in how to use and share knowledge. If employees can be convinced of knowledge management’s potential, then they will be encouraged to use
these tools because they will understand that the ability to access the firm’s corporate memory will increase the range of knowledge available to them. Ultimately, “with a good knowledge management system, the job is much more challenging and people can concentrate on problem solving rather than on number crunching and data collection.”

Perhaps the most effective measure that can be taken to encourage knowledge sharing is to integrate knowledge management activities into the everyday work function. By making knowledge management routine, employees will not be burdened with additional work. “The best knowledge management efforts are as transparent to employees’ workflow as possible. Ideally, participation in knowledge management should be its own reward. If knowledge management doesn’t make life easier for employees, it will fail.”

An example of how knowledge management activities can be integrated into routine work practices is the use of a content database as a central file storage system. Rather than have employees store data locally and then selectively upload important documents to a database at a later date, firms can have employees use the content database as the central file storage system. In this manner, employees will not have to take an extra step to sort through their files and upload key files to the content database.

**MEASURE IMPACT**

In conjunction with implementing a knowledge management system, it is also important to measure the impact of the system in order to evaluate its performance and to manage expectations. “Through measurement, organizations can tie knowledge management programs and activities to demonstrated results.”

Using a measurement approach modified from an approach suggested by the APQC, my implementation plan proposes designing knowledge management metrics which evolve as the firm’s implementation matures. Thus, I have developed specific metrics based on the firm’s implementation stage (pilot stage, roll-out stage or institutionalization stage). Due to the unique goals and challenges of each implementation stage, different knowledge management metrics will be suggested.

In designing these different metrics, it is important to remember that all of the metrics chosen must align the goal of the knowledge management system with the firm’s overall business strategy. Carla O’Dell of the APQC states: “One of the fundamental principles of knowledge management measurement is that you’ve got to connect the measures and indicators of knowledge management processes directly to the measures that matter to your organization.” In addition, I suggest choosing a menu of both qualitative and quantitative metrics which best match both the goal of the knowledge management system in the current stage and the firm’s overall business strategy. Below, I have described some of the knowledge management metrics appropriate for each stage of a knowledge management implementation.

**The pilot stage**

As stated above, the pilot stage of a knowledge management implementation begins once the decision has been made to begin testing a knowledge management system. Because of the unique nature of this stage, it is appropriate to design a special set of metrics to evaluate performance.

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51 www.apqc.org/portal/apqc/site/content?docid=116903
52 http://www.apqc.org/portal/apqc/ksn/Measurement%20for%20KM.pdf?paf_gear_id=contentgearhome&paf_dm=full&pageselect=contentitem&docid=106946
53 www.apqc.org/portal/apqc/site/content?docid=116903
The goal of this stage should be to prove knowledge management’s worthiness such that the firm can justify rolling out the knowledge management program to the broader firm. Therefore, the metrics selected at this stage should seek to capture success stories and other examples of how the knowledge management system has improved the knowledge sharing capacity of the firm. The “focus should be on meaningful measures that concentrate on exploring the various opportunities in your organization for implementing knowledge management practices, developing your organization’s knowledge management strategies, measuring the progress toward organizational awareness, and experimenting with different knowledge management concepts.” Over-reliance on quantitative metrics at this stage may not do the program justice as users of the pilot are not yet fully aware of its capabilities as well as the fact that the pilot may be limited in its potential due to the fact that the pilot is only conducted on a portion of the firm.

Some examples of qualitative metrics that are appropriate at this stage include:

- **Anecdotes and success stories.** The firm can begin to collect anecdotes and success stories to document the benefits the pilot program has created. Such benefits can help to provide evidence to roll-out the program to the broader firm.

- **Employee awareness of the program.** Beginning to build awareness at the pilot project level will help to drive increased usage during later stages.

- **User feedback detailing their experiences.** At the pilot stage, feedback is an important metric because it provides further evidence of the program’s worthiness and it can provide helpful suggestions which can be incorporated into the broader roll-out.

While quantitative measures should not be the primary focus of this stage, some examples of quantitative measures which may be appropriate include:

- **Time saved.** Measures of time saved by users as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success at the pilot stage.

- **Cycle time reductions.** Cycle time reductions as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success at the pilot stage.

- **Contributions to knowledge database.** The amount of information contributed to and retrieved from its knowledge database should be tracked to assess the degree to which the firm is building its corporate memory.

- **Communities of practice.** By measuring the number of communities of practice sanctioned, the firm can assess the degree to which its employees are meeting to share knowledge.

- **Participation in communities of practice.** The percentage of employees who participate in communities of practice can be used as a metric to assess the degree to which employees are in support of knowledge sharing efforts.

- **Usage frequency.** The frequency with which employees use knowledge databases/tools can be used to measure how useful employees perceive the knowledge databases/tools to be.

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- **Number of users.** The number of absolute and repeat users can be used to measure how broadly accepted the firm’s knowledge management efforts have become.

These qualitative and quantitative metrics should attempt to capture the relative success the pilot program is having at getting users to share and transfer knowledge. A successful pilot program can provide compelling evidence to roll-out the program to the broader firm.

**The roll-out stage**

The roll-out stage begins once the firm has made the decision to expand its knowledge management pilot to the broader firm. Once again, the metrics used at this stage should measure success as it relates to both the stage goals of the program and the overall business strategy. Because the knowledge management program is still in its infancy during this stage, it is again important to not rely too heavily on quantitative metrics. Particular emphasis should be placed on measuring relative progress from the pilot stage to the roll-out stage and building user awareness and usage. “The value of knowledge management principles has already been proven and companies in this stage are focused on how to embed knowledge management throughout their organizations. Measures are used at this stage not to prove, but rather improve, the existing projects and add to the corporatewide strategy.” Only after a program has created awareness and educated its users can a firm expect to realize the full benefit of its knowledge management efforts.

Qualitative metrics which may be appropriate at this stage include:

- **Anecdotes and success stories.** The firm can also measure the number of such stories relative to the pilot stage and assess progress at generating successful instances of knowledge sharing.

- **Employee awareness of the program across the firm.** The firm should gauge whether it has been successful at increasing program awareness.

- **User feedback detailing their experiences.** The firm should incorporate any feedback it received from the pilot stage in order to expand and improve its program.

- **Performance review feedback.** The firm can also begin to include knowledge sharing as an element in employee performance reviews. Using such a performance review, the firm can assess how well its employees share knowledge.

- **Benchmarking.** The firm can also benchmark its knowledge management program relative to its peers. Such an analysis may indicate where the firm trails its competitors and should consider focusing resources.

I again suggest that quantitative measures should not be the primary focus of this stage; however, some examples of quantitative measures which may be appropriate include:

- **Time saved.** Measures of time saved by users as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success. Performance can also be compared to results from the pilot stage.

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- **Cycle time reductions.** Cycle time reductions as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success. Performance can also be compared to results from the pilot stage.

- **Quality improvement.** Quality improvement in products or services as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success.

- **Improvements in employee productivity.** Improvements in employee productivity as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success.

- **Customer satisfaction.** Customer satisfaction or response time to customer inquiries can provide meaningful evidence of success.

- **Contributions to knowledge database.** The amount of information contributed to and retrieved from its knowledge database should be tracked to assess the degree to which the firm is building its corporate memory.

- **Communities of practice.** By measuring the number of communities of practice sanctioned, the firm can assess the degree to which its employees are meeting to share knowledge.

- **Participation in communities of practice.** The percentage of employees who participate in communities of practice can be used as a metric to assess the degree to which employees are in support of knowledge sharing efforts.

- **Lessons learned / Expert locator.** Keeping a record of lessons learned or questions answered by experts can demonstrate how much knowledge the firm is adding to its corporate memory.

- **Usage frequency.** The frequency with which employees use knowledge databases/tools can be used to measure how useful employees perceive the knowledge databases/tools to be.

- **Number of users.** The number of absolute and repeat users can be used to measure how broadly accepted the firm’s knowledge management efforts have become.

These qualitative and quantitative metrics should attempt to capture the relative success that the roll-out is having at getting users to share and transfer knowledge. These metrics can be measured over time to assess progress as the program gains traction.

*The institutionalization stage*

After the roll-out stage has been completed and been in operation for a period of time (perhaps 1-2 yrs), the institutionalization stage begins. Once again, the metrics used should measure success as it relates to both the stage goals of the program and the overall business strategy. During this stage, the metrics can begin to focus more heavily on quantitative metrics as the knowledge management program will have reached a more mature stage. Because a knowledge management program is a continual effort to add, delete and update knowledge contained in the firm’s corporate memory, particular emphasis in this stage should be placed on measuring the usage of knowledge technologies and techniques and measuring the amount of information contributed to and retrieved from its knowledge database. By keeping close watch over these statistics, the firm will be able to closely monitor and ensure that its corporate memory is continually being updated.
Qualitative metrics at this stage should measure relative progress from the roll-out stage to the institutionalization stage. Examples of metrics which may be appropriate at this stage include:

- **Anecdotes and success stories.** The firm should continue to measure the number of such stories even at this stage. These stories are useful to assess the progress the firm has made as well as provide additional motivation for employees to continue program usage.

- **Employee awareness of the program across the firm.** At this stage, employee awareness should be high across the firm. However, the firm should continue to monitor awareness to insure that there are not divisions or sections of the firm which are less informed than others.

- **User feedback detailing their experiences.** The firm should continue to incorporate any feedback it received from the pilot and roll-out stages in order to expand and improve its program.

- **Performance review feedback.** The firm should also continue to include knowledge sharing as an element in employee performance reviews. Using such a performance review, the firm can assess how well its employees share knowledge.

- **Social network analysis.** The firm can conduct periodic social network analyses in order to assess the firm’s current level of knowledge sharing. As the knowledge management program matures and expands, the firm should begin to see enhanced connectivity in its social network maps. To the extent that the firm discovers areas of the firm which are not as connected as other areas, then the firm may seek to focus greater attention and knowledge management resources on this area of the firm.

- **Benchmarking.** The firm can also benchmark its knowledge management program relative to its peers. Such an analysis may indicate where the firm trails its competitors and should consider focusing resources.

During the institutionalization stage, quantitative metrics can play a larger role. However, these quantitative measures should be “used to check progress and monitor the continued evolution of the culture.” Some examples of quantitative measures which may be appropriate during this stage include:

- **Time saved.** Measures of time saved by users as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success. Performance can also be compared to results from the pilot and roll-out stages.

- **Cycle time reductions.** Cycle time reductions as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success. Performance can also be compared to results from the pilot and roll-out stages.

- **Quality improvement.** Quality improvement in products or services as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success. Performance can also be compared to results from the roll-out stage.

- **Improvements in employee productivity.** Improvements in employee productivity as a result of lessons learned, feedback from communities of practice or centers of excellence can provide meaningful evidence of success. Performance can also be compared to results from the roll-out stage.

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The Design and Implementation of Effective Knowledge Management Systems

Steve Morrissey

- **Customer satisfaction.** Customer satisfaction or response time to customer inquiries can provide meaningful evidence of success. Performance can also be compared to results from the roll-out stage.

- **Contributions to knowledge database.** The amount of information contributed to and retrieved from its knowledge database should be tracked to assess the degree to which the firm is building its corporate memory. During this stage, it is important to monitor how current the firm is keeping its knowledge database. Measures can be designed to keep tabs on the documents added, deleted and updated to the database.

- **Communities of practice.** By measuring the number of communities of practice sanctioned, the firm can assess the degree to which its employees are meeting to share knowledge. Performance can also be compared to results from the roll-out stage.

- **Participation in communities of practice.** The percentage of employees who participate in communities of practice can be used as a metric to assess the degree to which employees are in support of knowledge sharing efforts. Performance can also be compared to results from the roll-out stage.

- **Lessons learned / Expert locator.** Keeping a record of lessons learned or questions answered by experts can demonstrate how much knowledge the firm is adding to its corporate memory. During this stage, it is important to monitor how current the firm is keeping its lessons learned and directory of experts. Measures can be designed to keep tabs on the lessons added, deleted and updated.

- **Usage frequency.** The frequency with which employees use knowledge databases/tools can be used to measure how useful employees perceive the knowledge databases/tools to be. Performance can also be compared to results from the roll-out stage.

- **Number of users.** The number of absolute and repeat users can be used to measure how broadly accepted the firm’s knowledge management efforts have become. Performance can also be compared to results from the roll-out stage.

- **ROI.** The firm may also wish to measure return on investment which incorporates the revenue gain or savings from a knowledge management initiative relative to cost of the initiative.

These qualitative and quantitative metrics should attempt to capture the relative success that the program is having at getting users to share and transfer knowledge, to maintain high levels of usage and to contribute to and retrieve knowledge from the firm’s knowledge database, communities of practice and centers of excellence. These metrics can be measured over time to continually assess the progress of the program.

**PROMOTE AND ADVERTISE SUCCESS**

The last stage of my implementation process is to promote and advertise the success of the knowledge management initiative. Such promotion is key to the long-term success of the initiative. “If people see the system as a powerful resource, they are also more likely to contribute to it.”

The more success stories that employees hear about, the more encouraged they are to increase their usage of the knowledge

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management tools and technologies. This leads to a “snowball effect” in which increased usage leads to further success stories which, then, leads to further increased usage.

There are several ways that a firm can promote its knowledge management efforts. A firm can advertise its knowledge management techniques and technologies in a corporate newsletter or on the corporate intranet. If the firm holds regular on-site or offsite meetings, the firm can devote a portion of time to further describing its knowledge management tools. These tools can also be incorporated into the firm’s training program for new hires or into the firm’s continuing education efforts. By using these different media, the firm can both educate its employees on its new knowledge management initiatives and encourage use by advertising success stories.
Challenges and Critiques of Knowledge Management

**KNOWLEDGE MANAGEMENT CHALLENGES**

“A 1997 report from the Ernst & Young Center for Business Innovation in Cambridge, Mass., and Business Intelligence Ltd. in London revealed that 94% of 431 organizations surveyed in Europe and the United States have executives who believe ‘it would be possible, through more deliberate management, to leverage the knowledge existing in [their organizations] to a higher degree.’ Yet, while there’s a lot of faith in the concept of knowledge management, 71% of those same executives rated their businesses as average or worse at ‘embedding knowledge in processes, products and/or services.’ Knowledge management will remain an elusive goal until companies overcome the barriers – both organizational and otherwise – to instituting it.”

Because the benefits of knowledge management have remained elusive for a number of companies, it is worthwhile to explore some of the primary challenges companies face when implementing a knowledge management system. These challenges will be introduced in this section and the case study section which follows will discuss how selected companies have addressed and overcome these challenges in their successful implementations.

*Justifying an investment in knowledge management*

The first challenge that is often encountered is how to justify an investment in knowledge management. In the previous section, I outline some of the ways in which an investment can be justified (traditional return on investment approaches, qualitative approach and a real options approach).

However, these approaches have limitations. The primary disadvantage of the traditional return on investment method is that this method requires the firm to be able to quantify both the timing and amount of incremental profits generated by the knowledge management program. Any incremental revenue generated or cost savings can be difficult to quantify, thereby limiting the effectiveness of this method.

The qualitative methods also have limitations. For example, social network analysis requires the firm to understand and map all of the communication linkages between its internal and external partners. While the social network map shown above was relatively simple, in reality, a firm’s social network map can be highly complex. In reality, “a multitude of players generate and circulate relevant knowledge, yet it is extremely difficult to ascertain which knowledge is most critical for success.” Thus, it can be highly challenging to map and understand all of the intricate communication flows in a firm. Without the ability to map and understand such communication linkages, the value that social network analysis can provide is limited.

Scenario planning may also have limitations. The use of scenario planning to justify an investment assumes that the firm accepts scenario planning as a strategic planning tool. To the extent that scenario planning is not used by a firm or that scenario planning is not given sufficient credibility as a strategic planning tool, then the relative weight that the firm will give to the benefits of knowledge management stemming from the use of scenario planning may be diminished. Additionally, in order for managers to think broadly about the future, a scenario plan must “challenge managerial beliefs.”

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analysis, there is the potential challenge of forcing management to think outside of traditional boundaries. To the extent that management is uncomfortable or unable to do so, then the application of scenario planning may be limited.

Finally, there may also be some challenges associated with applying the real options approach discussed above. In my application of real options theory, I have assumed that the knowledge management investment can be implemented in a staged approach, thereby maintaining the firm’s option to further invest, abandon or delay the project at a date in the future. However, these options may not exist in every case or may be difficult to structure into the investment. For example, if we are dealing with a small firm, then it may not be possible (or cost-efficient) to only implement the knowledge management system in a portion of the firm. Also, competitive factors may force the firm to act quickly, rather than extend the evaluation period of the knowledge management system over a period of time. Additionally, a firm may not be able to fully realize the benefits of its knowledge management program unless the system is fully implemented across the entire organization. In this case, applying a real options approach may actually be limiting the system’s effectiveness.

However, despite these limitations, these approaches attempt to enhance the firm’s ability to understand the relative value that an investment in knowledge management can provide. Attempting to quantify an investment in knowledge management is no different than attempting to quantify an investment in any other intangible corporate asset, including investments in training, information technology or branding. While each of these types of intangible investments are difficult to quantify, at some level, sound business judgment which relies on relative value and benefits must factor into the investment decision.

**Obtaining senior management support**

As discussed in the previous section, obtaining senior management support for an investment in knowledge management is crucial. However, it can often be difficult to gain management support or attention. Making a compelling business case for an investment in knowledge management is one way that senior management support can be gained. Support can also be earned through the use of scenario planning and social network analysis by building a convincing strategic rationale for knowledge management.

**Overcoming cultural hurdles to sharing**

Another hurdle that some organizations need to overcome is the natural cultural aversion to sharing that exists in many organizations.

> “Most organizations reward individual achievement and foster competition among their workers. Employees tend to protect at least some of their knowledge or best practices as their edge. How then do companies reverse such biases? They must develop organizational processes that recognize and reward knowledge sharing and team achievement. They must develop a culture for sharing.”

Changing a firm’s culture to one which encourages and rewards knowledge sharing can be a significant challenge. However, firms which pursue an integrated knowledge management approach which integrates human resource strategy with knowledge management will have the best chance of success. A coordinated human resource strategy will allow firms to hire employees who are likely to embrace knowledge sharing, reward knowledge sharing behavior and promote those employees who demonstrate a high knowledge sharing capacity.

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61 [http://www.ndu.edu/sdcfp/AccentureFinal1.doc](http://www.ndu.edu/sdcfp/AccentureFinal1.doc)
Encouraging employees to use and share knowledge.
Some companies design their knowledge management program under the “if we build it, they will come” philosophy. However, employee use and adoption should not be taken for granted. A firm can design the best knowledge management system possible, but if employees are not trained in its use, aware of its potential benefits or encouraged to use it, then the potential exists that the investment will not be successful. In an environment “where an individual’s knowledge is valued and rewarded, establishing a culture that recognizes tacit knowledge and encourages employees to share it is critical. The need to sell the knowledge management concept to employees shouldn’t be underestimated; after all, in many cases employees are being asked to surrender their knowledge and experience — the very traits that make them valuable as individuals.”\(^\text{62}\)

In addition, firms must intelligently design their incentive systems to encourage use. “There's the danger that employees will participate solely to earn incentives, without regard to the quality or relevance of the information they contribute.”\(^\text{63}\) As mentioned in the previous section, a firm can encourage its employees to use and share knowledge through the use of training, performance evaluations, senior management support and promotion and advertising.

Aligning firm practices with knowledge management strategy
A common mistake that some firms make is that they fail to properly align their knowledge management strategy with their overall business strategy and other firm practices. As mentioned previously, one advantage of conducting a scenario plan as a means to determine future knowledge requirements is that this approach will properly align business strategy with knowledge management strategy.

Additionally, it is also important to align firm practices with knowledge management strategy. The previous section outlines how firms can design a knowledge management system which properly synchronizes their human resources strategy with their knowledge management practices.

Confidentiality issues may limit ability to share knowledge
In some situations, the ability to share knowledge may be limited by client confidentiality. Many professional service firms, including legal, consulting and financial services, must maintain some degree of client confidentiality. Maintaining such client confidentiality can impair a firm’s ability to share knowledge. However, firms can minimize this limitation by codifying knowledge learned in confidential situations in general terms or by masking the name of the client to maintain confidentiality.

Technology is a means to an end and not the end itself
It is important to remember that a knowledge management program is a comprehensive strategy to improve a firm’s knowledge sharing and retention. Thus, a knowledge management program is not exclusively comprised of knowledge management technologies alone. A firm which does not properly align its knowledge management technologies with the other elements of a knowledge management strategy mentioned in the previous section will not be able to realize the full benefits of an integrated knowledge management strategy.

\(^{62}\) [http://guide.darwinmag.com/technology/enterprise/knowledge/]

\(^{63}\) [http://guide.darwinmag.com/technology/enterprise/knowledge/]
In fact, the American Productivity and Quality Center believes “that there is no single technology solution to content management. The key is to understand all the components of the content management process and then look for the technologies that will best fit those needs. APQC experts advise to design the processes around the user and add technology as an enabler.” Thus, a firm cannot rely exclusively on technology or allow it to dictate its knowledge management strategy. “While technology can support knowledge management, it’s not the starting point of a knowledge management program. Make knowledge management decisions based on who (people), what (knowledge) and why (business objectives). Save the how (technology) for last.”

Potential for over-reliance on knowledge management system

One of the potential drawbacks to developing a knowledge management system is that employees who rely extensively on the system may be constrained by the limits of the knowledge contained in the system. Employees may feel obliged to follow certain procedures as outlined by the firm’s best practices. In such cases, over-reliance on a particular framework, method or procedure can lead to creativity impairment, narrow peripheral vision or limited ability to adapt to a changing marketplace. Thus, in these scenarios, over-reliance can actually limit knowledge creation.

In addition, it is important to remember that a knowledge management system is not a static system. Because knowledge can become stale over time, it is important for a firm to continuously update its knowledge management system with new information and knowledge.

Firms may collect and store the wrong information

Some firms fail to properly assess what knowledge they should retain. Some firms mistakenly attempt to retain all information and encounter information overload. It has been said that “quantity rarely equals quality, and knowledge management is no exception. Indeed, the point of a knowledge management program is to identify and disseminate knowledge gems from a sea of information.”

As mentioned in the previous section, I suggest that the first step a firm should take in a knowledge management implementation is to conduct a scenario plan in order to determine what knowledge the firm will require in the future. If this step is done properly, then the firm will be informed as to what knowledge it should seek to retain.

Project scope may be over-ambitious

Another challenge that some firms must grapple with is how to manage the scope of their knowledge management initiative. If a firm is too ambitious and attempts to roll out its knowledge management program too quickly or without proper planning, then the project may be more likely to fail.

One way that this challenge can be mitigated is by using a pilot project to conduct a staged roll-out of the knowledge management system. In this manner, a pilot project can be “used to develop understanding, build capabilities, and derive lessons for a wider roll-out.” Such a staged roll-out using a pilot project is an example of using a real options approach as discussed in the previous section.

65 http://guide.darwinmag.com/technology/enterprise/knowledge/
66 http://guide.darwinmag.com/technology/enterprise/knowledge/
Measurement

One of the most difficult challenges associated with a knowledge management implementation is measuring the system’s impact. “Determining knowledge management’s pervasiveness and impact is analogous to measuring the contribution of marketing, employee development, or any other management or organizational competency.”

Some firms fail to measure or document the benefits and successes of their knowledge management program. These firms are missing an opportunity to promote the success of their system to their employees, which could further encourage employee adoption and use. In addition, senior management may offer less support for a program which cannot detail its benefits. Thus, failure to measure the impact of a firm’s knowledge management program may have adverse effects.

The implementation process outline in the previous section describes some ways a firm can measure its knowledge management progress and overcome the potential adverse effects mentioned above.

Knowledge Management Critiques

In addition to the challenges mentioned above, advocates of a knowledge management system must overcome critics of knowledge management. In this section, I will describe some of the common critiques of knowledge management and address how proponents can mitigate their critics concerns.

Does knowledge management really matter?

Critics of knowledge management have suggested that knowledge management is just another management fad, similar to quality circles and total quality management in the 1980’s and 1990’s. Some critics liken knowledge management to these management fads which were “considered an innovative concept or technique that is promoted as the forefront of management progress and then diffuses very rapidly among early adopters eager to gain a competitive advantage. After organizational leaders come to the realization that the concept has fallen short of its expected benefits, the concept is quickly discontinued or drops back to very modest usage.”

While the benefits from a knowledge management system can be elusive, I believe that knowledge management is not a fad and will be an essential management practice in the future. For example, “What happens if a firm does not have a knowledge management system? One result is that the firm will be very inefficient because its [employees] will spend a considerable amount of time replicating their colleagues’ work. More importantly, the quality of the firm’s service will suffer substantially; decisions will be based on insights (anecdotes) rather than a thorough understanding of the underlying business situation.”

In this respect, I believe that knowledge management has the potential to address significant challenges that firms face, including (i) fostering innovation by encouraging the free flow of ideas between areas of the firm; (ii) improving customer service by streamlining response time; (iii) boosting revenues by getting products and services to market faster; (iv) improving and lowering the costs of employee training; (v) reducing the costs associated with employee turnover through the institutionalization of firm knowledge; and (vi) streamlining operations by eliminating redundant processes. Firms which can successfully realize the above benefits will be at a substantial competitive advantage relative to their competition.

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68 http://www.apqc.org/portal/apqc/ksn/Measurement%20for%20KM.pdf?paf_gear_id=contentgearhome&paf_dm=f ull&pageselect=contentitem&docid=106946
to these competitive factors, firms cannot choose to ignore the potential of knowledge management. In the next section, I will document cases in which firms have successfully realized these benefits.

In addition, I believe that the resource-based view of the firm provides a compelling justification for why knowledge management will continue to be an important management practice. The resource-based view of the firm suggests that the firm “is essentially a pool of resources and capabilities and these resources and capabilities are the primary determinants of its strategy.”\textsuperscript{71} Thus, firms can “establish competitive advantage through the development and deployment of resources and capabilities.”\textsuperscript{72} Importantly, if a firm’s resources and capabilities are hard to imitate or duplicate or are scarce or hard to manage, then the firm may be able to sustain a competitive advantage. In this respect, knowledge management can be viewed as a “capability” of the firm. By its very nature, a capability in knowledge management is very hard, if not impossible, to duplicate by another firm so there are meaningful opportunities for competitive advantage. The better a firm is at developing this capability through building and developing its knowledge management systems, then the greater the potential for a sustainable advantage. Thus, knowledge management provides an opportunity for firms to develop a capability which will enable it to have a competitive advantage over its competition.

Finally, perhaps the most telling statistic of why knowledge management matters is that knowledge management appears to have a meaningful impact on a firm’s valuation. According to Teleos, its list of Most Admired Knowledge Enterprises has generated a total return to investors of 17.9% during the period 1992-2002 compared to a median return of 9.1% for the U.S. Fortune 500.\textsuperscript{73}

\textit{Is it good for a firm to retain its corporate memory?}

Other critics suggest that perhaps there are situations in which it can be advantageous for a firm to selectively “forget”, rather than retain knowledge. These critics believe that a firm may occasionally encounter an event which may be best if left forgotten. If firms continue to dwell on failures or other negative corporate events, then the firm may have difficulty moving on and employee morale may suffer. When making future business decisions, firms may also erroneously allow their decision making to be influenced by their past history. If the firm dwells on its failures, then the firm may become overly risk averse or indecisive.

While these are valid concerns, I believe that a firm should retain all of its relevant knowledge. The purpose of retaining knowledge of past failures or other adverse events is so that a firm can learn from its past in order to avoid negative events in the future. If a firm selectively “forgets” these adverse events, then it runs the risk of making the same mistakes again.

\textit{Knowledge management is too difficult to measure}

Still other critics believe that the benefits of knowledge management are simply too difficult to measure. Without the ability to accurately measure the benefits, there is no way to know for sure whether or not the knowledge management system is truly adding value.

I believe that those critics who suggest that knowledge management benefits are too difficult to measure are uninformed. In the previous section, I discuss ways in which a firm can measure its knowledge management success. By using these and other similar metrics, a firm can gauge the degree to which it has been successful in its knowledge management endeavor.

\textsuperscript{73} \url{www.apqc.org/portal/apqc/site/content?docid=116903}
Successful Knowledge Management Applications

In order to examine the field of knowledge management in greater depth, I turn next to several case studies of successful applications of knowledge management. It has been stated that “knowledge management has different implications for different businesses in different contexts.”\(^7^4\) Due to these wide differences, I have selected three case studies, covering the pharmaceutical, energy and consulting industries, which profile different techniques and adaptations of knowledge management based on the unique circumstances and demands of the profiled company. These case studies have also been selected across industries in order to show the broad applications and uses of knowledge management and to show that there is no single formula with which to implement a knowledge management system.

As I mention above, my findings indicate that the pharmaceutical, energy and consulting industries have several commonalities which have led to their aggressive knowledge management expenditures which make them interesting case studies. These industries: (i) are human and intellectual capital intensive; (ii) are all highly competitive; (iii) offer the potential for large rents to firms which are “first-to-market”; (iv) generally are comprised of firms with highly distributed organizations with operations across multiple geographic and business units; (v) often have a high percentage of repeat work product which potentially can be leveraged through re-use and (vi) have high turnover and/or pending labor force retirement issues. My findings indicate that these industry characteristics have forced firms in these industries to develop competencies in knowledge management or else risk being at a competitive disadvantage relative to other firms in their sectors.

Figure 1: Framework to assess industry marginal benefit from knowledge management

In each case study discussed below, I will begin by giving a brief overview of the industry and the selected company, followed by a discussion of how the targeted firm is impacted by the unique industry characteristics mentioned above and why the company has chosen to implement a knowledge management solution. I will then discuss the various tools and techniques that the company chose to

employ in order to implement its system, followed by an analysis of the challenges which needed to be overcome and the benefits that the company has documented.

After my presentation of the case studies, I will then draw some conclusions as to why these profiled companies have been successful in their implementations of knowledge management.

APPLICATIONS OF KNOWLEDGE MANAGEMENT IN THE PHARMACEUTICAL INDUSTRY

The pharmaceutical industry generates over $400 billion in annual sales and has one of the highest profit margins of any industry. However, despite this apparent strength, the industry is faced with:

“immense pressure to deliver blockbuster drugs, reduce prices to compete with generic alternatives…[to] sustain shareholder value. In addition, there are heightened regulatory concerns, significant branding issues, impending patent expirations and short-lived profits, escalating R&D and operations costs, and the increased complexity in research data that comes with information overload.”

These dynamics helped drive pharmaceutical firms’ early adoption of knowledge management as a means to develop a competitive advantage. Using the framework in Figure 1 to explain the pharmaceutical industry’s early and aggressive adoption of knowledge management, it becomes clear that the pharmaceutical industry: (i) is driven by the research efforts of scientist and, thus is human and intellectual capital intensive; (ii) is highly competitive and offers the potential for large rents to firms which can secure patents by being the first to bring drugs to market; (iii) generally is comprised of firms with highly distributed organizations with operations across multiple geographic and business units; (v) is characterized by drug research which involves a high percentage of repeat work product which potentially can be leveraged through re-use and (vi) may have high turnover and/or pending labor force retirement issues.

As a result of the above industry dynamics, the pharmaceutical industry became a prime candidate for knowledge management investment. Pharmaceutical firms were among the first to recognize that knowledge management had the potential to help firms in the industry to address the above issues. To address these issues and discuss how one pharmaceutical firm turned to knowledge management as a solution, I will present a case study on a leading pharmaceutical firm and proponent of knowledge management, Aventis.

Problems to be addressed by knowledge management

Aventis Pharmaceuticals is a leading pharmaceutical firm with headquarters in Strasbourg, France. It has over €17 billion in annual sales and 71,000 employees in offices around the world. The R&D division at Aventis alone invests over €3.14 billion annually and is comprised of over 5,000 employees in multiple locations in the U.S. (1,500), Germany (1,350), France (2,250) and Japan (400).

Because Aventis recognized that it operated a highly distributed organization and could potentially realize substantial benefits from investments in knowledge management, Aventis conducted a preliminary diagnostic to assess the degree to which knowledge was shared within the organization, specifically within its R&D division. To the extent that Aventis found minimal knowledge sharing, then Aventis

http://www.apqc.org/portal/apqc/site/content?docid=109994

recognized that a knowledge management initiative could help Aventis improve its knowledge sharing and efficiency.

To assess the efficiency of its knowledge flows, Aventis conducted a social network analysis to better understand the knowledge flows within its immunology researchers across its five global R&D labs. Its analysis revealed that each individual research lab possessed a high degree of interaction within its own lab. However, communication between R&D labs was substantially lacking. Aventis had discovered that its R&D labs had become “silos” of drug research and, thus, was missing opportunities to share knowledge between labs.

Aventis was not alone in discovering that its research labs were siloed. One of Aventis’ competitors, Bristol-Myers Squibb, recently estimated that its scientists were “spending 20 percent to 25 percent of their time looking for data and knowledge to get their work done.” Because it has been estimated that “it costs between $800 million to $1 billion to develop a new drug and get it into the hands of consumers over a time span of 10 to 12 years”, Aventis realized that it could help reduce these high drug development costs if it could reduce the time wasted by its scientists looking for information.

Aventis recognized that improving its knowledge flows would help the firm reduce these high research costs and improving the connectivity between researchers at different labs would help improve researchers’ problem solving abilities. Improving connectivity would also help researchers identify and locate other researchers who may have an expertise or experience in a certain area. Enhanced communication flows may also enable researchers to locate information or documents more quickly and easily. Finally, Aventis believed that establishing a knowledge management initiative may also help the firm document and institutionalize lessons learned and best practices. Ultimately, if Aventis could realize these improvements, then this improved communication and knowledge flow could enable the organization to improve the efficiency with which it develops drugs. Because drugs only have a limited amount of time on patent, bringing a drug to market only weeks ahead of schedule can mean the difference in hundreds of millions of dollars in incremental profits.

Collectively, Aventis’ analysis of its knowledge flows and its desire to achieve the above benefits led it to explore knowledge management initiatives which could enhance collaboration between immunology researchers globally.

**Knowledge management implementation**

In order to improve the knowledge flows within and between its R&D labs, Aventis instituted several knowledge management initiatives, each of which was part of an organized, integrated knowledge management plan. Its knowledge management implementation was comprised of both knowledge management techniques and knowledge management technologies.

**Knowledge management techniques implemented**

- **Communities of practice.** One of the first steps that Aventis took to help improve the communication flows between its R&D labs was to introduce communities of practice. Aventis defined its communities of practice as a “network that connects scientists across project teams, sites, disease

77 [http://www.apqc.org/portal/apqc/site/content?docid=109994](http://www.apqc.org/portal/apqc/site/content?docid=109994)

groups and centers of expertise through a commitment to sharing knowledge for problem solving.”

In this manner, Aventis researchers were encouraged to form communities around common research areas. For example, a community was formed for researchers in Aventis’ immunology research. Practitioners from previously unconnected areas of research, including rheumatology, respiratory, central nervous system, oncology, biotech, screening, clinical pharmacology and anti-infective, were brought together under the common bond of a single community. In this community, researchers, who shared the common bond of immunology research, could come together to exchange ideas, share knowledge and discuss common challenges. It was Aventis’ goal that communities of practice would help promote knowledge sharing between scientists in different research labs. This effort allowed scientists researching similar areas to share ideas and ways to solve common problems. Communities allowed researchers to connect with people, both internally and externally, who could help them solve everyday problems. In this manner, communities helped both the researchers and Aventis save time and reduce cycle time.

- **Continuous improvement reviews.** In addition to communities of practice, Aventis also instituted “continuous improvement reviews”. Such reviews are similar to after-action reviews in which Aventis managers and researchers review the successes and shortcomings of each project at its conclusion. These continuous improvement reviews are meant to help institutionalize “learnings” so the firm can improve its corporate memory and learn from each incremental project.

- **Regular division meetings.** At Aventis’ regular division meetings, Aventis began to employ case studies as a means to share and transfer knowledge and key practice area learnings. A format that Aventis frequently used was to provide the audience with a case study situation, background and problem. The audience would then be asked to form small groups and discuss how they would have solved the problem presented. After groups had time to discuss, the presenter would then share with the audience how the case team actually solved the problem. Such methods helped Aventis share key learnings with other researchers, as well as provide recognition and reward to the case team which developed the original problem solution.

**Knowledge management technologies implemented**

In addition, Aventis also invested in several knowledge management technologies.

- **Document management, storage and retrieval software package.** To improve researchers ability to more quickly locate and retrieve relevant documents, Aventis installed a document management, storage and retrieval software package which allowed researchers to more easily find important documents they were seeking.

- **Expertise locator.** Aventis also invested in a software tool, KMail, which could be used by researchers to identify other Aventis scientists with specific expertise or experience. In this manner, Aventis aimed to reduce duplication of research efforts by helping researchers identify other scientists within the organization who already had expertise in a certain area. This technology could also be used by scientists to locate scientist who could then be called on to help solve similar problems that they may have experienced in the past. Both of these initiatives were aimed at improving the efficiency of the research organization with the goal of speeding the drug development process. 

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**Benefits realized**
Aventis was able to realize meaningful benefits from its knowledge management initiatives. Aventis claims that its communities of practice have helped researchers connect with other researchers (internally and externally), improve problem solving, enhance personal networks, increase knowledge, gain and demonstrate leadership skills and improve career possibilities. At the same time, Aventis claims that communities have helped the firm reduce project cycle time, improve employee retention and improve innovation.

The technologies that Aventis has implemented have also demonstrated substantial benefits. For example, Aventis documents that KMail has helped scientists leverage expertise of other Aventis colleagues and, in the process, reduce the time required to complete research. On 19 recent projects in which KMail was used, Aventis estimates that KMail has saved over 10 months worth of research time. Aventis has also found that KMail has been particularly useful in helping integrate new researchers into the organization, thus reducing the costs of turnover. Using KMail, new researchers are at less of a disadvantage in knowing who in the organization to contact because KMail can allow them to quickly locate colleagues.\(^\text{81}\)

**Challenges faced**
While Aventis was able to realize meaningful benefits from its knowledge management program, it encountered several challenges in the course of its implementation.

*Justifying an investment in knowledge management*
The first challenge that Aventis faced was how to convince senior management that an investment in knowledge management was a worthwhile endeavor. In order to make the business case for the investment, advocates of Aventis’ knowledge management efforts employed a real options approach in order to justify their investment.

Aventis recognized that choosing to implement its knowledge management program in such a staged format would allow it to retain maximum flexibility and, thus, option value. Rather than make a single large investment and roll out its knowledge management initiative to the entire firm at once, it employed a staged, real options approach to this investment. Aventis deployed its knowledge management initiative by first testing its success in a pilot project among a sub-set of its vast research network. By structuring its initial investment as a pilot program (staged investment), Aventis was able to generate option value by capitalizing on “…the managerial discretion to take full advantage of favorable developments, while limiting the negative effects of unfavorable developments. The greater the uncertainty, the greater the value of such managerial flexibility and, hence, of the associated real options.”\(^\text{82}\) Based on its success in this one area of the firm, Aventis could then exercise its “option” in the future after evaluating the initial success of the pilot project. At that point, Aventis could then decide whether to proceed, abandon or delay further investment.

As this Aventis example illustrates, implementing a pilot test program for a knowledge management system is a classic example of utilizing a real options approach. Aventis was able to minimize its initial investment by investing only in the pilot project and could choose at a later date whether to continue the roll-out of its knowledge management system. In fact, Aventis was so pleased with the results of its knowledge management pilot that it chose to exercise its option for a full deployment in 2003.

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Overcoming cultural hurdles and encouraging scientists to share

Another hurdle that Aventis needed to overcome was the natural cultural aversion to sharing that exists in many research organizations. Research scientists operate almost by definition in silos. That is to say, it is very easy and common for researchers to become so ingrained in their research efforts that they lose sight of what is going on around them. If Aventis’ knowledge management efforts were to succeed, it would need to overcome this obstacle.

To combat this phenomenon, Aventis made additional investments in training in order to inform its researchers about the potential benefits of its knowledge management program. Scientists were trained and informed about their new information technology tools. To encourage participation in communities of practice, Aventis promoted communities as a means to help researchers solve common problems and expand their knowledge networks. Aventis promoted the possibility of being able to learn from the “best practices” of other researchers. Finally, Aventis adjusted its performance evaluation system to include continuous improvement reviews which were designed to encourage knowledge sharing and document knowledge successes for the benefit of Aventis’ corporate memory.83

Obtaining senior management support

As mentioned above, it was important for advocates of Aventis’ knowledge management program to gain senior management support. In order to overcome this potential obstacle, Aventis formed a steering committee of senior managers who were responsible for project oversight and direction. This buy-in from senior level managers was essential for project success because without it, lower level professionals may not have given the initiatives as much credibility or committed as much time to these initiatives.

Conclusion

As outlined in Figure 1, the pharmaceutical industry faces a unique set of industry characteristics which make it an ideal candidate for knowledge management investment. The industry’s reliance on human and intellectual capital, high level of competition, large first-mover rewards due to patent protection, highly distributed organizations and high percentage of repeat work product provide the pharmaceutical industry with the potential for a high marginal benefit from knowledge management investment. As these examples show, “knowledge management can play an important supportive role in the challenges facing the pharmaceutical industry.”84

84 http://www.apqc.org/portal/apqc/site/content?docid=109994
APPLICATIONS OF KNOWLEDGE MANAGEMENT IN THE ENERGY INDUSTRY

While the pharmaceutical industry has adopted knowledge management primarily as a means to improve the efficiency of its drug development efforts and reduce the time it takes to bring a new drug to market, the energy industry, on the other hand, is grappling with a different sort of dynamic. The Society for Petroleum Engineers (SPE) estimates that:

“Between 1980 and 1998 the number of people working in the oil and gas industry fell from 700,000 to 300,000 people. The median age of today’s SPE membership is 47. The industry, according to SPE, will experience a 44% attrition rate among petroleum engineers by 2010, and 231,000 years of cumulative experience and knowledge will be lost to the industry in the next 10 years due to retirement. Almost half of the work force will be new. Collectively, upstream oil and gas companies will likely lose more than 60% of all employees – along with their experience and knowledge – by 2010.”

As a result of the above dynamic, the energy industry became a prime candidate for knowledge management investment. In addition, my framework shown in Figure 1 can also be used to explain the energy industry’s early and aggressive adoption of knowledge management. From this framework, it becomes clear that the energy industry also: (i) is driven by the research efforts of scientist and, thus is human and intellectual capital intensive; (ii) is highly competitive and offers the potential for large rents to firms which can efficiently locate and extract natural resources; (iii) generally is comprised of firms with highly distributed organizations with operations across multiple geographic and business units; and (iv) has pending labor force retirement issues. By operating in such an industry environment, energy firms recognized that knowledge management had the potential to help firms in the industry to address these issues.

As an example of how one energy firm turned to knowledge management as a solution, I will present a case study on a leading energy firm, Schlumberger.

Problems to be addressed by knowledge management

Schlumberger is a global oilfield and information services company with over $12 billion in revenue. In addition to exploring the use of knowledge management as a means to retain valuable knowledge during a period of work force aging (or reductions), Schlumberger also struggled with how it could more efficiently transfer knowledge and information to those who needed it on a timely basis. D.E. Baird, former Chairman and CEO of Schlumberger stated: “We must become experts in capturing knowledge, integrating and preserving it, and then making what has been learned quickly and easily available to anyone who will be involved in the next business decision.”

As an example of Schlumberger’s struggles, consider the following scenario which occurred as recently as 1996. Suppose a field engineer at a drilling site encounters rock or soil formations which contain abnormal levels of acidity. The engineer needs to know how such acidity affects the calibration of his drilling equipment. In 1996, the field engineer would have to submit a field technical request to district support and divisional support. The request would then get funneled through to field services at headquarters. Headquarters would then pass the request down to a product development team where a design engineer would attempt to answer the drilling equipment question. Ultimately, the original information request would have to flow through seven layers of bureaucracy in order to reach a

http://www.apqc.org/portal/apqc/ksn/Alice's%20Retaining%20Knowl%20Article.doc?paf_gear_id=contentgearhome&paf_dm=full&pageSelect=contentitem&docid=107030

professional who could answer the field engineer’s question. In this scenario, it could take between 2-16 weeks to answer technical assistance questions or up to 16 weeks to resolve engineering modifications. If the technical question required an update to any equipment user manuals, it could take between 2-5 years to have such documentation updated. Clearly, Schlumberger’s information flows were highly inefficient and a knowledge management initiative could offer great benefit to the firm by minimizing downtime at drilling sites. A knowledge management system could minimize the time between having a problem or an issue and finding a solution.

Knowledge management implementation
In response to the difficulties Schlumberger field engineers experienced in getting answers to technical questions described in the anecdote above, Schlumberger developed an integrated knowledge management system. Schlumberger implemented its knowledge management solution by utilizing both knowledge management techniques as well as knowledge management technologies.

Knowledge management techniques implemented
In an effort to facilitate the continuous learning of its employees, Schlumberger has established the following knowledge management techniques:

- **Communities of practice.** Schlumberger currently supports 19 voluntary, self-governed technical communities of practice, which in total have more than 3,300 members. Each community of practice focuses on a key engineering or scientific discipline – such as Geophysics, Mathematics or Reservoir Characterization. Communities network globally, hold workshops, and publish and rank best practices. These communities of practice allow technical specialists to pool their collective ideas and knowledge to help build and institutionalize Schlumberger’s corporate memory.

- **Training.** Schlumberger offers training courses in order to transfer knowledge to its employees. Training includes classroom-based courses on a number of relevant topics. Schlumberger is also “using the vast resources of its intranet for interactive training and distance learning to provide instructor-based training directly to end-user’s location. Multiple sites can be connected simultaneously with an expert anywhere in the world, delivering just-in-time training.” Another training mechanism is “NExT where major universities combine their academic excellence and close links with industry with the experience of Schlumberger professionals to create the Network of Excellence in Training consortium (NExT). The NExT curriculum consists of more than 90 courses in Geoscience, Well Engineering and Petroleum Engineering.”

- **Storytelling.** Schlumberger is one example of an organization which has “turned to storytelling and anecdotal success stories to show the value of the investments made in knowledge management.” Schlumberger has used storytelling “to personalize the effects of knowledge sharing…and create a virtual coffee bar where success stories are told.”

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87 http://www.apqc.org/portal/apqc/ksn/Day.ppt?paf_gear_id=contentgearhome&paf_dm=full&pageselect=contentitem&docid=110357#4
89 http://www.slb.com/aboutus/unlockingvalue.html
Knowledge management technologies implemented
Schlumberger also complemented its knowledge management techniques with a set of knowledge management technologies.

- **Content management system.** Schlumberger developed a content management system for its knowledge management data storage, organization, collection and retrieval needs. Its content management system provided “meaningful and timely information to end users by creating processes that identify, collect, categorize, and refresh content using a common taxonomy across the organization. Content can include databases, audio clips, competitive data, presentations, publications, e-mail – virtually any artifact of transactions or dialogue or creative work, inside or outside the organization. Users can access internal and external content from the same system and with the same queries, yet still know the source of the content.” Schlumberger developed its system as a means to “develop and deploy processes and technology to improve organizational performance and reduce cost for Schlumberger and its customers by enabling individuals to capture, share, and apply their overall knowledge – in real time.”

- **Intranet.** Schlumberger has a partnership with Harvard Business School Publishing known as the Harvard Manage Mentor. This is an intranet tool designed to keep Schlumberger’s employees “informed and on track in today's blink-of-an-eye business environment.” This unique knowledge management partnership with an external stakeholder allows Schlumberger’s managers to have access to online modules on a variety of current business topics.

- **Expertise locator.** In order to help expedite the process of getting answers to the technical questions of Schlumberger field engineers, Schlumberger developed a system whereby field personnel could have real-time contact, round the clock, with each other and with global experts at Schlumberger Technology Centers. This system provided field personnel access the latest solutions and best practices for technical issues. Before contacting a Schlumberger expert, a field engineer could first query a database to see if an applicable solution to his problem already exists. If no such solution existed in the database, then engineer could then contact an expert for help solving the technical issue. Schlumberger could then add to its corporate knowledge base by adding this previously unrecorded technical solution to its database, thereby capturing knowledge for subsequent application.

Benefits realized
Schlumberger turned to knowledge management in order to help it solve two primary problems. In the short-term, Schlumberger wanted to be able to expedite the process by which field engineers could get answers to their technical questions so as to minimize downtime at field sites across the globe. In the intermediate term, Schlumberger, along with the rest of the energy industry, was grappling with how best to minimize the impact of the pending retirement of large portions of its workforce. Schlumberger was able to realize benefits from its knowledge management system related to both of these problems facing the company.

To assess the progress that Schlumberger’s knowledge management system made on speeding the process by which field engineers receive answers to their technical questions, Schlumberger conducted a user survey of 4,613 of its field personnel to assess the success of its knowledge management system.

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97 The responses to its field survey were impressive: 95% of respondents indicated that there was a reduction in time to resolve technical questions and respondents indicated that there was a 75% reduction in the time it takes to update engineering modifications. Schlumberger estimated that its knowledge management system had resulted in approximately $30 million annual savings ($75 mm since inception) stemming from reduced field downtime. In addition, Schlumberger realized less quantifiable benefits as well. Schlumberger’s investment in knowledge management also resulted in an increase in service quality to customers, which indirectly led to revenue enhancement and cost savings in the field.

Schlumberger’s knowledge management system also allowed it to minimize the impact of its pending labor force retirement. By establishing communities of practice, senior Schlumberger employees could use the community as a forum through which they could share their vast wealth of tacit knowledge. Experienced Schlumberger employees could also use the content management system as a means to store and document the explicit knowledge that they had accumulated through the years.

The benefits that Schlumberger generated were not unique to the energy industry. In fact, Chevron estimates that its knowledge management program produced total savings of $650 million from 1991 to 1999. In addition, from 1992 to 1999, Chevron estimates that its productivity increased 30% and employee safety improved 50%. One of Chevron’s communities of practice established a set of best practices, which after adopted by Chevron globally, resulted in an annual savings of $20 million.98 Chevron’s former Chairman and CEO, Kenneth Derr, appropriately summed up Chevron’s experience with knowledge management:

“Of all the initiatives we’ve undertaken at Chevron during the 1990s, few have been as important or as rewarding as our efforts to build a learning organization by sharing and managing knowledge throughout our company. In fact, I believe this priority was one of the keys to reducing our operating costs by more than $2 billion per year.”99

Challenges faced
While Schlumberger was able to realize meaningful benefits from its knowledge management program, it encountered several challenges in the course of its implementation.

Justifying an investment in knowledge management to senior management
One of the biggest challenges in establishing a knowledge management system is first convincing senior management that a knowledge management system will result in a sufficient return on investment. In the case of Schlumberger, its initial investment in its content management system was more than $1 million. In order to justify this cost of investment, Schlumberger used both a quantitative and qualitative justification approach. On the quantitative side, Schlumberger estimated the time savings that its employees would realize given the new knowledge management systems benefits. As mentioned above, Schlumberger was able to realize substantial cost savings from the reduced downtime of its field operations.

In addition, Schlumberger was also able to make the business case for its content management system based on qualitative factors. Schlumberger believed that its knowledge management system was a strategic, mission-critical investment which was a cost of doing business, rather than an investment which

98 http://www.apqc.org/portal/apqc/ksn/KMExSum.pdf?paf_gear_id=contentgearhome&paf_dm=full&pageselect=contentitem&docid=100820
required a clearly measured ROI.100 Thus, Schlumberger also viewed its investment in knowledge management similar to how it might view an investment in any other intangible asset, such as training or branding, which may have benefits that can be hard to quantify.

**Encouraging employees to use and share knowledge.**

One of the biggest challenges that firms face when they implement a knowledge management system is finding ways to encourage employees to use and share information. If the knowledge management system creates incremental work for the employee, then employees can be less likely to adopt and use the system. To combat this challenge, Schlumberger found that the “most effective way to capture, retain and transfer knowledge is to embed that process into the workflow...This not only retains the context, but also links the sources and co-creators of knowledge while they are still present to learn from each other.”101 In this manner, Schlumberger integrated its communities of practice, content management and expertise locator tools into employees’ work processes, thereby creating minimal additional work for its employees and limiting barriers which would discourage use of its knowledge management system.

In addition, Schlumberger actively promoted its knowledge management system. It used its corporate newsletter and other internal communication to build awareness and recognition within the Schlumberger community about the benefits its knowledge management system had delivered. Schlumberger used these mediums to advertise the successes of its system as a means to encourage its further use. Schlumberger further encouraged use of its knowledge management system by integrating various knowledge management objectives into its performance appraisal and career progression reviews.

**Aligning firm practices with knowledge management strategy**

The most successful knowledge management implementations align all aspects of the organization to promote a knowledge sharing culture. Schlumberger was no exception. In order to strengthen its knowledge sharing culture, Schlumberger worked to integrate its human resources and knowledge management strategies. Specifically, Schlumberger modified its hiring practices to recruit employees who would work effectively in a knowledge-sharing environment.102

**Technology is a means to an end and not the end itself**

The American Productivity and Quality Center believes “that there is no single technology solution to content management. The key is to understand all the components of the content management process and then look for the technologies that will best fit those needs. APQC experts advise to design the processes around the user and add technology as an enabler.”103 Schlumberger followed this prescription by investing in both technological tools (content management, expertise locator, etc.) as well as management tools. Furthermore, Schlumberger also worked to align its organization processes with that of a knowledge sharing culture (e.g. human resources strategy).

**Conclusion**

As the above case illustrates, the energy industry is characterized by high human and intellectual capital content, a high level of competition, the potential for large rents, highly distributed organizations and pending labor force retirement issues. These industry characteristics have encouraged industry participants to invest in knowledge management systems. However, the success of Schlumberger’s knowledge management program can be attributed to its integrated implementation strategy. Its knowledge management strategy aligned all aspects of its organization to create a knowledge sharing

culture. Schlumberger recognized that technology tools are only a means to an end and not the end itself. In so doing, the firm also relied on knowledge management techniques in addition to technology solutions. It was apt to gain senior management support for its initiatives and sought to align human resource strategy with its knowledge sharing culture. Finally, Schlumberger did not sit idle after the initial program roll-out; it advertised and heavily promoted its program’s success stories in order to encourage employee use.
APPLICATIONS OF KNOWLEDGE MANAGEMENT IN THE CONSULTING INDUSTRY

“Knowledge management is perhaps the most critical process within the firm. It is certainly the case for the consulting industry, where the firm’s core product is knowledge itself. Consultants live and breathe knowledge management because they sell business solutions and knowledge itself. Producing and selling knowledge constitutes their core resource or asset.”

The third industry that I will examine in my case studies is the management consulting industry. Similar to both the pharmaceutical and energy industries, the management consulting industry is impacted by the same competitive forces as shown in Figure 1. These industry dynamics have also driven the management consulting industry to be an early adopter of knowledge management.

Specifically, an analysis of the management consulting industry reveals that consulting firms: (i) are driven by the creative thought and experience of their consultants (high degree of human and intellectual capital); (ii) are highly competitive and the potential for large rents exists for firms which can efficiently deliver value enhancing strategies and solutions for their clients; (iii) generally is comprised of firms with highly distributed organizations with operations across multiple geographic and business units; (iv) often have a high percentage of repeat work product which potentially can be leveraged through re-use and (v) may have high turnover. By operating in such an industry environment, consulting firms have recognized that knowledge management has the potential to help firms in the industry to address these issues.

While the consulting industry is very broad, consulting firms can generally be categorized into two different types, depending on the degree of customization and originality in the solution delivered to the client. The first category of consulting firms is those firms which provide highly customized solutions and advice for their clients. Examples of these types of consulting firms include firms such as McKinsey and Boston Consulting Group.

The second category of consulting firms are those firms which spend significant time and resources to develop a competency and a “solution” to a common business problem, such as business process reengineering. These firms then market their standardized “solution” to a broad base of potential clients based on a proven set of procedures and techniques developed by the consulting firm. Examples of such firms include Accenture and Cap Gemini Ernst & Young.

Both of the above types of management consulting firms have invested in knowledge management initiatives. However, I have selected to profile Accenture, a consulting firm from the latter category of consulting firms. I chose to study a firm from the latter category based on the fact that these firms have a higher percentage of repeat work product. As a result, these consulting firms have developed knowledge management systems which often have sophisticated knowledge sharing systems and processes in place. These knowledge management programs warrant interesting and insightful case studies.

Problems to be addressed by knowledge management
Accenture is a global management consulting, technology services and outsourcing organization. In 2004, Accenture generated over $13 billion in revenue, serving clients in every major industry. Accenture has over 100,000 employees in over 110 offices in 48 countries. Accenture’s current

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knowledge management team includes over five hundred dedicated personnel and a $500 million per year budget.\textsuperscript{105}

Accenture defines knowledge management as, “a systematic process for creating, acquiring, synthesizing, sharing, and using information, insights, and experiences to achieve organizational goals.”\textsuperscript{106} Accenture turned to knowledge management in order to “improve knowledge and information sharing, decrease response time, accelerate innovation, reduce cost, reduce loss of intellectual assets from employee turnover, and give them the means to function on a global market.”\textsuperscript{107} As a global consulting firm with clients operating in nearly every industry in countries around the world, knowledge management also facilitated Accenture’s ability to offer a consistent product on a global basis, enabled more efficient work and better use of resources by minimizing the time consultants spend researching and looking for information and allowed the firm to more efficiently disseminate best practices and successful client solutions to consultants in the field. In essence, Accenture required that its knowledge management system must “leverage the best internal and external knowledge to maximize performance and deliver innovation.”\textsuperscript{108}

**Knowledge management implementation**

In order to help achieve its knowledge management goals, Accenture implemented an integrated knowledge management system consisting of the following knowledge management techniques and technologies.

**Knowledge management techniques implemented**

As will be discussed in the knowledge management technologies section to follow, Accenture consultants have access to a vast array of technologies and tools which can help them identify explicit knowledge relevant to their current project. However despite this vast amount of information, the tacit knowledge consultants possess in the form of their experience is extremely important to the corporate memory of a consulting firm. Accenture (as well as other consulting firms) has recognized that this tacit knowledge, which is hard to codify and document, is an organizational asset and the basis for much of the firm’s corporate knowledge. As a result, Accenture has turned to the following knowledge management techniques in order to share and transfer as much tacit knowledge as possible between consultants.

- **Communities of practice.** Accenture has formed several communities of practice as one element of its knowledge management strategy. Accenture has utilized its communities to “create knowledge and career development models [and] mentor within their practice.”\textsuperscript{109} Communities are also responsible for contributing to Accenture’s knowledge database, “sharing best practices, consulting with each other, and providing a means to bring the company’s worldwide resources against a single problem.”\textsuperscript{110}

- **Centers of excellence.** Many consulting firms have also established centers of excellence around key areas of practice. These centers of excellence serve multiple roles. From a knowledge management perspective, centers of excellence work to build knowledge by establishing best practices and promoting such learning throughout the consulting firm. In this fashion, there can often be overlap between a center of excellence and a community of practice and, in some cases, the two entities are the
same. Centers of excellence often maintain databases of their work and sometimes publish their findings in white papers (or other similar publications) which are shared with the firms’ stakeholders as a means to transfer knowledge. Of course, consulting firms also use centers of excellence as a marketing tool to promote their consulting expertise in a particular field.

- **Regular meetings.** One method that is frequently used by consulting firms to share experiential knowledge is a regular project leader meeting. In such meetings, project leaders from across the organization meet to discuss their projects and exchange experiences based on their recent case work. Consultants share new insights, key learnings and challenges they have faced in the field.

- **Training.** Accenture invests heavily in the training and continuous education of its consultants. New consultants typically are trained in courses on the specific consulting frameworks, methods and processes employed at Accenture. Experienced consultants are expected to stay current on these topics. Through training and continuous education, Accenture is able to ensure a consistent level of knowledge and is able to share and transfer best practices across the organization.

In addition, Accenture employs an apprenticeship-based staffing model, which also helps serve as a training and knowledge transfer mechanism for junior consultants. In this model, junior consultants conduct most of the case work and analysis, while senior consultants and partners provide project oversight. This staffing model serves as a means not only “of making available the experienced consultants’ knowledge to several projects, but also of transferring this knowledge to less experienced consultants. Many consultants mentioned that their most valuable learning experiences occurred when working together with other, more experienced consultants.”

- **Standardized taxonomy and methods.** Accenture has also developed standardized frameworks and methods for its consultants to use in solving case problems. Prior to beginning a project, consultants can refer to a set of standardized procedures that Accenture has developed for various types of projects. These procedures assist consultants by outlining the “activities required, for example, in the execution of re-engineering projects, and more specific tools for tackling a variety of tasks, such as how to design a sales organization, the product-development process or a logistics system in a specific industry.” These procedures “provided the consultants with models, templates and checklists to support and structure their work.” Procedures and methods are continuously updated based on new learnings from the field. Thus, “rather than merely providing a procedure to follow…methods contributed to the creation of a shared language, in the above sense, among consultants using a specific method. This shared language was…found to be an important enabler, not only of the consultants’ face-to-face exchange of experience, but also of structuring the documentation from previous cases to make them more easily accessible to and applicable by others in the consulting organization. The method's contribution to creating a shared language in the consulting organization was, further, an important facilitator of the interaction among consultants, which in turn was referred to by individual consultants as the most important vehicle of learning.”

**Knowledge management technologies implemented**

In addition to its knowledge management techniques, Accenture has invested in a suite of complementary knowledge management technologies which allow consultants to more efficiently locate, retrieve, share, store and transfer explicit knowledge.

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111 [http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print](http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print)

112 [http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print](http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print)

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- **Content management system.** Accenture maintains a vast database of prior work product, known as its Knowledge Xchange database.\(^{115}\) These databases include all documentation related to prior cases and proposals on which the firm has consulted. Such documentation includes proposals, memos, presentations, reports and other relevant analyses. This documentation provided consultants with a valuable source of knowledge:

  “When designing a proposal for a new project, the consultants began by consulting the knowledge database to obtain examples of how proposals had been designed in previous similar projects. In later phases of the project, inspiration for formulating meeting agendas or organizational solutions could also be obtained from previous cases.”\(^{116}\)

In addition to the above, Accenture’s content management database also includes “best practices” case material. This best practices material is documentation which is developed and maintained by the various centers of excellence for different industries (e.g. finance and aerospace) and processes (i.e. procurement process). These best practices materials included the firm’s best products as identified by the consultants responsible for their creation and maintenance. They included documents such as successful proposals, process models, marketing support, educational material, benchmarks, and other deliveries from previous client assignments.\(^{117}\)

- **Expertise locator.** In addition to providing consultants with easy access to information from prior cases, Accenture’s content management database provided its consultants with another valuable tool. The database also allowed consultants to identify which Accenture professionals were involved in the original project. Thus, Accenture’s content management database has a dual function: “first, the direct transfer of knowledge between different projects; and second, the establishment of contacts for a more personal transfer of experience in relation to specific projects.”\(^{118}\) In addition, Accenture’s centers of excellence also serve as a convenient source of expert location. Accenture’s corporate directory lists which individuals are involved in which centers of excellence and possess area expertise.

- **Search and retrieval software.** Accenture’s suite of knowledge management technologies includes a “yellow pages” for browsing topics of interest and advanced search software that supports extremely detailed and specific searches. These software tools enable Accenture’s consultants to more efficiently search and locate information they are seeking.

- **Discussion and chat technologies.** Accenture has also invested in discussion and chat technologies. These communication tools allow Accenture consultants to collaborate and have real-time communication with team members, other consultants and Accenture experts from around the globe.

- **Data monitors.** Accenture consultants also have access to specialized tracking software which allows consultants to automatically monitor news and data based upon specified parameters. These data monitors are capable of tracking desired information from major news organizations or industry groups, allowing Accenture consultants to stay informed of industry trends and developments.\(^{119}\)

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\(^{116}\) [http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print](http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print)

\(^{117}\) [http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print](http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print)

\(^{118}\) [http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print](http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print)

\(^{119}\) [http://www.ndu.edu/sdcfp/AccentureFinal1.doc](http://www.ndu.edu/sdcfp/AccentureFinal1.doc)
Benefits realized
Accenture’s knowledge management system has resulted in several benefits to the firm. First, Accenture’s content management database, Knowledge Xchange, has received wide acceptance and use within the firm. By 2000, the database registered over 40,000 users. This wide adoption and use of the database has helped Accenture consultants retain, organize, share, store and transfer explicit knowledge from Accenture’s client work.

In addition, as mentioned above, Knowledge Xchange also serves as an expert locator, so the widespread use of this database has also helped Accenture consultants make connections and identify experts in order to facilitate the transfer of tacit knowledge within the firm.

As a representative anecdote of the benefits of Accenture’s Knowledge Xchange database, consider the following:

An Accenture consultant in Chicago “needed to learn about something called FDDI, which is a blueprint for designing a fiber-optic data network. By Tuesday his question, posted on an Andersen Xchange bulletin board, had replies from colleagues in three states and Great Britain…[the consultant] had cast his net wider and hauled it back fuller, faster and cheaper than he could have before – and with no need to make photocopies, fill out Federal Express waybills, or play phone tag. Best of all, his question created a piece of intellectual capital: a file that from now on is there for any Andersen consultant who needs the same information.”

The above anecdote exemplifies the benefits of Accenture’s Knowledge Xchange database. This consultant was able to receive a prompt answer to his query and was able to use the database to locate other professionals within Accenture who had resident knowledge on the topic in question.

Accenture’s standardized procedures and methods have also registered benefits. These procedures and methods made “communication between the consultants more effective, as the senior consultants could refer to the method when explaining to their junior colleagues what to do…The common framework provided by the method in terms of phases, activities, measures, forms, checklists, and so on was further described as an enabler of the communication between consultants, in which knowledge from one individual was made available to another.”

However, perhaps the best barometer of Accenture’s knowledge management efforts is the tremendous success and growth the firm has been able to achieve. Accenture now encompasses over 100,000 employees in 110 offices in 48 countries. Without the ability to coordinate projects, collaborate, share knowledge and best practices, efficiently search and locate information from disparate parts of the firm and train and educate thousands of new consultants, such growth would not have been possible.

Ultimately, Accenture created its knowledge management system to “improve knowledge and information sharing, decrease response time, accelerate innovation, reduce cost, reduce loss of intellectual assets from employee turnover, and give them the means to function on a global market.” Partly in recognition of these benefits that Accenture has realized, Accenture was recognized as one of 20 winners of the 2004 Global Most Admired Knowledge Enterprises award. The Most Admired Knowledge

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122 http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print
123 http://www.ndu.edu/sdcfp/AccentureFinal1.doc
The Design and Implementation of Effective Knowledge Management Systems

Steve Morrissey

Enterprises study was established in 1998 to recognize organizations for their ability to create shareholder wealth by transforming new as well as existing enterprise knowledge into superior products/services/solutions. Accenture is a seven time winner of this award.\textsuperscript{124}

**Challenges faced**
While Accenture has realized substantial benefits from its knowledge management initiatives, it has faced challenges along the way. Some of the most substantial challenges which Accenture had to overcome include the following:

*Obtaining senior management buy-in*
As stated previously, perhaps the most important hurdle that an organization must overcome is getting senior management support for the firm’s knowledge management efforts. At Accenture, senior executives had the foresight to recognize the strategic rationale for a knowledge management system. Thus, Accenture’s senior leadership actually \textit{led} the knowledge management effort. Accenture actually deployed its knowledge management system using a top down approach, in which Accenture’s most senior consultants received the first training and equipment, followed by lower level managers, consultants and analysts. This approach “emphasized the importance of the program and forced lower levels to get on board quickly to understand what their bosses were doing.”\textsuperscript{125}

Accenture’s senior leadership support was epitomized in an April 1997 \textit{Harvard Business Review} article, in which Accenture’s CEO, George Shaheen, stated “Knowledge capital is our most valuable asset and it drives our organization. It’s what we sell, and what we must continue to protect and perfect. Our people should diligently find new ways to share and reuse information and deploy it around the world.”

*Aligning firm practices with knowledge management strategy*
Part of Accenture’s integrated knowledge management strategy involved aligning its human resource strategy with its knowledge management strategy. Thus, Accenture modified its performance evaluation process to incorporate a knowledge management element as follows:

> “Accenture establishes written expectations for each employee and regularly reviews progress. Knowledge sharing is a key professional quality that is used for performance and promotion evaluation. At certain levels, failure to share knowledge can even prevent promotion. Failure to use or contribute to the knowledge management system results in redundant activities, reinvention of processes, failure to use best practices, and stifles innovation.”\textsuperscript{126}

*Encouraging employees to use and share knowledge.*
Accenture also had to find a way to encourage its consultants to use its knowledge management techniques and technologies. As mentioned above, Accenture deployed its Knowledge Xchange database using a top-down approach. This approach encouraged junior consultants to use the database as senior managers embraced the knowledge management efforts.

Accenture also trains its new consultants on how to use its knowledge management technologies. Accenture advertised and promoted the successes its consultants had in using its systems. Another benefit of Accenture’s Knowledge Xchange database is that as “connections” are made between consultants and questions receive answers, these answers are displayed for any Accenture consultant to

\textsuperscript{124} http://www.knowledgebusiness.com/knowledgebusiness/upload/2004GlobalMAKELPR.pdf
\textsuperscript{125} http://www.ndu.edu/sdcfp/AccentureFinal1.doc
\textsuperscript{126} http://www.ndu.edu/sdcfp/AccentureFinal1.doc
view. The “visible” nature of this organic growth in knowledge helps to reinforce the value of Accenture’s Knowledge Xchange system and further encourage its use.

Finally, Accenture’s human resources policy, which incorporates knowledge management and knowledge sharing into a consultant’s performance evaluation, serves as further encouragement for use. Thus, consultants are properly incentivized to share knowledge, use knowledge management technologies and participate in other knowledge management initiatives, such as communities of practice, centers of excellence, project leader meetings and continuing education.

Potential for over-reliance on knowledge management system

One of the potential drawbacks to developing such an institutionalized knowledge management system is that consultants may be constrained by the limits of the knowledge contained in the system. Consultants may feel obliged to follow certain procedures as outlined by the firm’s best practices. In such cases, over-reliance on a particular framework, method or procedure can lead to creativity impairment, narrow peripheral vision or limited ability to adapt the process to a changing marketplace. Thus, in these scenarios, over-reliance can actually limit knowledge creation.

However, Accenture was careful to combat this potential obstacle. For instance, Accenture allowed and encouraged its consultants to use its frameworks, methods or procedures as starting points, rather than absolute guidelines. Instead, Accenture consultants viewed their best practice frameworks, methods or procedures as “an important enabler of their working in project groups…Methods made communication between the consultants more effective, as the senior consultants could refer to the method when explaining to their junior colleagues what to do.”

The same logic also follows for the use and re-use of work from prior case engagements. Accenture consultants have noted that “documents from previous cases could seldom be reused without adaptation. Rather, they served as a point of departure or source of input in the process of creating a specific design or solution for a specific case.” By following these more flexible guidelines, Accenture has been able to overcome obstacles related to creativity impairment, narrow peripheral vision and inability to adapt frameworks, methods and procedures to changing market environments.

Conclusion

As the above Accenture example demonstrates, the management consulting industry is characterized by a high degree of human and intellectual capital, intense competition, potential for large rents for firms which can efficiently deliver value enhancing strategies and solutions for their clients, high degree of dispersion between offices, consultants and clients, high percentage of repeat work product which potentially can be leveraged through re-use and high turnover. By operating in such an industry environment, consulting firms have recognized that knowledge management has the potential to help firms in the industry to address these issues.

A case study of Accenture reveals several interesting learnings as to how Accenture has successfully implemented its knowledge management program. Accenture recognized that its corporate knowledge resided in both tacit and explicit forms. Therefore, Accenture understood that it needed to structure an integrated system which involved knowledge management techniques in order to capture and transfer tacit knowledge, in combination with knowledge management technologies in order to capture and transfer explicit knowledge. Additionally, Accenture’s senior management recognized the strategic rationale behind its knowledge management effort. As a result, senior executives were fully supportive of

127 http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print
128 http://www.findarticles.com/p/articles/mi_m4339/is_6_24/ai_105918454/print
the knowledge management initiatives. Furthermore, while Accenture’s knowledge management system provided its consultants with extensive access to firm best practices, frameworks and methods, consultants were trained to use these tools as starting points rather than rigid processes. In this respect, Accenture was able to minimize any potential for over-reliance on its knowledge management system. Finally, Accenture encouraged widespread adoption and use of its knowledge management initiatives through the use of performance incentives, senior management support, promotion and advertising of success stories and training and continuing education.

LESSONS LEARNED FROM THESE CASE STUDIES

While there are many different strategies and processes that a firm may use to implement its knowledge management system, there are several commonalities among effective knowledge management systems. First, there must be senior management buy-in. Just as with any other project undertaking, gaining senior management support can often make the difference between a project’s firm-wide acceptance and failure. Second, a firm must invest in training to support its knowledge management initiative. Unless all of a firm’s employees are aware and sufficiently skilled in how to utilize the knowledge management system, the firm will not be able to maximize its benefit. Third, a firm must encourage its employees to use and share the knowledge contained in its knowledge management system. Thus, a firm must align its incentive compensation and reward system to encourage knowledge sharing behavior. Fourth, information technology is a means to an end and not the end itself. In other words, information technology clearly plays a large role in the software tools which can be used to store, locate and share electronic forms of information. However, not all knowledge (tacit) can be conveyed electronically and unless information technology investments are coupled with the other elements of a knowledge management system mentioned above, information technology alone cannot produce an effective knowledge management system which can confer the above benefits. Last, a firm needs to measure the relative success of its knowledge management system in order to evaluate its performance and identify areas for improvement. Thus, in order to implement an effective knowledge management system, a firm must thoughtfully align its leadership, training, culture and reward systems, technology tools and measurement systems in order to achieve maximum benefit.
The Future of Knowledge Management

While the present knowledge management landscape offers some exciting examples of knowledge management success stories as evidenced by the previous case studies, the future of the field is even more encouraging. My view of the future is that the knowledge management field will evolve into new technologies and new applications.

New technologies
There are a plethora of knowledge management technologies on the market today, in addition to the proprietary custom designed technologies that some firms have developed in-house. As I have studied the market, I anticipate the continuance of three trends that I have seen in the marketplace for new knowledge management technologies:

- **Increase in integration of knowledge management technologies.** Most of the technologies on the market today are specialized packages which focus on a particular element of knowledge management (content/document management, search and retrieval, collaboration tools, communication tools, etc.). In the future, I anticipate new technologies which can help bridge and integrate some of these functions into more comprehensive technology packages. For example, “Collaboration tasks usually require access to reference material and also generate new content. For that to be managed effectively, you need content management as an integral part of your collaboration suite.”¹²⁹ In addition, “most pieces of content require multiple authors, which means that collaboration tools can be very useful…The substantial set of multiple content management tools and collaboration functions demands an integrated user interface for effective delivery.”¹³⁰

- **Increase in prevalence of active technologies.** In addition, many of the technologies in existence today are passive in nature. A passive technology, for example, requires the user to specify what he is seeking and the user must initiate the desired function. By contrast, active technology is capable of “knowing” in advance what the user seeks or desires and proactively conducting the desired function. For example, suppose the user seeks to retrieve information related to XYZ topic. If the user is working with a passive technology, the user will need to take the initiative and specify search criteria in order to locate the information he is seeking. However, if the user is working with active technology, then the user could specify in advance that he wishes to retrieve any document relating to XYZ topic. Then, any time there is a document relating to XYZ topic, the active technology will proactively retrieve the relevant document and alert the user of its existence.

While there are some active technologies in existence today, their deployment has only recently begun. A new technology, known as Really Simple Syndication or RSS, can be designed to “regularly pull headlines from news sites and Web journals and present them within e-mail software, Web browsers or standalone programs known as readers.”¹³¹ While there will always be a place for passive technologies, I anticipate that active technologies will play a larger role in knowledge management in the future. Active technologies have an inherent advantage in that they can “automate” some retrieval functionality and deliver relevant content to users on a real-time basis. Thus, active technologies can be particularly useful in helping to keep knowledge databases current and up-to-date with new information.

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Technologies which facilitate increased dissemination of knowledge. In the next generation of knowledge management technologies, I envision increased decentralization of the knowledge management function. “Desktop personal knowledge search, instant messaging, Google, free VOIP, P2P file sharing and collaboration suites, social networks, RSS, blogs and wikis are all making it possible for individual knowledge workers to take control of the management of intellectual capital within the enterprise.” In addition, Schlumberger believes that in the future “there will be better technology available to provide more support for distributed authorship, editing, and publishing.”

Technologies which help to decentralize the knowledge management function will help firms deliver the appropriate technology and tools to workers who possess the knowledge the firm seeks to capture. This trend will only help firms to increase their knowledge capture capability.

New applications

In conjunction with the above trends in the development of new technologies, I also anticipate that there will be new applications for knowledge management. New applications include: (i) expansion of knowledge management into lesser penetrated industries and (ii) new uses of knowledge management within highly penetrated industries.

Expansion of knowledge management into lesser penetrated industries

While knowledge management has taken hold in many industries, including pharmaceuticals, energy and management consulting to name a few, the knowledge management field has had less success penetrating other industries. In the future, I anticipate that industries which possess the characteristics outlined in Figure 1 will increasingly choose to adopt knowledge management. For instance, as mentioned earlier, the Buckeye Institute reports that approximately 71% of all federal government employees will be eligible for retirement by 2010. Thus, I anticipate increased government expenditures on knowledge management initiatives. In fact, KM World magazine reports that government agencies and non-profits “are making significant investments in knowledge management. The primary driver is the new standard of accountability for business results within non-profit organizations and government agencies.”

In addition, there are other service industries which have yet to invest as heavily in knowledge management. The investment banking industry, for instance, would appear to be a prime candidate for knowledge management investments. In fact, the industry: (i) is human and intellectual capital intensive; (ii) is highly competitive; (iii) offers large payouts to firms which can deliver financial solutions to clients; (iv) is comprised of firms with highly distributed organizations with operations across multiple geographic and business units; (v) has a high percentage of repeat work product which potentially can be leveraged through re-use and (vi) has high turnover. Thus, knowledge management would appear to have the potential to offer substantial benefits to the investment banking industry.

However, upon closer examination, it becomes clear why the industry has yet to embrace knowledge management. The culture of investment banks rewards individual performance. Under most current compensation structures, employees are rewarded for business they generate; there is little incentive to share knowledge as employees will generally not be compensated for this activity and doing so detracts from their busy schedules. Additionally, much of the work of investment banks is highly confidential and covered by SEC regulation. Thus, in order to share information, it must first be codified into general

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134 http://www.buckeyeinstitute.org/Articles/2003_06-26Workforce.htm
terms before being transferred to the end user. This additional step complicates and creates a barrier to knowledge sharing.

In the future, however, I believe knowledge management will eventually make inroads into the investment banking industry. The potential gains are simply too large for investment banks to continue to ignore, although banks will have to overcome the above challenges. In fact, Morgan Stanley recently implemented ActiveNet, an expertise sharing and relationship networking software package. This piece of software will help Morgan Stanley’s bankers to “locate and share expertise.” The software also “allows employees to search for peers who have existing business relationships with target companies or specific individuals within a target company.” 136 This expertise locator software package offers Morgan Stanley a sample of the benefits knowledge management may be able to provide to its organization. Importantly, this knowledge management tool observes Morgan Stanley’s stringent client confidentiality standards while avoiding incremental work for its busy bankers. Should Morgan Stanley’s foray into knowledge management succeed, I anticipate other banks to follow Morgan Stanley’s lead into the field.

New uses of knowledge management within highly penetrated industries
I also anticipate that knowledge management will develop new applications within existing highly penetrated industries. For example, if a firm is able to develop an extensive knowledge management database, it will have developed a highly valued core of knowledge. This database of knowledge may be highly valued by outsiders, in which case the firm may consider selling access to its database as a means to generate incremental profits.

In fact, consulting firm, Ernst & Young, has done just this. E&Y has developed “Ernie”, which is “an Internet based consulting service to which clients can subscribe for an annual fee of a few thousand dollars. In return, they can send questions to Ernst & Young asking for advice to solve their current management problems.” 137 However, E&Y’s Ernie product has an additional, perhaps more important benefit: “While Ernie is a great opportunity for Ernst & Young to leverage the current knowledge management system, it also adds to the system in a significant way: it is an additional ‘ear’ for the firm, allowing it to learn about emerging topics and thus focus its knowledge-building efforts in a proactive way.” 138 Thus, I anticipate further examples of firms attempting to leverage their knowledge databases into similar such opportunities. Not only does such a product generate additional revenue (and thus, improve the firm’s knowledge management ROI), but it also enhances firms’ radar capability to detect new developments.

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136 “Banking on expertise sharing.” *KM World.* May 2004. p. 6
Conclusion

While there has been much excitement in the field of knowledge management, the substantial benefits of knowledge management have been elusive for many firms. The purpose of this paper was to examine the knowledge management process and study successful applications of knowledge management in order to draw conclusions as to how to design and implement effective knowledge management systems.

My study of the field resulted in a seven step implementation process which firms can use as a guide to their implementation. This process includes: (i) an assessment of what knowledge is required; (ii) an assessment of the degree of organizational sharing and retention; (iii) the garnering of senior management support; (iv) the design of an integrated system of tools and technologies; (v) the design of incentives for use; (vi) the measurement of the program’s impact and (vii) the promotion and advertisement of the program’s success. Importantly, by following this procedure, a firm will be able to design and implement a program which both integrates and aligns knowledge management with business strategy. In addition, this integration process also helps firms address common knowledge management challenges and critiques. If the firm is able to successfully manage each of these challenges and overcome its critics, then the chances of a successful implementation will be substantially greater.

The case studies that I presented also provide insight into how to design and implement effective knowledge management systems. While there are many different strategies and processes that a firm may use to implement its knowledge management system, there are several commonalities among effective knowledge management systems. Importantly, in order to implement an effective knowledge management system, a firm must thoughtfully align its leadership, training, culture and reward systems, technology tools and measurement systems in order to achieve maximum benefit.

This project has also allowed me to develop views of the future of the knowledge management field. On the technology front, I anticipate trends toward: (i) an increase in the integration of knowledge management technologies; (ii) an increase in the prevalence of active technologies and (iii) an increase in technologies which facilitate the increased dissemination of knowledge. On the application front, I anticipate that there will be new applications for knowledge management, including: (i) the expansion of knowledge management into lesser penetrated industries and (ii) new uses of knowledge management within highly penetrated industries.

Ultimately, it is important to remember that knowledge management is not an extension of information technology; rather, it is a business process. “It is the process through which firms create and use their institutional or collective knowledge.” Thus, my study of knowledge management has attempted to demonstrate that a knowledge management program must integrate information technology, firm culture, organizational processes and senior management support into a cohesive system. Firms which can successfully manage this integration will be the firms which can successfully develop knowledge for competitive advantage.

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