DEFENSE SYSTEMS MANAGEMENT COLLEGE

PROGRAM MANAGEMENT 2000:
Know the Way

How Knowledge Management Can Improve DoD Acquisition

Report of the Military Research Fellows
DSMC 1998 - 1999

Lieutenant Colonel George Cho, USAF
Lieutenant Colonel Hans Jerrell, USAF
Captain William Landay, USN

January 2000

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FOREWORD

Knowledge Management is a concept whose time has arrived. During my tenure as Secretary of Defense, we and our acquisition personnel spent tremendous amounts of time, energy, and resources in improving acquisition processes to support the warfighter. We were working primarily on improving the ways and manner of actually making acquisitions. Our efforts would have been really strengthened by the innovative coupling of technology and process change that we are witnessing in the marketplace today — that is the whole management of our acquisitions.

As moderator of the television program, *World Business Review,* I have seen how private industry is using technology to improve the knowledge of its workers. Organizations with dispersed offices are able to bring greater intellectual assets to bear on the problems of improved customer service, product-to-market excellence, and lowered operational costs.

These DSMC Military Research Fellows have it right … knowledge management is not a single undertaking; rather, it is a cultural and strategic change, powered by Information Technology and process innovation. As you implement Knowledge Management projects in your organization, regardless of the projects selected, the people, process, and technology issues need to be addressed simultaneously or disappointing results are apt to follow.

Knowledge Management is not a passing management fad; it is here to stay. So I encourage you not just to read this report but also to absorb the principles it emphasizes. By implementing a Knowledge Management project, we can help the Acquisition Workforce to work "smarter" in producing the goods and services needed by our warfighters, "faster" at improving the DoD acquisition processes, "better" in providing customer service, and "cheaper" in overall program costs.

Essentially these are the things the best of our private companies are doing. Defense, one of our largest and certainly our most important activities, cannot do less.

Caspar W. Weinberger
Chairman
FORBES

PREFACE

The Under Secretary of Defense (Acquisition) (now known as the Under Secretary of Defense (Acquisition, Technology, and Logistics)) chartered the Defense Systems Management College (DSMC) Military Research Fellowship Program in 1987. Since then, three acquisition professionals have been competitively selected each year to receive advanced professional and military education and to explore new technologies, techniques, and approaches that will enhance the Department of Defense (DoD) acquisition community. We were privileged to be selected as the 1998–1999 fellows. This publication is the culmination of our 11-month fellowship program.

At the inception of this fellowship program, the Under Secretary of Defense (Acquisition) recognized that, while there were many things the DoD was doing right in systems acquisitions, there were many opportunities for improvement. When Defense funding began to decline, the Under Secretary of Defense (Acquisition) foresaw the need to invest in a fellowship program that allowed seasoned acquisition professionals to use their years of experience and desire for process improvements to take an unbounded view of how DoD could do things smarter. Every year since 1987, three fellows have examined an important acquisition topic and presented their ideas to DoD's acquisition executives, academia, and those people who are challenged daily with conducting the business of acquiring the best weapon systems possible.

As in previous years, our fellowship began with an intensive international Executive Education Program at the Harvard University Graduate School of Business (HBS). For 10 weeks we lived, dined, studied, laughed, and learned with over 160 of the best and brightest business professionals from all over the world. All participants were carefully selected by their employers to be groomed for much greater responsibilities in their companies. In fact, we learned as much from our classmates as we did from the world-class faculty at the HBS. We were also gratified that many of our classmates and the faculty held the U.S. military in high regard, both as a fighting force as well as a group of professionals who partnered with industry to supply the world's best fighting force with the world's best equipment. Still, the HBS faculty members were quick to point out that there is much room for improvement, and we agree. That is why the DoD sent us to this Harvard program.

After graduation, we returned to DSMC to begin the next phase of our fellowship. With a fresh view of the ideas being implemented by world-class companies and by embracing the observations of the HBS faculty, we decided to study how DoD could leverage "Knowledge Management" (KM) in its acquisition programs. A recurring theme at the HBS was that the U.S. is leading the world into a new economy. Just as the industrial revolution fundamentally changed the economic landscape so, too, is the current "information revolution" changing the economic landscape. Companies have learned that knowledge — both individual knowledge and corporate knowledge — bestow an enormous competitive advantage upon a company. We believe DoD can learn a lesson from the commercial sector and leverage KM to its advantage, both in an industrial sense and, ultimately, in a military sense.

In researching our topic, we read volumes of printed material; attended conferences and trade shows; visited organizations, both government and commercial; and interviewed numerous individuals to get the latest insight on this new and exciting business tool called Knowledge Management. We tried to get a sense of the emerging economic landscape to see how DoD could adapt to the new environment. We believe we have captured some common themes espoused by leading practitioners of KM, and we have also added our own thoughts and assessments to this report.

Since this field of KM is relatively new and evolving rapidly, and we only had about four months to conduct all our research, some of the material contained in our report may be dated by the time the first copy is printed — that is to be expected. Information and knowledge are being generated so fast that most people and organizations cannot keep up with them. Recognize, however, that knowledge can and must be managed; and, if you manage it well, you will gain considerable competitive advantages over your competitors or, in the case of the military, over your foes.

All of the people we interviewed, in both government and private sectors, were very selfless in sharing their time and ideas. They are pioneers in KM and were eager to help us in our research. We are grateful to all of them.

We would also like to acknowledge the help of our colleagues at DSMC as well as friends outside of DSMC. Many people took time out of their very busy schedules to give us their insights and advice on our research project. We benefited greatly from their help, and we are very grateful to them. While there are far too many people to thank, we would like to single out a few for special mention. Dr. James Price, Calvin Brown, Joan Sable, Alberta Ladymon, Greg Caruth, Kay Sondheimer, and Jim Elmore have been particularly helpful in providing sage advice and support. We could not have published this report without their assistance.

Finally, we must express our heartfelt thanks to our families, who put up with our absences while we attended Harvard for 10 weeks, flew around the country for interviews, and spent evenings and weekends writing and rewriting our report. We know it was difficult for our children to have an “absent dad” and for our wives to carry the domestic burden alone. This was not the first time we have asked our families to make sacrifices, and it likely will not be the last. We can only say we feel blessed to have such supportive and loving families willing to accept less from us so we can give more to the Department of Defense and to the public that it serves.

1

INTRODUCTION

"Knowledge is Power"
– Sir Francis Bacon (1561–1626)

Efforts to overhaul or "Reform" the Department of Defense (DoD) acquisition process have been underway almost since the process began. Especially over the past decade, there has been a particularly strong emphasis on making the process better. An entire subculture, which concentrates on this idea of Acquisition Reform, has evolved in the acquisition community. Tremendous amounts of time, energy, and resources have been applied to this issue with significant successes in many areas.

As impressive as the achievements in Acquisition Reform have been, the primary focus has been on the mechanics of executing the acquisition. Efforts to reduce specifications, use single processes across multiple programs, form and use Integrated Product Teams (IPTs), etc., have all produced successes of which we should be justifiably proud. But as this reform movement continues, it is time to ask ourselves if we are addressing all the possible areas of improvement or if we have allowed ourselves to become attached to those that provided our initial successes. We are constantly encouraged to do things "better, faster, and cheaper"; but we are really being asked to do them "smarter." Machines, like the computer, can help us to do the "faster" and some of the "better"; and removing some of our self-imposed procedural roadblocks allows us to save some time and money. To operate "smarter," however, we need to focus on something more. We need to focus on how we can improve the management of our acquisitions as effectively as we have improved the mechanics of executing them. We need to determine how to take the collective "smarts," the knowledge and experience of the Acquisition Workforce, and apply it intelligently across the entire DoD acquisition community. Only then will we begin to see some real improvements in reforming our system acquisitions, and only then will we become "smarter."

What Do "Smart" Companies Do?

In any business, successful companies concentrate on their core competencies — the attributes that distinguish them from the rest of the industry and provide a competitive advantage in the marketplace. These core competencies vary from successful company to successful company and from industry to industry, but those companies that stay successful continually focus and build on their specific core competencies. This is particularly important since the

competitive environment in which they operate changes. When you look at the DoD acquisition community, our core competence clearly lies in the ability to successfully manage the acquisition and sustainment of complex systems. We do this across a wide range of technologies, from the relatively mundane to the highly sophisticated. We do it with a wide variety of prime and support contractors and under a seemingly endless mass of regulation and guidance, and we do it well.

Given the environment and conditions under which our present system and process developed, we have every reason to believe we should continue to be successful; but, as in the commercial sector, our environment is changing. As one looks toward the future, it is clear that this rate of change will not only continue but also increase! We are grappling with the globalization of our defense base and the challenges of a strengthened military-industrial base in Europe. Competition in the U.S. defense industry continues to shrink as industry consolidates into a few mega-contractors. Budget pressures are increasing. Our leadership has decreed that we will have a high technology military force; and, therefore, our acquisition efforts will be subject to the rapid state of change endemic to that industry. The DoD is no longer a dominant force in many industries, which means we have less ability to shape the market to our needs. There is a strong push to significantly reduce the Workforce, which means fewer people to implement our existing process. Change is happening all around us. It is clear that the rapidly changing environment demands that our acquisition system and management practices change and at an even faster pace.

But what is the best way to get smarter? Under these conditions, the logical step is to focus on our core competencies and adapt and maximize them in this changing environment. Since that competency is the ability to successfully manage the acquisition and sustainment of complex systems, there are a couple of approaches we can take. To date, we have concentrated on the mechanics of a good existing process. We have fine-tuned it, eliminated obvious roadblocks, and optimized the effectiveness of each individual program. But as Harvard Business School professor Clayton Christensen points out, "Any of what are now widely accepted principles of good management are, in fact, only situationally appropriate."[1] In our changing environment, today's practices may not apply to tomorrow's problems; so we should turn to a more difficult second approach, which focuses on those management practices heavily dependent on the knowledge and innovation of the people involved. This is where we can apply our strongest assets — the knowledge, innovation, and experience of our Acquisition Workforce. This is the approach where we will see the greatest improvements in productivity — by "doing it smarter!"

The commercial sector already realizes that its most important competitive advantage is the knowledge that exists within the company. This knowledge, which can be shared and applied across the entire company, is not just the knowledge of each individual employee but, most importantly, the collective knowledge of the organization. For example, James Bryan Quinn of the Tuck School of Business at Dartmouth College estimates that information and knowledge have become the source of about three-fourths of the value added in manufacturing.[2] Companies believe that, if they can focus that collective knowledge toward their core competency areas, they can gain an edge over their competition. They believe that this allows them to bring products to market faster, at lower cost, and with greater customer satisfaction. Conversely, failure to focus on that knowledge can have an adverse effect. A study conducted by

KPMG in 1998 found that nearly half of the companies surveyed had damaged a relationship with an important client or supplier because they had "failed to turn human intellectual capital into organizational intellectual capital."[3]

In the DoD acquisition environment, this holds equally true. Every day, members of the Workforce are focused on solving the problems and improving the performance of their program. They develop solutions, some quite new and innovative, by drawing on their own experience, knowledge, and intuition and then combining these ideas with those of coworkers in their program. The problem with our existing process is that a solution or a new idea and the steps taken to arrive at them generally stay within the individual program. We do not easily share this knowledge with the entire Workforce, where it may have additional value. In other words, just as KPMG found, we are not turning individual program knowledge into organizational knowledge! This lack of collective sharing and transferring of knowledge causes us to miss a tremendous opportunity to improve our core competency. It is our inability to "manage" the existing knowledge throughout the entire DoD Acquisition Workforce that diminishes what should be a tremendous advantage.

What Do We Mean By Knowledge Management (KM)?

We will discuss the concept of "managing knowledge" in greater detail in Chapter 2. For now, think of KM in the context of intelligently applying the collective knowledge and abilities of the whole DoD Acquisition Workforce. To accomplish this goal, we must ask the following three questions:

- **What do we know about managing acquisitions?** We must identify and capture the critical knowledge that exists in our Workforce.

- **How do we share what we know?** We must organize, share and link this critical knowledge in order to provide other members of the Workforce with what they need, when they need it, and in a form they can easily use. This process entails collaborating to address issues regardless of the program, Service, or physical location.

- **How do we use what we shared?** Once we have it and share it, we then need to use and adapt this knowledge to solve problems and create new knowledge. This new knowledge is then added to the existing body of knowledge and is available for further sharing and use.

The answers to these questions are neither simple nor straightforward. Clearly we cannot develop some cookie-cutter approach that serves as a one-size-fits-all answer. Each program has its unique qualities, experiences, knowledge, and set of problems to address. Even if two programs had identical challenges, the pace of change in the environment within which we have to execute those programs will generate radically different sets of issues. These issues must be resolved; and, thereby, they will develop different experiences and knowledge. However, it is this very breadth and diversity that makes the concept of KM so powerful.

Our challenge, which is the focus of this project, is to determine how to harness the knowledge that exists in, or can be generated by, the Acquisition Workforce. In addition, we need to use it in a way that will allow us to significantly adapt and improve the way we manage DoD acquisition programs. Consider that today approximately 149,000 people are designated as members of the DoD Acquisition and Technology Workforce.[4] These people are primarily responsible for and have experience in some part of the process of systems acquisition

management. When you couple the knowledge of that Workforce with the equally impressive knowledge of the defense contractor and support contractor workforce, you begin to understand the vast amount of knowledge and experience that could be available to any and all programs.

Unfortunately, the sheer size of this Workforce, coupled with the fact that it is spread across all the Services and located across the entire country, makes it unwieldy to manage. Our existing process divides the Workforce into small pieces. These units generally are then assigned to a specific program office or Program Executive Officer (PEO) organization; and they actively apply their knowledge to solving the problems of their organization. Consequently, we apply only a very small portion of our collective knowledge to any given program.

In the past, this was a logical approach and probably the only viable means of managing the Workforce. Each program manager (PM) has a competent team, and the team members bring their knowledge and experience to bear on issues facing the program. But that knowledge is limited to personal experiences and those of a small "informal network" of associates usually located in the same physical location. The team knows these people and can ask them for help. But if you ask team members how often they go outside of their program to get help or to uncover what others are doing in their areas, the answer is generally "rarely if ever." It is not because they aren't interested but because they don't know who else is working on similar issues or don't see any connection between their project and another one in a different area. They just don't know what is happening outside of their relatively small sphere of contacts. Additionally, even if they try to look outside this sphere, the sheer volume of uncorrelated information makes any meaningful search difficult. As a result, they quickly succumb to "information fatigue" and retreat back into their narrowly focused world. Similarly, they rarely share their ideas or experiences outside of their programs because they are not aware that others are wrestling with similar issues. The bottom line is that much of our collective knowledge is bottled up in very narrow stovepipes because there is presently no framework or system for capturing, sharing, and using collective knowledge.

The result of this existing process is that PMs are forced to make decisions based on a very small subset of the good approaches that could be available. In a large program of 1000 people, the PM is still only using less than 1 percent of the available knowledge and experience available in the total Workforce. More importantly, many innovative ideas are either limited to a small segment of the organization or don't even occur. That is because essential ideas, even though tied to other ideas that potentially lead to new solutions, can't be brought together. Think how much better we could manage our acquisitions if not just the engineers in one program but all the engineers in all the Services could be queried for ideas for a solution to a problem. Then consider how much better you could operate if you could tap into the knowledge of all the PMs, contract officers, or testers to help you address an issue in your program.

A Vision for Program Management

Think of any issue with which you have wrestled, spent time, or used resources to solve. Then, ask yourself, "Wouldn't it have been resolved much more effectively if I could have brought the knowledge and experiences of 149,000 people to bear on it?" How often have you thought, after the fact, "I wish I had known about that." Ask yourself, "How many people do I know who are doing a similar job in a different program in my PEO/Systems

Command, in my Service, or in other Services?" If you are relying on your own formal and informal network to help you do your job better, think how many "experts" you are leaving out! Our question to you is, "Why leave them out?"

The concept of KM has six key applications to the acquisition community. Summarized here, they will be addressed in greater depth throughout this report. We believe that the implementation of these applications throughout the Department will fundamentally change our ability to manage our acquisition responsibilities.

- **Knowledge Mapping** — The ability to identify where expertise and knowledge resides throughout the Department and contractor base. It can also be used to highlight "white spots," i.e., areas where we may lack knowledge[5] or are about to lose knowledge through downsizing or retirement.

- **Communities of Practice** — The ability to virtually bring people with similar interests and issues together to share ideas, solutions, and knowledge.

- **Virtual Collaboration** — The ability to break out of our existing requirement to tie program offices and contractor offices to specific geographic locations. People can work effectively on program issues without being physically collocated. This allows the PM to locate members of the program where they can best serve the program yet still function as a coherent program office.

- **Best Practices** — The ability to collect, store, and access the best practices and lessons learned of the community. They can be tied to specific projects, areas of interest, or processes. It is critical that these best practices be readily available to all members of the acquisition community at their immediate place of work.

- **Customer Relationships** — One of the key aspects of the applications discussed above is that customers, from the end user to the Service/Office of the Secretary of Defense (OSD) staffs, can actively participate in the acquisition process; and their lessons learned and best practices can be accessed. Thus they become an integral part of the collaborative process, without having to leave their operational location. This provides a much tighter relationship between the acquisition community and the users.

- **Break Down Stovepipes** — This is one of the most important attributes of the KM concept. It provides the mechanism for information, knowledge, and expertise to flow easily and intelligently between people, organizations, programs, and Services. This allows the strength of the Acquisition Workforce — the collective knowledge of the people in it — to flow to wherever it can be applied best.

The skeptic in all of us is probably saying, "OK, that sounds nice. But is it really reasonable to do something like this, and is it worth the effort?" These are valid questions; and, until the last few years, the answer was probably, "No." However, recent advances in both business thinking and technology now bring this concept into the realm of the doable. To develop a strong KM capability, you need to focus on three key aspects: the people, process, and technology. Each is equally important and interrelated in a successful program. The people must believe in the idea of sharing knowledge freely, and the work culture must encourage and support that sharing. A process must exist that is clearly understood by everyone and allows capturing and sharing of knowledge to occur with a minimum of effort. Everyone in our acquisition community is busy. Any knowledge-sharing initiative that provides little value or causes a marked workload increase will not be actively

supported by the Workforce. Finally, the technology that makes the collection, transfer, and use of knowledge seamless must exist. One of the reasons that this concept of KM is possible today is because there currently are a number of commercial technologies and tools available that support the ability to share and manage knowledge. But, if there is one lesson that the leaders in this area have frequently learned, it is that all three of these aspects — people, process, and technology — are equally important to the success of this effort. Shortchanging any one area is guaranteed to lessen the effectiveness of the program. We will discuss each of these aspects in greater detail later in this report. We will also develop a basic framework for implementing the KM concept in your organization, and we will describe how all aspects must work together.

But Is It a Realistic Vision?

As to whether the effort is worth it or not, we need only look as far as the commercial business sector to see the strong emphasis they are placing on KM. Conventional business thinking is that 15–20 percent of managerial time is spent on knowledge searching. What could you do with an additional 15–20 percent of your day available? As Figure 1-1 shows, interest and investment in this area has grown steadily over the past 5 years.

AT&T has undertaken KM efforts in order to eliminate costs and improve customer interaction and time to market. One of their projects focused on improving response time and performance at all of their customer service centers. They determined that the difference between their "high performance" employees and others in the workforce was that the high performers developed better ways of finding information in response to customer questions. Based on their findings, AT&T implemented a knowledge system that both helped all customer representatives to access information more effectively and facilitated the input and dissemination of changes faster and more efficiently throughout the organization. This allowed them to reduce call time by 5 percent and follow-up calls by 8 percent, which resulted in significant savings in cost and improvements in customer satisfaction given their volume of calls.[6]

Buckman Laboratories, a chemical manufacturer, uses a knowledge-transfer system to leverage the company's knowledge everywhere it is needed in the world. This company credits its knowledge program with improving response time to customers from days and weeks to a couple of hours or, at most, a day or two.[7] The knowledge program has also enabled them to increase their percentage of sales of new products from 14 percent to 36.5 percent,[8] which, in turn, equates to higher profits.

Northrop Grumman believes that, through its B-2 KM program, the company can leverage B-2 knowledge as a competitive advantage. Grumman also sees the B-2 KM program as a means of mitigating the predicted reduction in experience levels of future technical staffs. The need to mitigate is caused by the dwindling number of new starts in military aircraft design, which has resulted in most of its workforce having worked on only a single aircraft program.[9]

Most of the big consulting firms, such as Arthur Anderson, have undertaken efforts to capture the knowledge of the consulting workforce and to share that knowledge widely within the company to provide improved support to customers.[10]

Even in the DoD, organizations such as the National Security Agency (NSA) and U.S. Atlantic Command (recently renamed as Joint

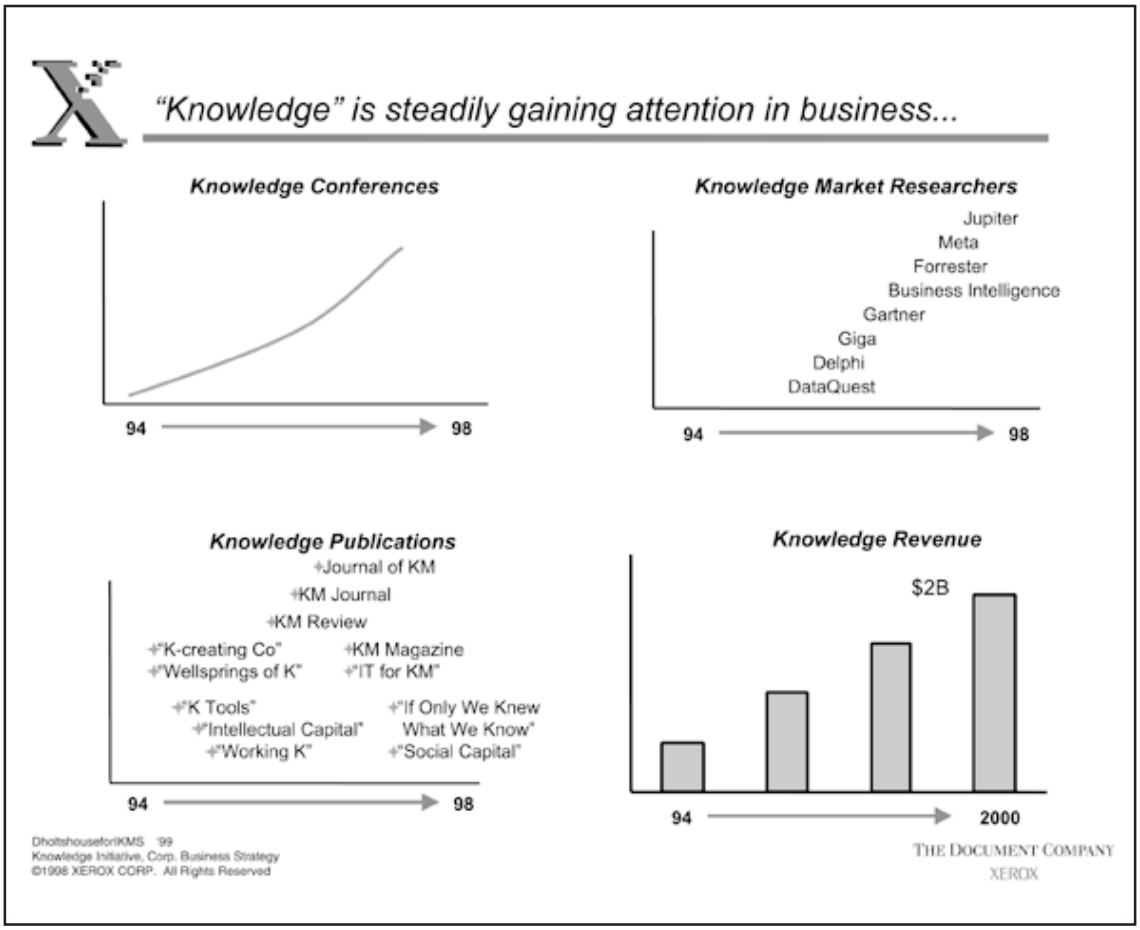

Figure 1-1. KM Interest and Investment

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Forces Command) have embarked on aggressive KM efforts to enable staff members to work smarter. NSA has developed a Knowledge map (Kmap) of the skills that exist within their workforce. Their KM system allows them to determine quickly and effectively who has the requisite skills and knowledge for any situation. It also allows them to determine where they may have holes or may be losing knowledge.[11] USACOM has employed collaborative tools within its command to improve the ability of the staff to manage and coordinate information during routine and crisis events.[12]

In all cases, these efforts are undertaken because management sees the knowledge that exists in their companies as one of their most important competitive advantages. They believe

knowledge helps them get to market faster, at lower costs, and with increased customer satisfaction and support. It allows them to operate **SMARTER**! This is exactly what we want to do in our acquisition process.

Can the DoD acquisition community also take advantage of this concept of leveraging Workforce knowledge to lower its total ownership costs (lower costs), reduce cycle time (quicker time to market), and improve customer satisfaction? We believe the answer is unequivocally, "Yes" — but only if we take a coherent Department-wide approach to the task. Remember, while these concepts could also be used in individual programs to improve their effectiveness, the real benefit lies in leveraging the knowledge that resides within DoD and applying it across the entire Department.

A Guide to This Report

Chapter 2 provides background and definitions of this new KM concept. It discusses the definition of data, information, and knowledge. It also explains what we mean by managing knowledge and what it can do for you.

Chapter 3 addresses the first of the fundamental cornerstones — people. It discusses why people may or may not share knowledge. It explores what organizational and cultural issues can be impediments to knowledge sharing. It also addresses some of the steps the DoD acquisition community must take to support this effort.

Chapter 4 looks at the second cornerstone — process. In this chapter we look at the importance of developing a process that supports knowledge transfer. We also stress that the process must be tailored to support the needs of each organization. There is no "one-size-fits-all" process, but there is flexibility to maximize the results for each organization. Various processes that have been used successfully by some of the leading practitioners in the field will be highlighted.

Chapter 5 focuses on the last cornerstone — technology. It is the recent emergence of KM tools and technologies that have allowed people and processes to be tied together in a way that supports large-scale knowledge transfer and sharing. In this chapter we will discuss the various technologies that are currently available and the benefit they bring to knowledge management.

Chapter 6 provides a framework for implementing KM within the acquisition community. It discusses the issues that must be resolved in order to implement such a program and concludes with a simple checklist of areas to consider before beginning any KM project.

Chapter 7 summarizes our findings and presents recommendations for implementing KM in the DoD acquisition community.

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2

BACKGROUND

"An investment in knowledge pays the best interest"
– Benjamin Franklin (1706–1790)

Why Knowledge Management? Why Now?

You may ask yourself, "Why is there a sudden, strong managerial interest in the term Knowledge Management (KM)?" After all, we have been managing knowledge in some form since Plato introduced the concept in *Meno, Phaedo, and Theaetetus*. While we would all agree that knowledge is important and that we have been managing it for many years, there are two fundamental reasons for today's interest in KM — the growing knowledge intensity of producing goods and services and the increased sophistication of networked computing.

Competition and the globalization of the economy are putting terrific pressure on organizations to provide better customer service, reduce cycle time, and lower total ownership costs. As organizations try to meet these pressures, they must be innovative to produce the knowledge-intensive products desired by their customers. Enabled by information technology (IT), organizations with dispersed offices are able to bring greater intellectual assets to bear on both products and organizational processes. As business knowledge comes to light, it is valued as both corporate intellectual property and a source of competitive advantage. However, as the amount and depth of business knowledge increases, it must be captured, stored, and made available for future use. That knowledge, in turn, is later retrieved to make even further product improvements that enhance customer service, reduce cycle time, and lower total ownership costs.

The increased sophistication of networked computing allows us to work and learn with each other from various geographic locations. While operating in a networked environment allows us to leverage our corporate resources, it adds to the information overload experienced by workers (Figure 2-1). In a networked environment, information overload occurs in two distinct ways. The first occurrence is the sheer volume and diversity of information sent to us when we are in a "receive" mode. The second can be frustrating when searching for knowledge; it is the replication of material found at various sites. Information is still communicated primarily in a read- or view-only mode. While this is efficient, the network environment is not always effective. Readers can select what to read, when to read it, how to read it (skim, in-depth), and whether or not to even respond to the information provided.

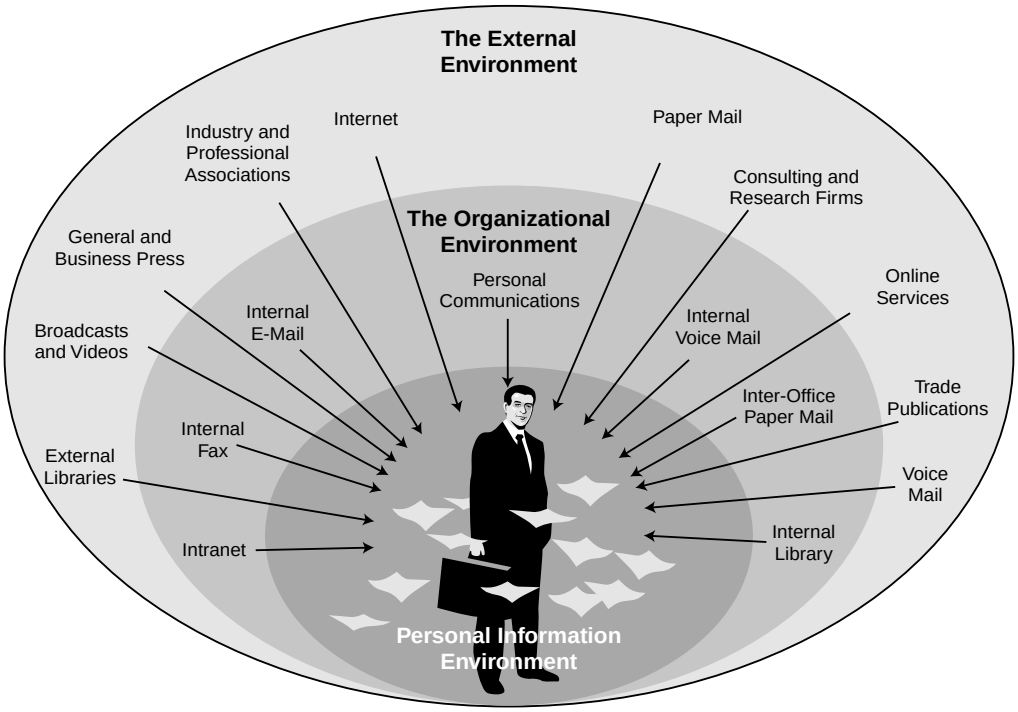

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Figure 2-1. Typical Information Sources for an Individual

Complicating matters further, DoD acquisition personnel work with regulatory processes that are as complex as the projects they control. These processes increase both the amount of time and the intellectual capital needed to respond to the information provided or requested. To ensure the continued efficiency of organizational processes, workers find they continually require improved networked solutions for managing and communicating information.

Organizations have always looked for ways to improve their competitive advantage and to lower costs. With products that are more knowledge intensive and people dispersed, IT has, for the first time, given us the ability to collectively leverage the entire organization. But because people are suffering from what *Reuters Business Information* terms "Information Fatigue Syndrome,"[1] organizations are looking for innovative ways to help workers find the knowledge they need when they need it. Organizations, as you will see later in the chapter, are embracing KM models that give their workers one view to the information they need. It allows teams to work as one as they move ideas forward and allows organizations to convert their collective knowledge into results. In fact, an International Data Corporation study estimates that, by the year 2002, spending on KM consulting services will reach $3.4 billion in the United States alone.[2]

KM is a recent field of endeavor. Because it is new, you will find that consultants, organizations, and consortiums use different

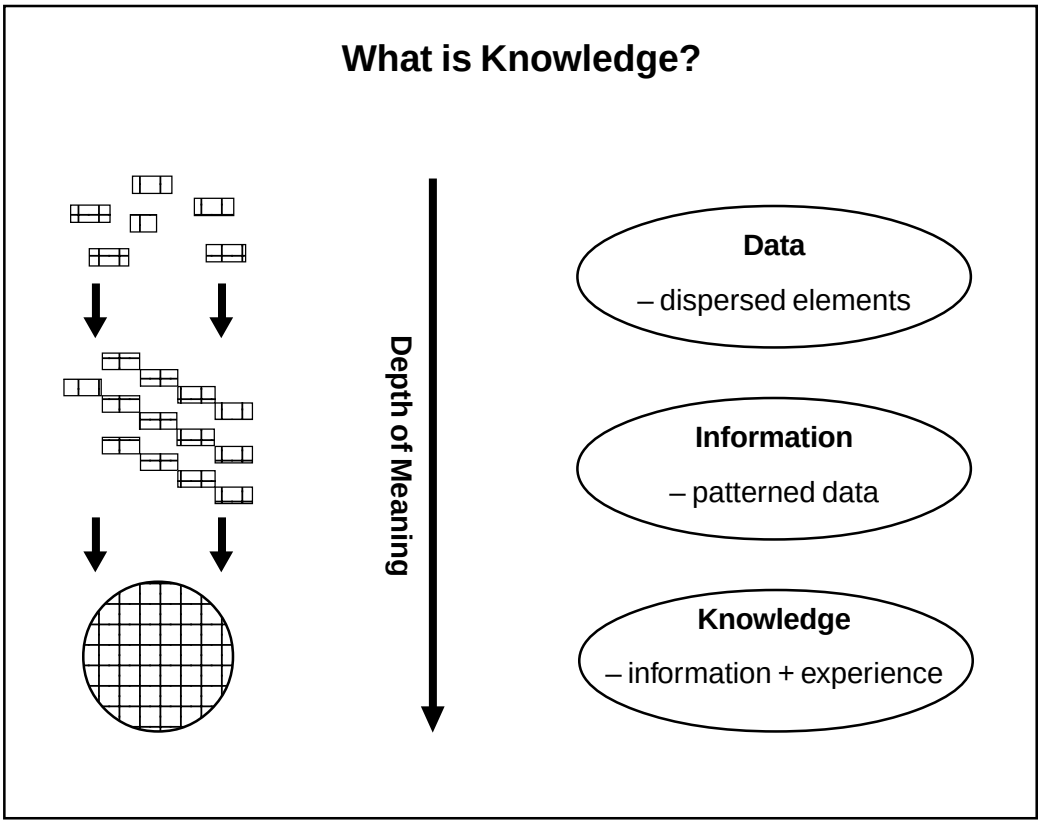


Figure 2-2. Data, Information, and Knowledge Continuum

terms, concepts, and definitions in addressing what KM means to them.[3] Because of the diversity of definitions, we have decided to use the definitions cited below.

Key Terms, Concepts, and Definitions

What is Knowledge?

The obvious place to find a definition of "knowledge" is *Webster's New Collegiate Dictionary*. The following definition is excerpted from *Webster's*:

> **knowl·edge** \'ˈnä-lij\ n … **2 a** (1) : the fact or condition of knowing something with familiarity gained through experience or association (2) : acquaintance with or understanding of a science, art, or technique … **b** (2) : the range of one's information or understanding <answered to the best of his ~> … **d** : the fact or condition of having information or of being learned <a man of unusual ~> …"[4]

Data, Information, and Knowledge

Unfortunately, despite its definition, knowledge means different things to different people. Generally, most people do not readily know the difference between data, information, and knowledge; they frequently use the term "information" for all three concepts. While data, information, and knowledge are not easy to separate, they can be viewed as a continuum (Figure 2-2).

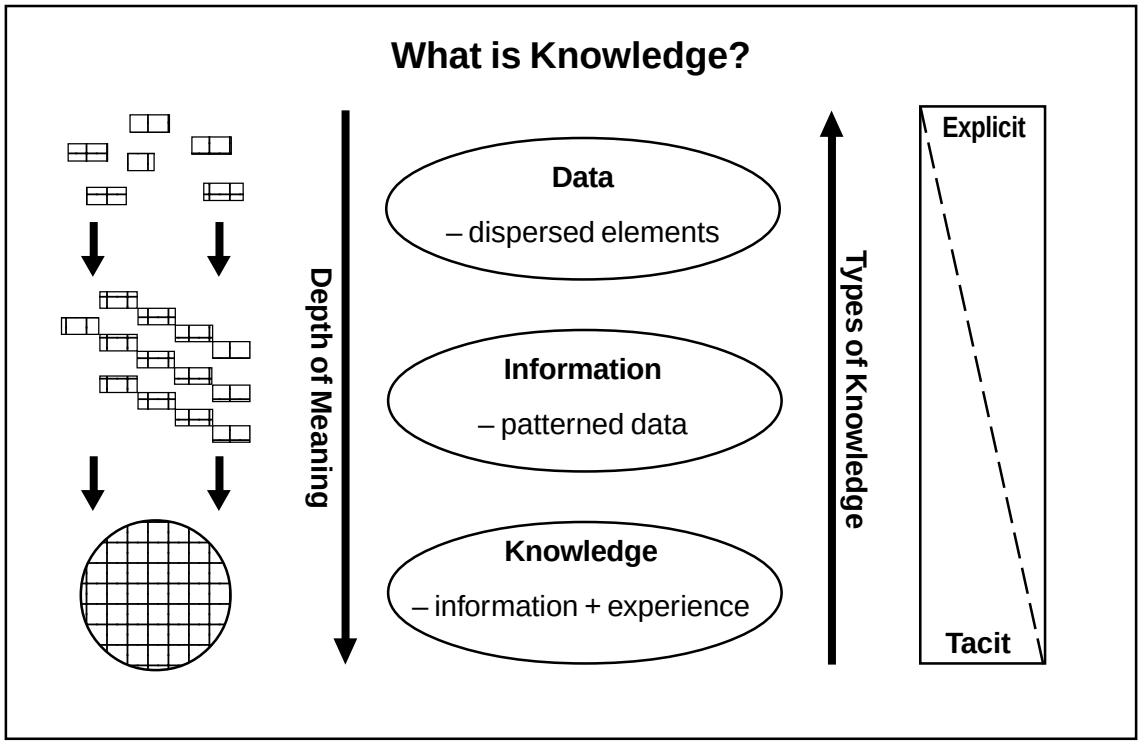


Figure 2-3. Types of Knowledge – Explicit and Tacit

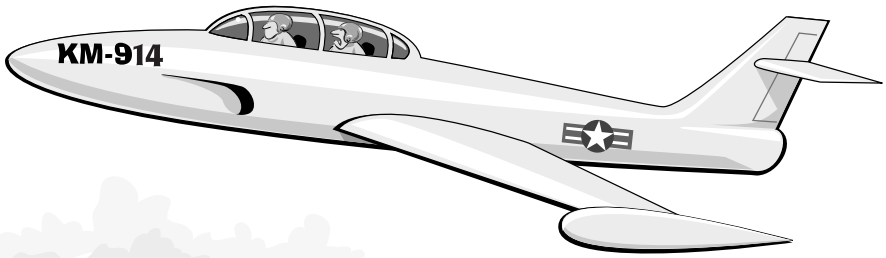
Data is a set of discrete, objective facts commonly seen in the structured records of transactions, e.g., credit card receipts. Data is unorganized but consists of independent numbers, words, sounds, or images that can easily be structured and captured on machines. Data, by itself, provides no judgment or interpretation of events.

Information occurs when data becomes organized, patterned, grouped, and/or categorized; thus it increases depth of meaning to the receiver. Information "informs" the reader and changes the way a reader perceives something by impacting the reader's judgment or behavior. While data generally resides in a database, information moves around organizations.

Knowledge is richer and more meaningful information put into productive use, e.g., best practices. Because it is intuitive, it is difficult to structure, can be hard to capture on machines, and is a challenge to transfer. Since knowledge is derived from information, people must work to transform information into knowledge. We often speak of a "knowledgeable person," and by that we mean someone who is well informed, reliable, and thoroughly versed in a given area.

Types of Knowledge – Explicit and Tacit

Data, information, and knowledge are derived from two types of knowledge — explicit and tacit (Figure 2-3). *Explicit* knowledge is seen everyday. It is written down in the form of



"That's it: ease it back...ease it back a little more... ease it back... GENTLY, darn it!"

Used with permission of the California Management Review, *Vol. 40, No. 3, Spring 1998, p. 18.*
Idea credited to 1st Lieutenant (USAF) Raymond E. Miles (Retired).

Figure 2-4. How Tacit Knowledge Becomes Explicit

words or numbers and is used to solve such problems as fixing a machine or performing other work-related tasks. Explicit knowledge is easily communicated between people in the form of hard data, formulas, and written or universal procedures. Some examples would include: books, papers, databases, policy manuals, and lessons learned.

Tacit knowledge is found in the heads of your employees and in the experience of your customers (Figure 2-4). Because it contains their insights, intuitions, and hunches, tacit knowledge is highly personal, hard to formalize, and deeply rooted in a person's actions and experiences as well as in their ideals, values, and emotions. Because of its nature, tacit knowledge is difficult to communicate or share with others. For example, plumbers may have a book or checklist on how to replace a disposal or unclog a drain; but, through experience, they have learned to sidestep a process or take another route when faced with a unique problem. When they return to the union hall at the end of the day and share what they found and how they corrected the problem with fellow plumbers, they discover that several other plumbers "experienced" the same problem and used the same or similar techniques to correct the unique problem. Despite this technique being discussed among plumbers, it has not been formally captured; therefore, it remains tacit knowledge. While tacit knowledge is difficult to capture, it is especially important in

organizations where frequent personnel movement or downsizing occurs.

As Figure 2-3 shows, data is strictly explicit knowledge since data contains nonobjective dispersed elements. Information, which is organized data, is still composed of explicit knowledge; but some tacit knowledge may provide additional meaning that causes readers to react. Finally, as information turns into knowledge, the human experience (tacit knowledge) is what provides true meaning to the explicit knowledge.

As an example of how these concepts all fit together, imagine the development of a map. A surveyor goes to a valley and takes a series of measurements and records the latitudes, longitudes, heights, grades, depths, etc. Those measurements are data — specific, discrete, but dispersed elements with no pattern that most of us can see and no information that we can use. The cartographer then takes that data and organizes it into a logical, structured pattern that we can use — a map. From that map, we can see that, at a certain location, there is a series of mountains with a river flowing through them and a few places where there are low spots that may provide an opportunity to pass through the mountains. This is information because the data has been organized in a manner that allows us to get greater meaning than simply looking at the surveyor's measurements. From this map, even if we have never been to the valley before, we can determine a route that appears to provide the best way to pass through the valley, ford the river, and pass through the mountains. Local guides use the same map. However, they can apply experience and expertise gained from years in the valley. They know the best place to ford the river varies according to the time of year and the snowfall of the previous winter. They know the lowest pass through the mountains is heavily forested and snake-infested; but another pass, although slightly higher in elevation, provides a much easier passage. This is knowledge. By taking the information from the map and applying one's experience, greater meaning is achieved.

How Do You Manage Knowledge?

You manage knowledge by developing a framework or system that enables organizations to capture, analyze, share, apply, and reuse knowledge to make better, faster, and smarter decisions across geographic, functional, and team boundaries. The cornerstones of any KM framework or system are people, processes, and technology. You will learn more about each of these areas in depth in the following chapters so that you can build a framework that is right for your organization.

We found that managers who effectively use their company's knowledge were able to break through a variety of knowledge-based barriers. For example, customer relationships improved when the customer was a real-time participant on the team and institutional stovepipes were set aside as teams worked towards a common goal. Figure 2-5 shows additional barriers and the solutions that were experienced and employed by both the private and public sectors to remedy their operational pressures. We discuss these knowledge-based solutions in more detail in Chapter 4.

What Will Knowledge Management Do for You?

We believe a KM program will do for you what it is accomplishing for other organizations. According to the General Accounting Office (GAO), the basic management goal for an acquisition program in DoD is similar to a commercial product — to develop and deliver a manufactured item that meets customer needs.[5]

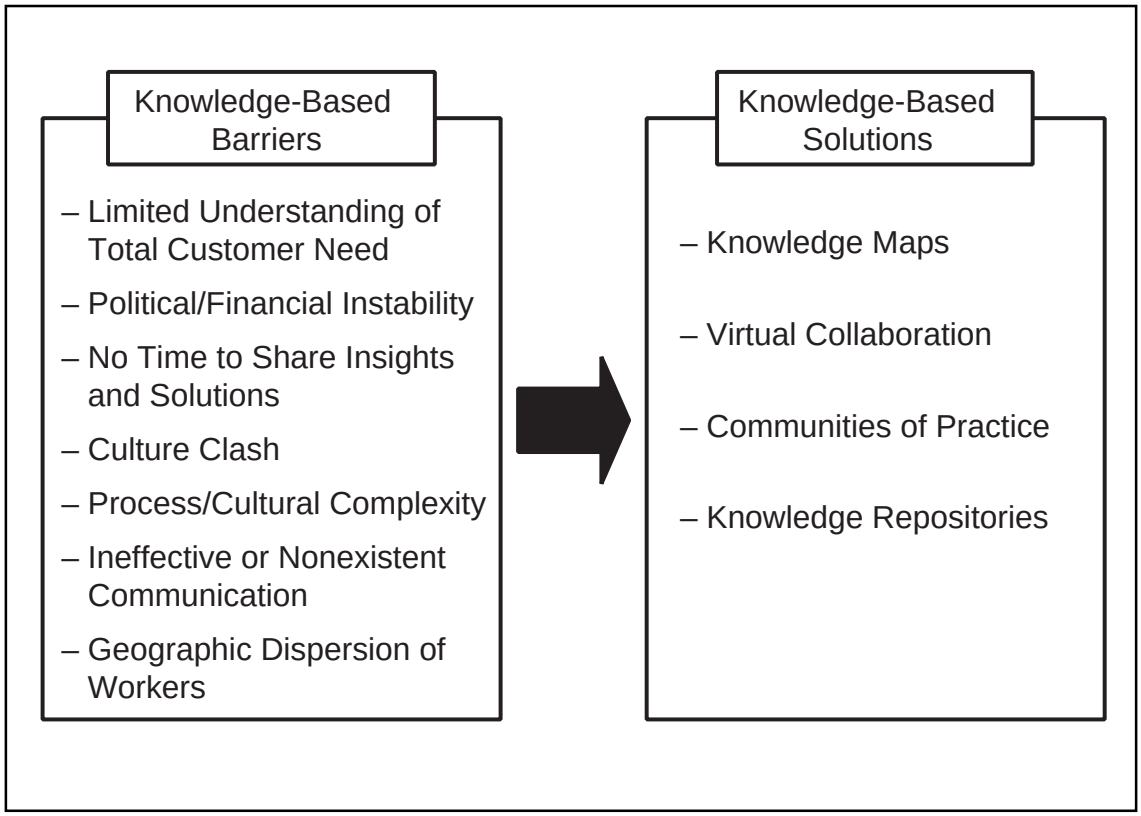


Figure 2-5. Knowledge-Based Barriers and Solutions

The GAO argues that a knowledge-based process is essential to getting better cost, schedule, and performance outcomes. This means decision makers must "sense and respond" to critical facets of the product under development when needed,"[6] e.g., program delays, improvements/degradation in operational processes, changes in customer requirements, etc. This is no different than in the private sector, where a 1997 survey of Fortune 1000 executives found that:

a. 97 percent said critical business processes would benefit from more employees having the knowledge that was currently residing within one or two people;

b. 92 percent indicated they worked in knowledge-intensive organizations;

c. 87 percent said costly mistakes occur because employees lack the right knowledge when needed; and

d. only 6 percent of the organizations were considered "very effective" in leveraging their knowledge to improve their business performance.[7]

We find that DoD is not any different than the private sector when it comes to organizational knowledge needs. Accordingly, we believe KM will provide you with both *organizational* and *economic value*. A review of KM practices in both the private and public sectors can shed light on what a KM program will do for you.

WHO FOCUSES ON WHAT? PF = Primary Focus; SF = Secondary Focus			
Organization	**Customer Intimacy**	**Product-to-Market**	**Operational Excellence**
Air Education and Training Command (AETC)	SF		PF
Amoco			PF
American Management Systems (AMS)	SF		PF
Arthur Andersen	PF		SF
British Petroleum (BP)			PF
Buckman Labs	PF	SF	
Chevron			PF
Cigna			PF
Dow Chemical		PF	
Hewlett-Packard		SF	PF
Hoffmann-La Roche			PF
Hughes		PF	SF
International Business Machines (IBM)		PF	
Joint Forces Command (JFCOM)			PF
Kaiser Permanente			PF
National Security Agency (NSA)		PF	
Price Waterhouse		PF	
Sequent	PF	SF	
Skandia			PF
Texas Instruments (TI)	SF		PF
United Services Automobile Association (USAA)	PF	SF	
World Bank		PF	

Figure 2-6. Business Focus of Organizations

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Organizational Value

In 1996, the American Productivity & Quality Center studied the focus and KM objectives of organizations (Figure 2-6). The Center found organizations focused primarily on the following:

Private Sector	DoD Equivalent
• Customer Intimacy • Product-to-Market Excellence • Operational Excellence	• Customer Service • Cycle-Time Reduction • Total Ownership Costs

Figure 2-7. Objectives of Knowledge Management

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To support their business focus, organizations pursued various KM objectives (Figure 2-7). For example, 11 of 19 organizations sought to improve their business processes across organizational boundaries. Additionally, 16 of 19 organizations attempted to share their best practices across the enterprise.[8] Specific to DoD acquisition, the GAO states that "DoD programs, with some exceptions, proceed with lower levels of knowledge about key factors of product development such as design maturity and production readiness."[9] We believe that a KM program that leverages the Acquisition Workforce would increase the levels of knowledge for systems development across the enterprise.

Economic Value

There is a cost associated with implementing a KM program, so any project must demonstrate

an economic benefit or program success. Besides direct benefits, a KM project can also provide indirect benefits — increased customer satisfaction or fewer phone calls, faxes, or E-mail messages. Examples of KM benefits achieved in the commercial sector include the following:

a. Anderson Consulting, AMS, Arthur D. Little, and most of the large consulting firms have built their own systems to capture and transfer internal engagement information and practices. Besides supporting their employees, their systems enable them to help clients design new business approaches built upon best practices.

b. Boeing's development of its breakthrough Model 777 marked a profound change in both company culture and design technologies. The company distributed 2000 terminals to the 777 design-build team, which included pilots, mechanics, and cargo handlers. These teams were geographically dispersed; and they used computer simulations to pre-build the entire airplane, including subsystems such as avionics and hydraulics. As a result, they delivered, on time, the first 100 percent paperless aircraft, the world's largest twin jet, and the first new-generation aircraft in 13 years.

c. Buckman Labs, a worldwide specialty chemicals firm, estimates it spends 4 percent of revenues on KM. However, its total revenue increased by 35 percent for new product sales. This occurred through the development, introduction, and effective marketing of new products that replaced less desirable ones. Buckman takes a team approach, building internal discussion forums around product lines. Associates worldwide discuss product problems, customer knowledge, and competitive intelligence among each other. As a side benefit, because one new product replaces several old products, production lines are less disrupted.

d. Chevron's Chief Executive Officer cites improved management of knowledge as the key to reducing operating costs from $9.4 to $7.4 billion over 7 years. Additionally, Chevron experienced productivity gains of 30 percent and cycle-time reductions of as much as 40 percent over the same period.

e. Ford Motor uses a global best practices KM program (used in 36 plants). Between 1996 and 1998 their employees implemented over 4000 high-leverage practices that saved Ford over $547 million. Additionally, Ford's KM effort was determined to be intellectual property and was bought by Shell Oil.

f. Sitel Corporation is a company with over 19,000 employees in 18 countries. Sitel sought to respond to a 350-page General Motors Request for Proposal (RFP) for a worldwide 5-year call-center outsourcing opportunity. Sitel's 700-page response used 30 internal experts from around the world and connected them with a number of subcontractors. The RFP was distributed globally via the World Wide Web (WWW). Team collaboration occurred via threaded discussions, and security was used to ensure that only the team had access to the documents. Sitel credits the dispersed team's collaborative efforts for not only winning the contract but also for the 37-percent reduction in the time it took to respond to an RFP and for the thoroughness of the proposal.

g. Texas Instruments (TI) generated $1.5 billion in annual free-wafer fabrication capacity by comparing and transferring best

practices among its existing 13 fabrication plants. The adoption of a best practices program resulted in increased production capability, and TI avoided building another chip plant.

As we have shown, KM projects vary according to organizational needs, but they all provide direct and indirect benefits. Ford implemented a best practices program to improve product-to-market excellence; Buckman Labs used employee collaboration to achieve customer intimacy; and Texas Instruments used a best practices program to achieve operational excellence.

We could address additional KM initiatives that are either underway or in planning by companies like John Deere, Dow Chemical, Kaiser Permanente, Northrup, SGI Computing, Shell, Sun Microsystems, Super Bakery, TransCanada, and USAA. However, we hope you noticed that, regardless of the industry, companies see KM as a distinct competitive advantage in focusing on customer intimacy, product-to-market excellence, or operational excellence. Despite the variety of successes achieved by these firms, their success was not instant nor did it come easily. A KM project requires a purpose and takes organizational commitment and leadership focus.

Why Do Organizations Fall Short When Developing Their KM Projects?

Organizations can become disappointed with their KM projects for a variety of reasons. Most disappointments stem from people, process, and technology issues. While not a complete list, we have addressed some of the more common problems that have confronted organizations that undertook a KM project. These reasons were provided by the practitioners we visited and through our research. Having a basic understanding of why organizations fall short in their implementation efforts will help you take steps to ensure your KM project stays on track.

The absence of management support, failure to address cultural issues, lack of implementation skills, and the use of buzzwords can seriously frustrate a KM effort. Senior leaders should understand what KM is and what it offers them in terms of operational improvements. Since it affects people, programs, and policies, organizational leaders must play a major role in the decision-making process. Their support should consist of more than just supplying funds and providing verbal endorsement. They must champion the project throughout the organization and to others who participate. As leadership changes, new leaders should not reorganize the KM project simply to effect "their" changes. Leadership must also develop a culture that allows people to trust each other and voice their opinions freely without the fear of reprisal. We provide greater detail on cultural issues in the next chapter. The lack of implementation skills is another reason why KM projects are hampered. It is not only important to capture the right knowledge, but people must be able to find it. This underscores the importance of creating a cross-functional team to develop the framework appropriate for the KM program. Without a team, you risk developing a system that is irrelevant to other workers since only a select few designed the process for many. Finally, many initiatives are sidetracked when hype about what they are going to accomplish raises expectations well beyond what is possible. Instead of using buzzwords, start a small KM project, accomplish something, and then trumpet the achievement.

In terms of process, the lack of a vision and a plan can derail the KM project. A vision is what you want your KM project to achieve.

Specifically, it is where your organizational performance has not met your expectations or where you believe you have the greatest opportunity for advancement. A plan is your blueprint for carrying out the KM project to achieve your vision. This plan should address the people, process, and technology elements involved in bringing the KM project to fruition.

Inadequate or complex technology choices will also frustrate your efforts to carry out a KM project. Because people will demand more features as your KM project grows, you should err on the side of overengineering your needs. While you want to provide additional features as they are recommended by your team, you want to make sure the software is easy to use; people can find what they need when they need it; and the software can grow (scalable) as your needs increase.

Since KM is a relatively new field, you can expect that high expectations will arise and some people will become disappointed with their particular results. This should not stop you; we believe (and empirical evidence demonstrates) you have much to gain by embracing a KM program. Finally, as powerful as a KM tool can be, senior leaders must ensure that organizations refrain from implementing islands of KM sites that neither contribute to nor benefit from an overarching KM system for all parts of DoD.

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3

PEOPLE

"We must be the change we wish to see in the world."
—Gandhi (1869–1948)

As we look into what makes a successful KM effort, it would seem logical to start with technology. It is easy to believe that it is the technology that makes this effort possible and that people and processes play a secondary role. Many early unsuccessful efforts in this field took that exact approach. To suppose that people and processes play a secondary role to technology, however, can easily undermine the KM effort. As seductive and powerful as the technology can be, knowledge and the people who develop and use it are the focus. So it is best to start our cornerstone discussion with people. We do this not because people are more important than the process and technology but because it takes all three to make a successful KM program. People, however, can be the biggest impediment to the success of this effort. The process and technology can be effective; but, if people refuse to participate, there is no knowledge to share.

People are important because they are the holders of knowledge. As we discussed in the previous chapter, people transform information and data into either tacit or explicit knowledge. In fact, by its very definition, tacit knowledge only resides in people. Once we share it, it becomes explicit. Furthermore, only people have the ability to receive knowledge, combine it with other knowledge or experiences, and generate new knowledge.

Do People Want to Share Knowledge?

You may question whether people, in fact, want to share their knowledge or whether they feel the sharing process somehow diminishes their importance. We will discuss that concept in some detail later in this chapter. More fundamentally, people are knowledge seekers. From our earliest days, we want to learn how to walk, talk, hit a baseball, and do well in school. We take the knowledge and experiences of others, assimilate them, and then apply them to our own environment. We take their tacit knowledge, which they turn into explicit knowledge, then use it and modify it as necessary, thereby developing new tacit knowledge. This cycle is part of our everyday lives. Some people are more aggressive in the pursuit of that knowledge, but everyone has an innate desire to gather the knowledge necessary to complete the task at hand.

The acquisition business is no different. Everyone is looking for insights, judgments, and understanding of their problems in order to solve

them. We constantly look for ways to solve problems and new ways to solve old problems better. As mentioned in the Introduction, 15–20 percent of managerial time is spent in search of knowledge, which means our desire to gather knowledge continues at all levels of the organization. But for us to gather knowledge, it must be available. Others must be willing to share their hard-earned knowledge and insights. It would be nice to believe that everyone will willingly give up that knowledge freely and without hesitation for the good of the organization. In fact, many early KM efforts were based on the belief in the free-flowing nature of knowledge sharing.

Unfortunately, people generally do not share their knowledge freely. Consciously or not, people believe their knowledge has value. The term intellectual capital is frequently used to express the idea that the result of our intellect, our knowledge, is an asset. Like all capital assets acquired by an organization, a value must be met before the asset is transferred. Unlike a physical asset, however, the value of this asset is very difficult to determine; and the tender used to acquire it varies. While money is certainly a means of paying for the value of the knowledge and has been used as an incentive to promote sharing, research indicates that people most often provide knowledge for three main reasons: reciprocity, repute, and altruism.

Reciprocity means that people share knowledge with one another in the belief that, when they need to gather knowledge in the future, others will willingly share with them. This is the most fundamental reason for sharing. People are willing to give up something of value if they expect to get something in return. This sharing relationship usually occurs among people who have already established a relationship. It is less effective when the people involved do not know each other because less trust exists. In these instances, the organizational culture must develop that relationship across the entire organization. It must provide a belief that all members will respond in kind if queried. Organizations, such as Buckman Labs, have had good success in developing just such a company-wide culture despite the global scope of their operations.

Repute is a strong factor in encouraging the sharing of knowledge as well. People share knowledge because they believe it will enhance their reputation and standing within the community. They become known as "experts" on various topics within their organization and are sought for their knowledge. Repute is valuable to people on a number of levels. First, it boosts the ego and sense of accomplishment when their peers recognize them as an expert. Because of their reputation, they are actively sought to participate in projects of importance to the organization. This allows them to have their choice of interesting and challenging assignments. Finally, in the era of downsizing and consolidation, their reputation and recognized knowledge may provide some measure of protection when personnel layoff decisions are being made. In the present downsizing environment, the importance of repute as an inducement to share knowledge is increasing.

Finally, there is *altruism* — the sharing of knowledge despite no direct compensation for doing so. As mentioned earlier, evidence shows that people seldom do this. However, there are indirect compensations that, while not obvious, act as sharing incentives and give the appearance of altruism. People may share knowledge if they believe it will enhance the overall performance of the organization in a way that directly impacts them. If sharing knowledge will result in improved company performance and increased stock value, it can also be a strong

incentive to those participating in a stock-option program. Helping people improve their performance, if that improvement benefits you in the accomplishment of your work, can be another reason for sharing. Although altruism is a factor in the sharing hierarchy, it generally seems less an incentive than reciprocity or repute.

So, Why Don't People Share It?

If incentives exist to share knowledge, why does so little of it actually occur? Just as there are positive reasons for people to share knowledge, there are equally powerful impediments. These impediments fall into three broad categories: cultural, economic, and process.

Cultural, the organizational culture or environment in which we work, is probably the most powerful of these categories. The most common theme here is that "knowledge is power." While some people recognize sharing as a means for their reputation to grow, others look at the hoarding of knowledge as a means to become an "expert." If useful knowledge is closely held, then those on a knowledge search must eventually "bow at the altar" of the "hoarder." Hoarders see withholding information as a means to solidify their position in the organization; often they will not share knowledge even if asked unless they see a clear benefit to themselves. This approach obviously benefits only the individual who hoards the information, usually to the detriment of the organization. Furthermore, there is no desire to reciprocate with hoarders if they ever go in search of knowledge themselves. These individuals are in all organizations but usually flourish in those that do not support a sharing culture. If hoarding is recognized, condoned, or tolerated, then the organization is sending a clear message that this is acceptable. If knowledge hoarders are promoted, an even stronger signal is sent that such behavior is an approved method of operating. For a vibrant KM program to exist, the organization must take clear, strong steps to constantly reinforce the idea that knowledge sharing is the only acceptable behavior.

Economic barriers exist on a number of levels. From an organizational perspective, programs frequently compete with each other for scarce resources. One program's success may come at the cost of another, or at least it may be perceived that way. In this competitive environment, there may be a good sharing of knowledge *within* the program but limited sharing *across* the programs. This tends to suboptimize the entire organization and results in a loss of competitive advantage in the marketplace. Since promotion or compensation may be tied to the success of an individual program, this can have a very strong, negative impact. This is particularly true in the DoD acquisition community where a PEO may have to rank several PMs for advancement. Additionally, in this era of downsizing and rightsizing, individuals may be reluctant to share their knowledge in the belief that they will be kept because they are the only people in the organization with that knowledge. Researchers have also found that, in companies where employees fear layoffs, people are reluctant to share information, particularly when it concerns mistakes or failures.[1]

Process barriers prevent the transfer of knowledge even if the cultural and economic barriers are overcome. The biggest barrier is that there is often no mechanism to share. This is especially true in a large, geographically separated organization. If abilities or tools are not readily available to share knowledge, the process becomes too difficult to function smoothly. It may be too hard to capture or codify the knowledge. Also, no easy means may exist to get the knowledge query to all the appropriate people throughout the organization or to generate

explicit knowledge. If it isn't a by-product of normal work but is perceived as an additional burden, then workers will not spend the extra time on it. Connectivity must allow knowledge to be transferred to whoever needs it, when they need it, where they need it, and how they need it. Within the constraints of the existing security requirements, if workers cannot access knowledge at their workplace, knowledge rapidly loses effectiveness. Finally, it may be difficult to evaluate the quality of knowledge received. In a large, widely dispersed organization, workers may not know each other. That lack of personal relationships makes it difficult to determine the validity and accuracy of knowledge received. If trust isn't in place to support this evaluation, the workforce may revert back to using only the small network of people they know and trust, which negates the power of the collective intellect of the entire organization.

How Do We Become a Knowledge-Sharing Organization?

To implement knowledge sharing, we must maximize the positive reasons for sharing, recognize barriers, and minimize those barriers. The single most important step to take (and the most difficult to implement) is to develop a culture that supports the sharing of knowledge within the entire organization. This can be accomplished only by the conscious daily support of the concept of openly sharing knowledge throughout the entire organization. This is a long, slow process if the organization has not established that culture at the start of the knowledge-sharing effort. It must be consciously undertaken for the endeavor to succeed. Generally this venture is best started as a pilot effort within a small part of the organization, usually where the organization has identified an area of less-than-desired performance. The goal is to identify and then overcome those barriers and to generate and demonstrate some clear benefits of knowledge sharing. Pick an area that has previously not performed well, one that "has generated some pain" for the organization. Make improvements and benefits that result from the knowledge-sharing approach.

A key area of emphasis should be promoting the positive aspects of sharing at the individual and small-unit level. Innovative companies, such as AMS, Boeing, Sun Microsystems, and Buckman labs, have done this in a variety of ways. These positive aspects include monetary incentives for strong sharers (economic), designation as "knowledge experts" in specific areas (repute), and recognition of those acclaimed by peers to be the most helpful at providing the best and most responsive knowledge (reciprocity and repute). Another common method of generating this sharing culture is to use the KM system to support informal relationship building within the organization. Buckman Labs has a "virtual breakroom" area where people in the organization can chat socially. This area is used to tell jokes, organize social outings, identify people with similar interests, etc. Senior management actively supports this gathering place because it helps develop a more cohesive organization while, at the same time, it further embeds the knowledge-sharing system into the cultural bedrock of the organization. It also establishes personal relationships even though members of the company are located all over the world.[2] This proves important later as people attempt to evaluate the quality of business-related knowledge they receive from these people.

We Need a Cultural Shift

Knowledge management, as the name implies, starts with knowledge. As stated, knowledge is the focus of core competency. Knowledge of acquisition management comes from people

who make up our Workforce. If these people are unwilling to share that knowledge with the rest of the Workforce, we are forever doomed to repeat the mistakes of the past and miss opportunities to advance our competency. Also, the development of a Kmap, which makes it easier to locate needed expertise and knowledge, has no value if workers are unwilling to share their knowledge. A community of people where no one talks to their neighbors serves little purpose. The ability to virtually tie people together and to bring all of their expertise to bear on an issue has little chance of success if program or service cultures discourage the active flow of knowledge. If the users and the Workforce don't want to talk to each other, there is very little value in bringing them together because customer relationships will not be strengthened.

While there are some small efforts underway to do a better job of sharing knowledge, these efforts are primarily focused on "method," e.g., best practices databases. They do not address the most difficult but fundamental barrier — our culture. Our culture is not averse to sharing knowledge, but it does not strongly support and reward sharing. As discussed above, unless we recognize this fact and take some proactive steps to evolve our culture into a more sharing one, all of the discussion on process and technology that follows will not overcome this obstacle.

Similarly, as we focus on changing the cultural aspects, we must remember that the process can also impact people's reactions to this effort. We will discuss various process issues in the next chapter. Overarching that discussion, however, is the very human perception that this process needs to be easy for individuals to use. If the process is not easy to use, people won't spend time on it. Key aspects of the development of the technology and the process of sharing knowledge must be fairly transparent to the users. If "knowledge capture," for instance, requires a person to develop a document or piece of knowledge and then spend time formatting that knowledge into some other form so it can be codified, transferred, or stored, that person will be very reluctant to add that extra work to an already busy work day. If on the other hand, the process and technology to capture that knowledge is part of the system and is basically invisible, then the transfer will occur much more readily.[3] Understanding the "people aspects" are critical components to the development of the process and technology of the knowledge-transfer system.

ENDNOTES

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4

PROCESS

"An immense and ever-increasing wealth of knowledge is scattered about the world — but it is dispersed and unorganized. We need a sort of mental clearing house for the mind: a depot where knowledge and ideas are received, sorted, summarized, digested, clarified and compared."

—H.G.Wells, 1940

In 1940, futurists could only dream about managing knowledge. Today, with the help of enabling technology, it is not only possible but also more vital to facilitate knowledge sharing. A Meta Group study found that, while all organizations can benefit from better Knowledge Management (KM) techniques, organizations that redefine core processes to exploit KM opportunities will become 21st century leaders.[1] But because KM is still a relatively new field, managers are unsure what strategy to implement, what KM processes are involved, what projects they can undertake, or how they can determine the success of their KM projects.

Knowledge Management Strategic Plan

In developing a KM program, you should first develop a strategic plan. The chart at Figure 4-1 provides you with a basic KM framework. Use it as a starting point to develop a KM program that is right for your organization rather than following a standard solution. By following the framework, you can map and optimize your business processes and procedures based upon your business strategy and goals. Further, it can increase your organization's ability to respond to customer demands, supplier issues, management needs, and overall business relationships. Finally, it will increase the value of your organization by transforming your collective knowledge into tangible, retainable, and maintainable intellectual property.

As we have stated throughout the report, *people, process,* and *technology* are the cornerstones in developing a KM program. Any strategic plan (Figure 4-2) must address all three areas and must be continually reviewed as the KM program evolves. Additionally, since a KM program can involve several projects, a separate plan for each project may be appropriate.

People Strategy

People strategy emphasizes the role of people as a critical component of KM. When developing a people strategy, you should at least address executive leadership, organizational communication, employee motivation and reward systems, and training issues. The KM plan begins with executive leadership and the need to establish a knowledge-sharing environment. It should address how the executive team will provide direction for the KM project as well as implement and support the cultural changes needed to shift to a knowledge-sharing

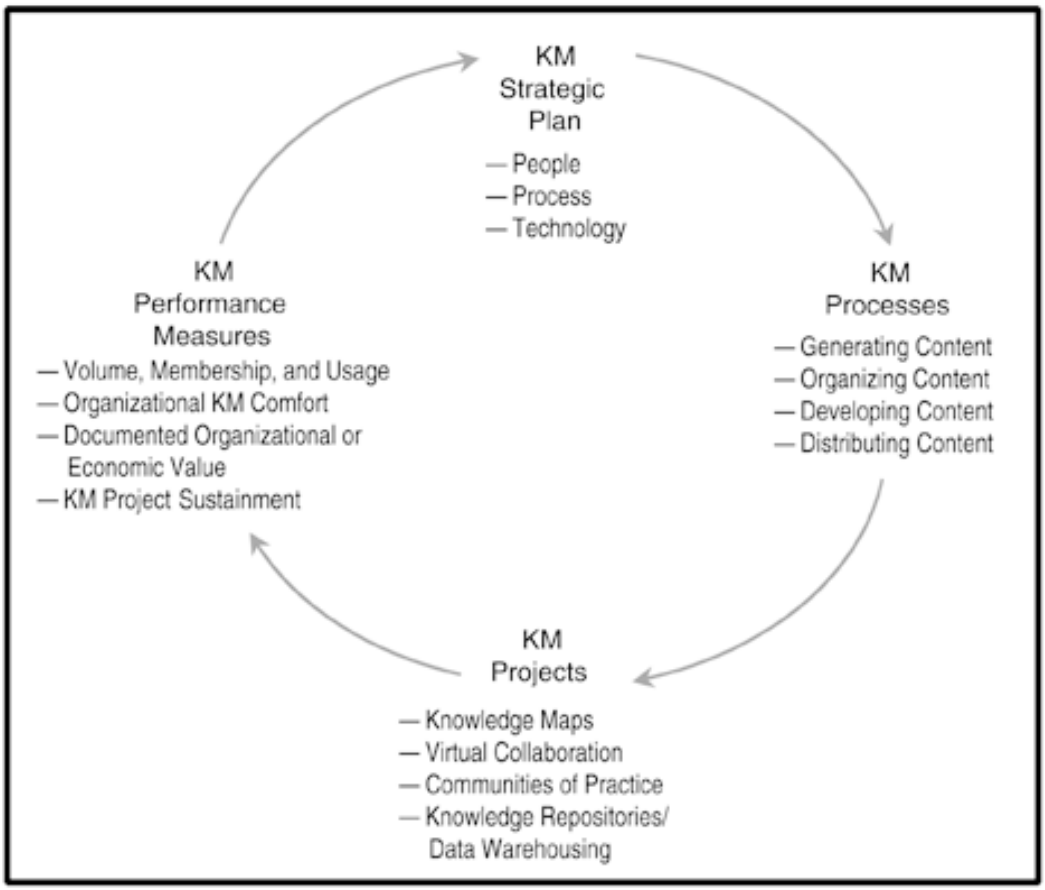

Figure 4-1. Knowledge Management Framework

environment. The plan should address the scope of possible users as well as worker understanding of and commitment to a knowledge-sharing environment. Workers must be willing to share, contribute, and use what knowledge is available as well as contribute to the development of new knowledge.

Worker motivation and reward systems may be appropriately premised upon the KM project selected. These may include monetary incentives for strong knowledge sharers (economic), designating people as "knowledge experts" in a specific area (repute), or recognizing those identified by their peers as the most helpful and who provide the best and most responsive knowledge (reciprocity and repute). An additional decision you may face is whether you need a part- or full-time knowledge manager to oversee your knowledge requirements and whether that duty is temporary or full-time. For example, consulting companies, such as American Management Systems (AMS), use a full-time knowledge manager for a 2-year period. Other companies, such as

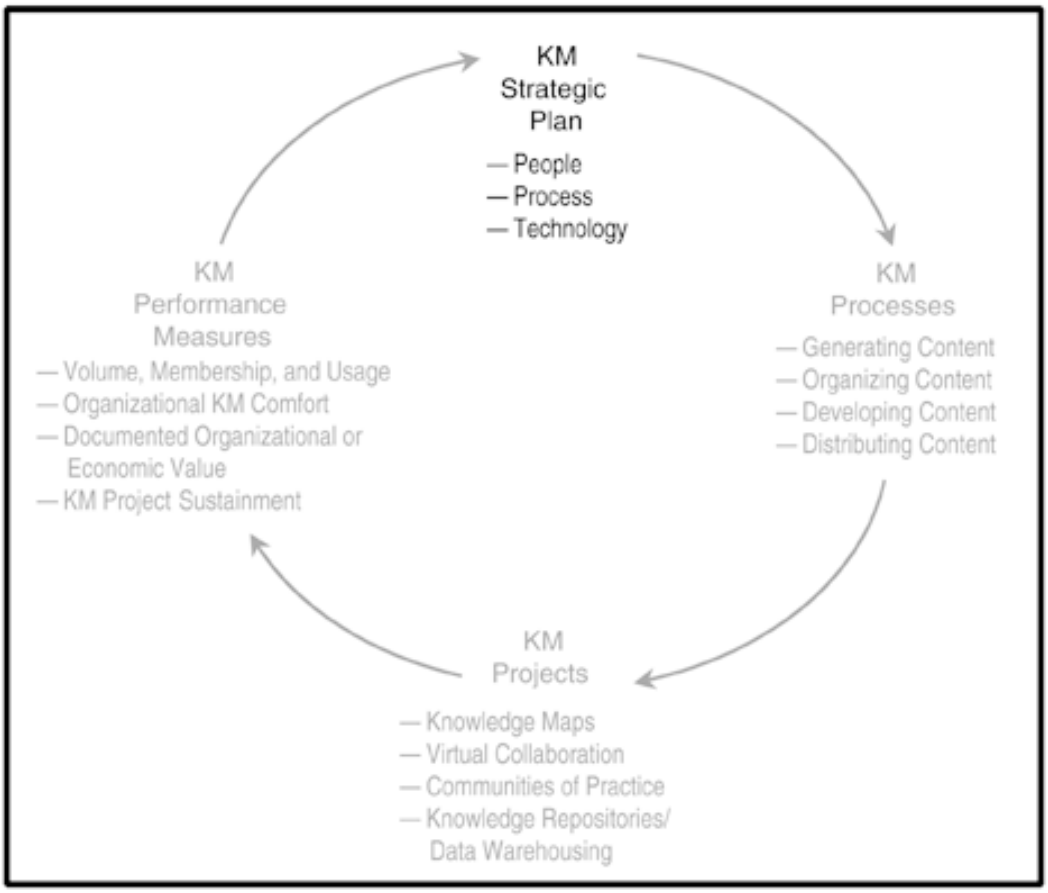

Figure 4-2. Knowledge Management Strategic Plan

Buckman Labs, use a team approach to manage knowledge.

Training support may be needed to establish the body of users and to ensure the continued understanding and effective use of the operational environment as the program evolves. The training may range from formal instruction on how to use a particular brand of software to a workshop addressing how a KM project will be implemented. Informally, the organizational intranet can be used to provide training any where and any time. For example, Buckman Labs uses their intranet to educate more than 130 employees worldwide on their specialty chemicals and company procedures.

Process Strategy

Process strategy is concerned with the activities that lead to functional efficiency, more satisfying careers for workers, and improvements in organizational capabilities and performance. Your strategy should highlight your business

focus and cite your operational KM needs. The plan should address what kinds of knowledge you require and how you plan to capture and share that knowledge. In this way, not only can you see what knowledge is of value to you but also how it links your knowledge resources back to your strategic plan. A knowledge audit (see Chapter 6) can help reveal your current state of knowledge and highlight any gaps. Where gaps exist, determine how to replenish the knowledge. For example, knowledge may be available elsewhere in the organization; or you may need to purchase the knowledge externally, whether through a knowledge-exchange website, such as www.knexa.com, or through some type of consultant, e.g., firm, industry expert, or entrepreneur. Also, when employees have departed, you may want to contact them to capture their tacit knowledge.

Part of your strategic plan should also address how you plan to implement your strategy. While there are various methods of implementation, they are either planned or unplanned and broad or narrow in scope. For example, you may decide upon a planned, structured business approach or allow the demands for knowledge to emerge informally. Additionally, you can assign responsibility for KM to everyone in your organization or develop specialized roles or units to carry out the work. Regardless of the approach, some level of detailed planning, which incorporates activities, schedules, milestones, risk management, and appropriate monitoring and tracking tools to support success, may be appropriate. The results of the planning should integrate knowledge sharing into normal activities so it appears as an enabler, not as a burden.

Technology Strategy

Innovative technology allows the organization to rethink how goods and services are designed, manufactured, and delivered. A sound *technology strategy* is essential if the organization is to achieve substantial performance improvements. Your technical infrastructure must support knowledge sharing from both a cost and architectural standpoint appropriate for the organization. Additionally, people must be comfortable using any technology solution. Finally, security needs to be addressed to balance the needs of the organization with the ability of workers to both access and create knowledge.

Based on need, every organization has a business process and approaches a KM program differently. However, to develop an effective strategic plan, you must also understand the basic KM processes that allow you to integrate them into your strategic plan.

Knowledge Management Processes

If you were to perform a literature search on KM processes or visit organizations that have implemented a KM project, you would find a variety of KM models. Because of the diversity of the processes, we will use as our methodology the one cited in Figure 4-3. It consists of *generating content, organizing content, developing content and knowledge,* and *distributing content and knowledge*.

Generating Content

Generating content consists of two primary tasks — identifying the content needed and getting people to contribute their ideas, whether through online discussions or by delivering finished materials. Identifying the content needed includes both the general subject area(s) and the documents that support those areas. Ideally, content is not only reviewed before it is finished but also after many others have had a chance to provide feedback by contributing ideas. Both cultural and technological barriers make this process difficult. People must move

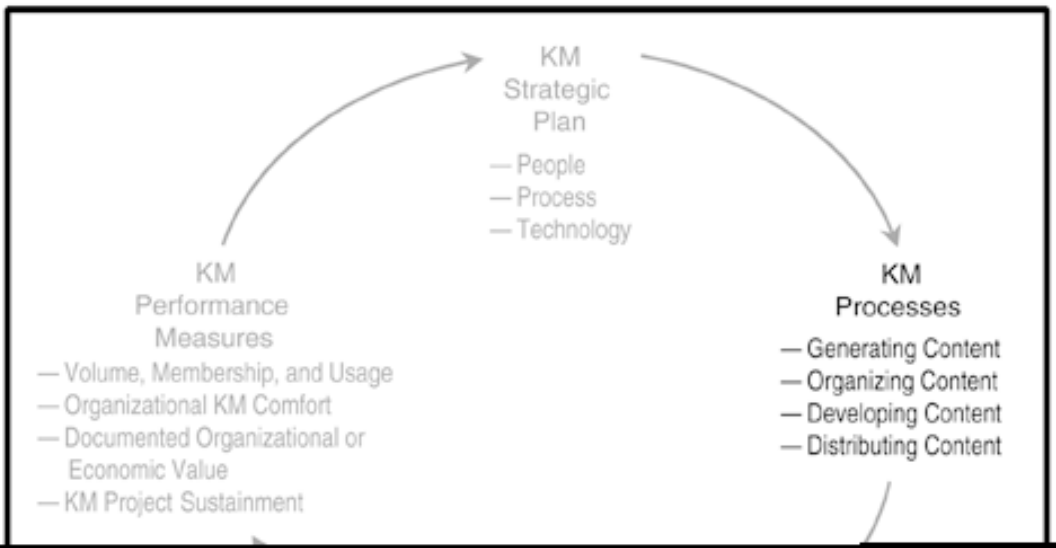

Figure 4-3. Knowledge Management Processes

from a "knowledge is power" to a "knowledge sharing is power" mind-set. Additionally, they may need specific training on how to submit their material electronically. Content can include scanned images, E-mail, spreadsheets, video, fax, Hypertext Markup Language (HTML) links, and microfilm, to name a few.

Organizing Content

Once information or knowledge is collected, it must be organized so it can be retrieved electronically. Accordingly, knowledge-sharing tools, such as the knowledge base (Kbase), user interfaces, and taxonomies, must be decided upon to facilitate the *organizing content* process. Whichever knowledge-sharing tools the organization adopts, the correct positioning of material and linkages among the elements is critical to allow workers access to what they need when they need it.

How you organize your information depends upon the scope of your KM project. The materials are located in either an unfiltered or filtered Kbase. An unfiltered Kbase consists of content that has not been formally reviewed. It contains raw data or information and may

require workers to spend more time to get what they need. A filtered Kbase means content has been reviewed, distilled, and approved for use by recognized experts. It contains material deemed important, represents the best ideas of its kind, and reflects the perspective of the organization's top experts. This type of Kbase contains material that is sensitive to context and relationship, making it easier for workers to glean what they need faster. One crucial task in maintaining a filtered Kbase is ensuring the material is continually refreshed or deleted.

Developing Content and Knowledge

Developing content and knowledge involves selecting and refining organized material to increase its value to others. The line between organizing and developing content can be difficult to distinguish since many times the two occur simultaneously. Organizing and developing material are both collaborative functions and draw upon the expertise and experience of users or experts. In unfiltered Kbases, it can be as simple as using (and capturing) a discussion forum about specific materials. For filtered Kbases it can involve other subject-matter experts who review and concur with the work performed by the organization's top experts.

Distributing Content and Knowledge

There are two primary objectives involved with *distributing content and knowledge*. They are (1) making it easy for people to gain access to material they need and (2) encouraging the use and reuse of knowledge. Accordingly, both training and reward systems play a role.

To facilitate these two objectives, decide whether you need a "push/pull system." "Push" refers to material automatically sent out to those who need it or have an interest in a particular field. "Pull" pertains to people either manually searching or using a search engine to find material in a knowledge repository. Both systems have strengths and weaknesses. Because we all use E-mail, tool developers are working to achieve interoperability between E-mail and knowledge-sharing tools. Additional information on push/pull systems is provided in Chapter 5.

Once you understand the basic KM processes, you should review various types of KM projects. By understanding the types of projects, you can then integrate the processes to implement the project.

KM Projects

Since KM is an evolutionary process, KM projects are a continuum. The fact that technology changes, business processes evolve, and resource constraints can hamper success should not stop you from selecting the project that is right for your needs. While we highlight KM projects here (Figure 4-4), additional details on these subjects are in Chapter 5 and Appendix D. These following four projects — *Knowledge maps (Kmaps), virtual collaboration, communities of practice,* and *knowledge repositories/data warehousing* — take advantage of the World Wide Web (WWW) and may be implemented either on your WWW site or on an Intranet. Additionally, they can be implemented as stand-alone projects or in some combination.

Deploy Knowledge Maps (Kmaps)

Kmaps are one of the best tools for managing knowledge and have various configurations. They connect people to organizations, people and organizations to expertise, and expertise to business or activity processes. Like an index,

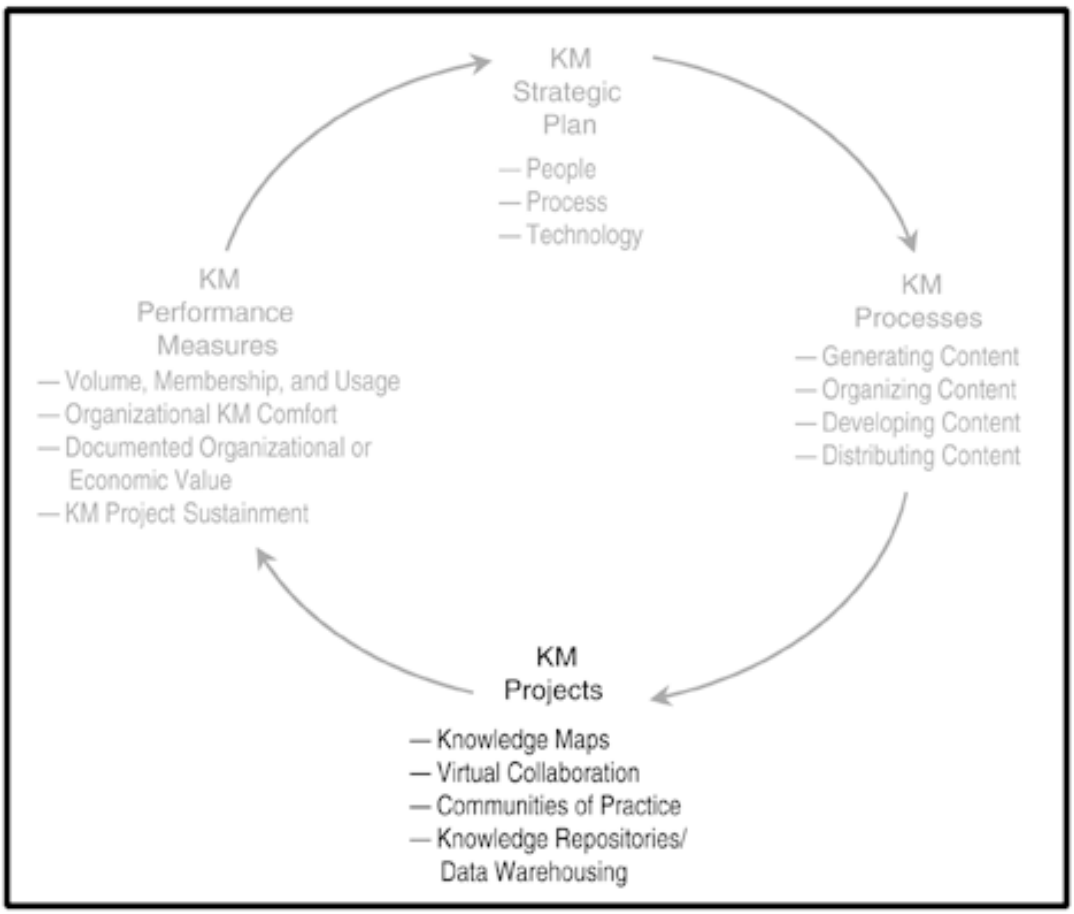

Figure 4-4. Knowledge Management Projects

Kmaps point to where knowledge is located, and they provide a structure for knowledge terminology.

Kmaps facilitate knowledge creation by showing where knowledge and expertise reside. They show who does what and where, and they highlight organizational knowledge surpluses or shortfalls. In its most basic form, a Kmap provides the names and locations of people who not only have the raw information but also the experience in a given subject. As a

Kmap Type	Kmap Structure	Organizational Source
• Organizational Structure	• Organizational Structure	• Functional
• Topical	• Organized Around Products, Customers, or Subjects	• Functional • Cross Functional
• Process	• How Activity Conducts Business	• Functional • Cross Functional

result, a Kmap determines where KM initiatives will have the greatest impact on the organization by focusing on organizational strengths and weaknesses.

A Kmap contains a blueprint of knowledge sources on a given subject and identifies and standardizes knowledge terms. This aids people in quickly finding the knowledge needed, helps prevent duplication of effort throughout the organization, and avoids the accumulation of knowledge for knowledge's sake. For example, people use different names for liquid refreshment — soda, pop, or soft drink. A Kmap standardizes the term (the preferred usage and a series of synonyms) and helps connect people working on the same issue. The company Teltech uses a thesaurus approach. They maintain a database of personnel biographies, which are linked to the thesaurus through a set of keywords. The expert biographies are updated annually to address new expertise and new terminology.

Since the process of creating Kmaps are as valuable as the end products, developing Kmaps should not be looked at as a one-time event. It is a continuous process of reviewing knowledge from new perspectives to solve new problems.

Establish Virtual Collaboration

Virtual collaboration is the ability to break out of our existing requirement to tie program offices and contractor offices to specific geographic locations. Using digital networks and telecommunication technology rather than physical environment, working virtually allows you to think in terms of competencies, not geographies, and allows the organization to locate members who can best serve the program.

Collaboration is the best way to encourage sharing ideas in a team environment as well as to improve situational awareness. Often, a team is tasked with producing a report, a set of presentation charts, a proposal, or other documents. Using virtual collaboration, team members all work on the same document concurrently, thereby shortening the time it would otherwise take to integrate multiple inputs from members. Additionally, it shortens the learning cycle of employees by allowing them to see the entire picture and the impact of their contributions. Virtual collaboration strongly supports both knowledge generation and distribution. It can be as simple as Buckman Lab's use of team-centered E-mail, which uses a commonly available program; or it can be a more complex software solution that employs additional features beyond E-mail. Chapter 5 discusses collaboration in greater detail.

Invest in Communities of Practice (CP)

A *Community of Practice* (CP) is a forum that brings networked people with similar interests and issues together to address problems, provide solutions, share ideas, and build communication links. They can be initiated, organized, and controlled by community members themselves, by organizations, or by third parties who act as intermediaries between community members and other interest groups such as business organizations and advertisers. These networks of people help advance the collective understanding of different subject areas by codifying the tacit knowledge of participants. Some differences between Work Groups/Teams and CPs include the following items:

CPs can be built around functional expertise, processes, activities, etc. One example of a CP is Quality Assurance (QA). This CP would, for example, allow all people who work on QA issues to have a single reference point to address

QA issues or to present ideas. Further, if a large enough community is interested in a subset of QA, such as ISO 9000, a separate CP can be built just for ISO.

Work Groups/ Teams	Communities of Practice
• Created to perform tasks	• Emerges through interaction
• Can be designed and created	• Can be detected and supported
• Shared responsibilities and plans	• Shared interests and practices
• Team participation and leadership	• Peripheral participation and/or apprenticeship
• Technology supports task execution	• Technology supports membership

CPs do require some form of Knowledge sharing (Ksharing) champion(s). The champion(s) can be organized in a formal or informal manner:

a. Formal – The KM steering champion(s) can be an expert or group of experts whose duties include developing or assessing knowledge strategies and establishing the scope of knowledge-sharing activities. At Buckman Labs, for example, it was prestigious to be on a committee; and people served without additional compensation while performing their usual work. At AMS, performing committee duties was a 2-year, full-time assignment and replaced the individual's regular workload.

b. Informal – A simple discussion forum is established; and people, who have an interest in the community, freely communicate. While self-regulating, the discussions do not always lead to nuggets of knowledge or the ability to capture best practices.

CPs are defined by boundaries and rules. The boundaries can be geographic (U.S.), affiliation (community of users), or common interest (quality assurance). Rules can range from online decorum to requiring community members to respond to posted questions/messages over a certain amount of time.

Creating Knowledge Repositories/Data Warehousing

Knowledge repositories capture explicit and, hopefully, tacit knowledge. They provide the history of the organization since they can contain everything the organization produces, and they reflect the collective knowledge of Communities of Practice. Knowledge repositories are general or specific in nature. For example, you may have a general knowledge repository for QA and/or a specific repository for a subset of QA.

Two of the more popular types of repositories in KM are best practices and lessons learned. Best practices are those "practices that have produced outstanding results in one situation and that can be adopted for our situation."[2] At Chevron, four levels of best practices are recognized. The first is a "good idea," which has not been proven or substantiated by data but could have an impact on business. The second is a "good practice," which is any technique, methodology, procedure, or process that has been implemented and has improved business results for the organization. The third level is a "local best practice," which has been determined to be a best approach for all or part of the organization. Finally, the "industry best practice" is an approach based on both internal and external benchmarking work. The external benchmarking can come

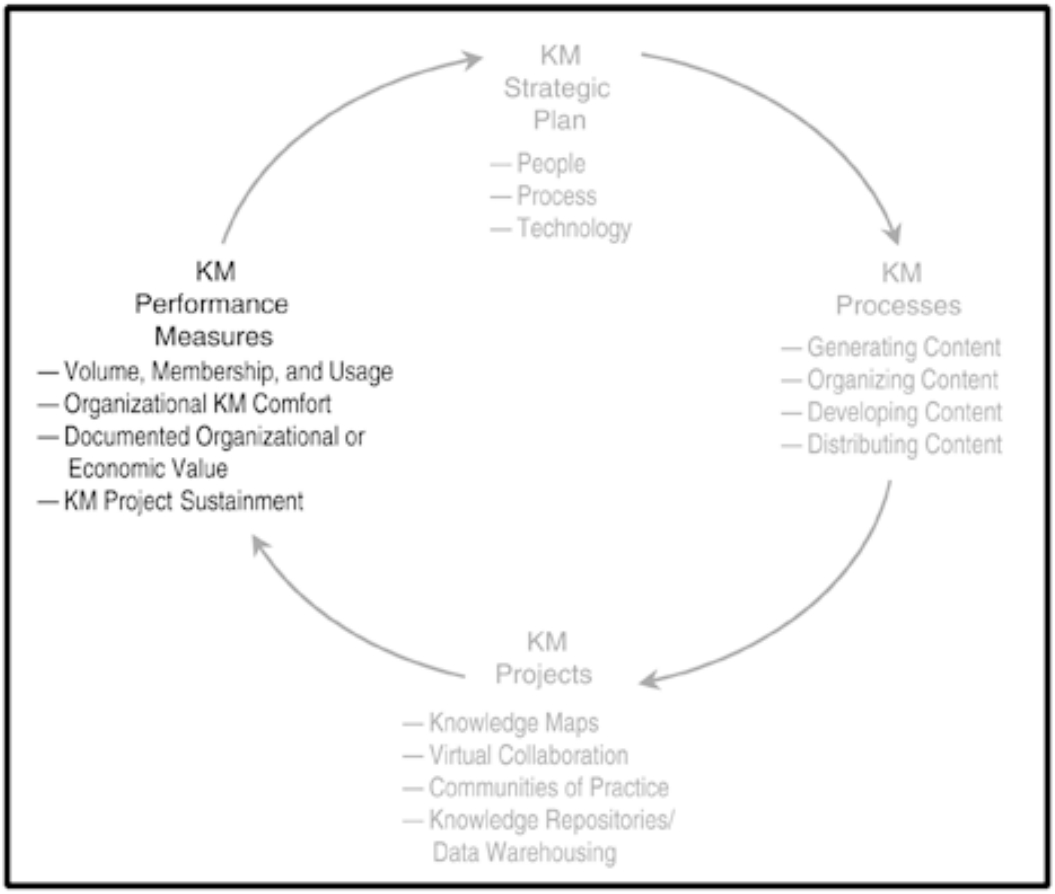

Figure 4-5. Knowledge Management Performance Measures

from other industries.[3] You can tie best practices to specific projects, areas of interest, or processes. It is important that all interested parties have access to best practices at their place of work.

Lessons learned refers to the feedback gained from day-to day experiences of some event or process. They can lead to best practices but generally tend to convey the situation, the options, choice(s) taken, and the results. Some examples of best practices/lessons learned repositories follow:

1. The Air Force Center for Knowledge-Sharing – Lessons Learned[4]
2. Air Force Knowledge Management – Best Practices and Lessons Learned[5]
3. Center for Army Lessons Learned[6]
4. Coast Guard Lessons Learned[7]
5. The Navy's Best Manufacturing Practices Center of Excellence

When a best practice or lesson learned is placed into a knowledge repository, it should be occasionally reviewed for relevance; and the submitter's contact information must be kept

current. One way to keep information current is to ensure that people have a lifetime (duration of military service) E-mail address. The U.S. Army has 19,000 people with such an E-mail account, and plans to provide every recruit with a duration-of-service E-mail address. This effort will support best practices and lessons learned by ensuring that people who submit the lessons learned/best practices are not lost in cyberspace when they transfer, move, or deploy.

KM Performance Measures

Once you embark upon a KM program, you can measure success several ways (Figure 4-5). First, measure the growth in the volume of knowledge content and usage in your KM project. Some growth indications are the number of documents in repositories, accesses to repositories, or the number of participants for discussion database projects. Next, assess the comfort throughout the organization with the concepts of knowledge and KM. This is admittedly a soft metric, but it can be witnessed by the growth of and participation in KM projects. Third, watch for some evidence of organizational or economic value (direct and indirect) to support the KM effort. Examples can include business impacts such as cost-benefits, cost-savings, or cost-avoidance. Also, the reduction or elimination of staff meetings can demonstrate value. This monitoring ensures the project is of value to the organization. Finally, observe whether the project will be sustained beyond a particular individual or two. Specifically, ensure that the project has turned into an organizational initiative, not an individual project.

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5

TECHNOLOGY

"Even if you are on the right track, you will be run over if you just sit there."
—Will Rogers (1879–1935)

As the preceding chapters discussed, DoD stands to realize tremendous improvements in systems acquisitions by allowing and encouraging people to leverage KM in their daily work. Chapters 3 and 4 dealt with ways that DoD could adapt its Workforce and business processes to position itself to provide the warfighters with first-class systems by adopting KM practices. However, preparing the Workforce and reengineering the processes are not the end of the story. In addition to cultivating a population of "knowledge workers" (individuals who work together using knowledge processes), DoD needs to provide the necessary tool — Information Technology (IT) — for this new breed of knowledge workers to successfully implement KM. It simply is not possible to operate a "knowledge organization" without using appropriate KM/IT tools available today.[1]

This chapter discusses the types of KM/IT tools that DoD should employ. Note that this chapter discusses "types" of KM/IT tools; it does not recommend specific products sold by vendors. Also, the technologies described in this chapter are based upon vendors' product descriptions and demonstrations. Most of the capabilities are presently available as Commercial Off-the-Shelf (COTS) products using open standards. Some of them are in alpha or beta test, and a few of them are still under development but are expected to be available within 1 year. For additional information about specific products, see Appendix C.

As you read this chapter, be aware that purchasing the technology described here will require only a relatively modest financial investment. Most of the infrastructure support for these products is already in place at DoD installations. For example, an informal survey conducted last year[2] found that approximately 95 percent of the Acquisition Workforce had access to a typical office suite of software, e.g., word processing, spreadsheet, presentation, E-mail, and web access, at or near their work space. Also, most installations already have adequate Local Area Networks (LANs) as well as security and long-haul communications equipment to provide workers with secure, robust connectivity to each other and the rest of the world via the WWW.

Integrated Digital Environment (IDE) in 1996

To appreciate today's technology, take a brief look back to see how technology has evolved in

recent years. The 1995–1996 DSMC Research Fellows' report[3] discussed DoD's efforts at establishing an IDE to conduct Electronic Commerce (EC). At the time, little thought was given to KM, and even less literature was devoted to the subject. While their report touched on some of the basic ideas included in KM today, the field of KM and the IT supporting it has evolved considerably since 1996.

In 1996, most of the Acquisition Workforce used stand-alone desktop applications like the Microsoft Office Suite software. Some organizations also used early versions of GroupWare, such as LAN-based E-mail, group calendaring, electronic bulletin boards, and workflow management. In addition to GroupWare, a few organizations adopted Electronic Data Interchange (EDI), using public standards and Database Management Systems (DBMS) to facilitate storage and retrieval of documents. Very little was being done with the Internet, especially the fledgling WWW.

Since that time, there has been an explosive growth of information available via intranets, extranets, and the Internet. Because of the huge volume of information available, people sought help in finding the few "nuggets of knowledge" they needed; however, these nuggets were buried deep in a mountain of data and information. KM tools have since been developed to help them drill through the mountain to find those nuggets, and more powerful GroupWare tools have been developed to help them share the wealth with their coworkers. We will elaborate on these topics later in this chapter.

Knowledge Management/Information Technology Tools

KM/IT tools are those computer and communication systems (including hardware and software) that facilitate the following functions:

- contributing knowledge to a corporate Kbase,
- finding knowledge in the corporate Kbase,
- finding experts anywhere in the organization,
- communicating with others having similar work interests,
- organizing teams (conventional or virtual) to work on common goals, and
- providing first-class technical and management support to users.

In the list above, "Kbase" refers to all knowledge repositories within the organization.

KM/IT tools enable workers to carry out the above duties while they are located anywhere in the world, at anytime. In effect, they have a constant virtual presence with each member of the project team.

Contributing Knowledge to a Corporate Kbase

KM/IT tools enable workers located anywhere to easily add content to the Kbase at anytime. In a simple case, an office worker could contribute to the Kbase by sending an E-mail to an electronic data warehouse elsewhere. This contributed information could be something as simple as an E-mail account that everyone in the company is allowed to peruse for items of interest, much as they would view a company bulletin board. While this method of contributing knowledge is easy, it lacks robustness. Fortunately, today's KM/IT tools allow workers to contribute their knowledge through a variety of means that are all easy to use.

A worker can contribute knowledge to the Kbase by directly placing items into the Kbase or by using KM/IT tools to capture knowledge from other workers. This knowledge transfer can be achieved without the worker's time and effort being spent on adding knowledge to the Kbase.

In the first case, a worker writes a White Paper, bundles it with a set of presentation charts and electronic photographs, and then attaches some keywords to the package to facilitate future searches for the objects.[4] The package of material is then sent to the Kbase, where it is categorized and stored.

In the second case, the KM/IT tools monitor E-mail traffic, threaded discussions, chat rooms, and workflow systems to watch for possibly related objects. The KM/IT system infers what are related objects and asks for a confirmation from the worker. If confirmed, the system establishes appropriate metadata labels[5] for the objects. Over time, as the KM/IT system "learns" with greater accuracy, workers will spend less time organizing their data — the KM/IT system will do it for them.

In addition to having two ways to contribute knowledge to the Kbase, several modes for contributing knowledge exist. An individual's knowledge can be sent via computer as E-mails, data files, faxes, or telephone transmissions, etc. With voice mail as well as with the voice and character recognition tools available today, workers can contribute audio (voice) files by calling the KM/IT system or sending a fax to it. Knowledge can also be contributed by groups of workers using GroupWare tools. (This subject is discussed further later is this chapter.) For example, brainstorming sessions or Frequently Asked Questions (FAQs) can be easily captured by GroupWare tools and passed to the Kbase.

Finding Knowledge in the Corporate Kbase

KM/IT tools enable easy access to the Kbase by anyone (with privileges); at anytime; and from anywhere via computer, telephone, or fax. You can use a web browser[6] to "drill down" through categories of information or use a search engine[7] to find information in the Kbase meeting your search criteria. If you are away from your computer, you can telephone the Kbase and, using your choice of language (English, French, Spanish, etc.), request whatever information you want. The information can be read to you over the telephone (by a computer-generated voice), faxed to a nearby machine, or sent to a file server for later retrieval.

Whenever information is delivered to you, the KM/IT system "learns" your preferences for presenting information. For example, it can build a profile on you that knows what information you typically request, how often you request it, where you want it delivered, how you want it delivered, and what format you need. In addition to providing you with information, today's KM/IT systems have the "brains" to figure out the context and pattern of your inquiries, so they can retrieve and deliver information that you did not specifically request.[8] Over time, the system's profile on you will be complete enough that it can anticipate your inquiries; have the information prepackaged for you; and have it delivered where, when, and how you want. For instance, every other Monday morning you might request reports about the previous 2 weeks of maintenance actions on your weapon systems. You need those reports to discuss the matter with the weapon system user. The KM/IT system can gather the information, send you all the information electronically (in whatever format you need), prepare a summary slide for your meeting with the user, and fax it to the user's office so it will be waiting for you when you arrive for your meeting. As your profile continues to be fine-tuned, the KM/IT system will anticipate your information needs to the point where it can "push" relevant information to you that you might otherwise not realize was available. A major American airline, for example, deployed a software product to learn the flight preferences of its Frequent

Flyer customers so it could target its promotions and routes. Shortly after deploying the software, the airline saw a 35 percent boost in new bookings and Frequent Flyer miles from its Frequent Flyer customers. As a result of this KM application, customers were able to take advantage of bargains they probably would not have heard about otherwise, and the company had a tremendous growth in sales revenues.

Finding Experts Anywhere in the Organization

In their book about transferring knowledge, authors Carla O'Dell and C. Jackson Grayson, Jr., assert that "ultimately, knowledge and best practices are in people's heads" and that "tacit knowledge is best shared through people."[9] While some pedagogues would take issue with those views, it is safe to say that lots of knowledge resides in the minds of experts. It is, therefore, essential that you quickly find the right experts in your organization to help you when you need expertise. As a company CEO has noted, "from a process standpoint, the key is to find the pockets of intellectual capital and bring them together in a timely manner."[10]

How does an organization do this? Many organizations rely on word of mouth. Some have simple databases of names of experts and their areas of expertise. Often, though, these databases are incomplete and out of date. They depend upon individuals to update their own resumes; this rarely happens. KM/IT systems have some built-in provisions for keeping up to date. For example, you can use KM/IT tools to build a Kmap — a "yellow-page directory" to knowledge in the organization. Since it is thematically organized, you can easily find the category of knowledge you seek, determine where the knowledge resides, and then go to the source. After the KM/IT system builds a Kmap, it will also monitor objects as they flow into or out of the Kbase to see who is interested in particular subjects. It will remember everyone who is a member of a "community of interest" on a particular subject. Then, if you are looking for a subject-matter expert, the KM/IT system will recall and relay to you the names of all members of that community of interest "weighted" by those individuals who seem to be the most knowledgeable and active in that community. In addition to identifying these people, the KM/IT system provides information on how to contact them. It can also provide hotlink[11] access to related objects in the Kbase owned by members in the community of interest.

Many organizations we visited reported that, in most cases, finding the right expert is only half the battle toward accomplishing the task. A quick access to both the subject-matter expert(s) and the repository of relevant information could make the task much easier.

Communicating with Others Having Similar Work Interests

Though it is certainly important to find an expert, it is also important to communicate with the expert once found. Today's KM/IT tools greatly facilitate communication among members of an organization, including members geographically dispersed.

Communicate Point-to-Point Online or Offline

In recent years, tremendous growth has occurred in communication tools. You can now communicate with anyone, from anywhere, at anytime, and via any mode. KM/IT tools provide instant, live, and personal video teleconferencing (VTC) from virtually anywhere on the planet. Portable computers, e.g., laptops, coupled with cellular or satellite telephones provide the ability to engage in live discussions

via chat rooms, messengers, Internet-based telephones, or VTCs. Due to technological advancements, you can now afford to bring VTC capability to your desktop or laptop without the need to be tethered to a VTC studio at your organization's headquarters. Of course, the party you wish to communicate with might not always be available at the moment you choose. On those occasions, KM/IT tools allow you to leave E-mail and voice-mail messages, faxes, threaded discussions, uploaded files, or other attachments for your coworker. When the person becomes available, information can be requested in a variety of forms. For example, an E-mail you send to a colleague can also be delivered in the form of voice mail or as a fax in the language you used or in a foreign language.

Broadcast Communications

Most of the previous discussions involve point-to-point communications, i.e., discussions between you and another person or, possibly, a few additional individuals. KM/IT tools certainly facilitate that type of communication. In addition, these tools can facilitate communications among an entire community of interest. In fact, it could involve everyone in the organization. This other type of communication — broadcast — can be distributed organization-wide by using chat rooms, streaming audio/video, E-mail, or voice mail. All of these forms of communication can be digitally recorded and played back whenever needed by any worker who is located anywhere and at anytime.

Economy of Time

While KM/IT tools enable people to broadcast E-mails, video clips, etc., this can be a nuisance if the messages are broadcast to people who have no interest in the subject matter. Fortunately, KM/IT systems also provide ways of targeting the information to just the relevant parties in an organization so the rest of the people do not have to waste time sifting through a daily dose of interesting, but unneeded, broadcast communications.

One of the goals in knowledge-based organizations is to provide the right information to the right people at the right time. KM/IT systems do this by identifying communities of interest within the organization. These communities of interest can be explicitly defined. For example, a project manager can establish a list of workers to include as members of a project team; or the KM/IT system can "infer" or "learn" the existence of an undeclared or informal community of interest. For example, the KM/IT system can monitor E-mail traffic, threaded discussion, or chat rooms and "see" that a topic of discussion has persisted for awhile and several people are contributing to the discussion. The KM/IT system will "learn" that these people have a common interest in that topic and remember it. When future discussions are taking place or objects are being added to the Kbase involving that topic, the KM/IT system will alert the community of interest. They can, at the earliest opportunity, stay abreast of breaking news and learn who else in the organization has been working on that topic. This technique of alerting the community is referred to as "pushing" because, though people have not requested the information, they probably have an interest in it. People can, if they choose, have their names added to the community that receives the information even though the KM/IT system would not have known of their interest otherwise. By pushing this information out to this targeted audience, the KM/IT system relieves the individuals of having to spend time searching for new items when there are none to be found. Pushing also prevents individuals from

missing out on information because they forgot to check or did not know where to look.

Portals

Another KM/IT tool — a class of software called "corporate portals" or "business portals" — facilitates staying abreast of emerging information and communication among members of a community. A corporate portal "provides business users one-stop shopping for any information object they need inside or outside the corporation."[12] This tool allows a user to bring several sources of related information together to provide the essential information components needed to accomplish knowledge work. "The best analogy for a Business Portal is a shopping mall. Many consumers prefer shopping at malls because they know they can go to one place to get all their shopping done instead of driving to a half dozen or more stores in different locations."[13] "A Business Portal is a shopping mall for knowledge workers."[14] Using Windows operating systems as another analogy, a portal is like a collection of windows (views) on your screen. At your convenience, you can activate any of the windows and manipulate the data until it shows the exact information you need. You can do this for each window in rapid succession because all of the windows have already been pulled together onto a single "page" on your computer. From that page, you can navigate to any object you need to accomplish your work; and because the information is juxtaposed with related information contained in the other windows, you are able to get a "god's eye view" of the knowledge embodied in those windows.

Once you have tailored the views in accordance with what you need for your project, you can electronically share your portal with all other members of your team or community of interest. The entire team will be able to see exactly what you are seeing at the same time you are seeing it. This feature is particularly valuable in organizations that have a high degree of personnel turnover, such as DoD. Acquisition professionals at DoD "move from one project team to another. … [They] need quick and easy access to information to grasp the significance of changing business models, get their bearings quickly, and become productive in their ever-changing roles."[15]

Organizing Teams to Work on Common Goals

Portals are important tools that work groups use to communicate and organize their work. Work groups use other KM/IT tools toward this end, also. In the last few years, the KM/IT industry has made impressive advancements in state-of-the-art GroupWare.[16]

Group Support

Products available now enable workers to spend much less time doing administrative tasks associated with working together as a group. Something as simple as scheduling a meeting can consume several hours of your time if you have to call individual team members to check their availability for a particular time slot. The time it takes for this task grows geometrically as the number of participants rises. Consider, for example, how long it would take to manually coordinate a meeting time for 50 people; you would, all the while, hope that no one's schedule changes while you contact all of the others. With GroupWare, everyone's calendar is available electronically. Using priorities that you set, the calendaring tools will, in a matter of seconds, scan each participant's schedule; scan resource schedules such as conference rooms, sound systems, etc.; and find a best time for the meeting.

Another time-consuming administrative task involves tracking action items or workflow. GroupWare tools are available that allow work

to be tasked out, tracked, reported, and documented electronically. Besides sending reminders to action officers of impending suspenses, GroupWare tools send alert messages to supervisors and "downstream" workers, who are depending on the timely completion of the tasks. By notifying the action officer, the supervisor, and affected workers of lagging work completion, attention is brought to solving the problem before it has a major impact on the project. After completion of the task, the action officer uses the GroupWare tool to easily file the work products electronically into the Kbase for future reference.

GroupWare support tools can reduce administrative burdens associated with publication and forms management. These tools allow 24-hour access to policies, procedures, newsletters, and announcements. They also can provide one-stop shopping for all forms. Instead of filling in paper forms and mailing them to the next office, workers can fill in the forms online. Filling in forms online has the advantage of being immediately auditable by the system for accuracy, and any errors can be corrected to avoid delays in processing the form. Thereafter, information is immediately processed electronically without the next office having to wait for the mail or to re-key the data. The Federal Energy Regulatory Commission (FERC), for example, implemented a KM solution for its publications and forms management needs. They had a daunting task of managing millions of documents — growing at a rate of 200 to 1,500 a day — and updating as many as 150,000 Commission Rulings daily. They also had to process a heavy volume of forms from the businesses they regulated. After deploying some support tools, the FERC cut access and processing times for new and updated documents from weeks to less than 1 day, earning them the Government Computer News Award for IT excellence in July 1998.

Finally, GroupWare tools allow a team to easily build a library of FAQs and answers. As new knowledge comes into the team or as new members join the team, this library of FAQs makes knowledge readily available to everyone.

Collaboration

While GroupWare helps a team work *more efficiently* as a group, collaboration tools help a team *produce group products*.

Often a team is tasked with producing a report, a set of presentation charts, a proposal, or other document; this is called "concurrent authoring." With collaboration tools, team members can all work on the same document concurrently, thereby shortening the time it would otherwise take to integrate multiple inputs from members. Members can also benefit from seeing everyone's ideas, which can trigger more ideas from others. As the old adage goes, "20 minds are better than one." Or, in the words of Arthur Schopenhauer, "…the task is not so much to see what no one yet has seen, but to think what nobody yet has thought about that which everybody sees."[17] A collaboration tool infuses a team with synergy during the construction of a "knowledge document," which is brought about as a brainchild of their collective minds.

As with concurrent authoring, collaboration tools help a group's generation of knowledge by facilitating group brainstorming. This tool facilitates concurrent (but separate and anonymous) generation of ideas, which is followed by concurrent and open generation of ideas; rapid categorization and "threading" of related ideas; as well as discussion, disposition, and immediate documentation of the ideas.

Discussion, Mediation, and Decision Support

Occasionally, teams disagree on how their product should turn out. When this happens, the KM/IT system facilitates a group discussion of the issues and keeps a record of the discussion as an audit trail. Often, an open and frank discussion results in a harmonious resolution. However, if discussions bog down, the KM/IT tools can also facilitate a voting process to break through barriers and thereby allow the team to continue making progress toward their goal. The KM/IT tools record the outcomes of the voting as well as any rationale for the votes (if desired) for future reference.

Virtual Teaming

Taken as a whole, GroupWare tools make it possible to use virtual teams to work on projects. Since virtual team members are geographically dispersed, it can be time-consuming and/or expensive for them to collectively and simultaneously work on tasks without GroupWare. GroupWare tools effectively substitute an electronic presence for a physical one and, thus, allow physically remote team members to have the same access and to provide the same contributions that they would if they were collocated with the rest of the team. This allows the team leader to use the best experts in DoD on the team rather than settling for whoever is available in their building.

Providing First-Class Technical and Management Support to Users

Most KM/IT tools today can be accessed via the Internet. This feature is particularly valuable because it enables "users/customers" to have direct access to information in the Kbase concerning products they are operating or products being developed on their behalf. These users have direct visibility into requirements translation and tracking, contracting, trade studies, work progress, testing, deployment, and support. By staying abreast of the project's progress, users are postured to provide quick, informed inputs to the program office concerning issues that they are in the best position to evaluate. The sooner a program office gets informed inputs from users, the more effectively it serves the interests of users. KM/IT tools facilitate sharing of information and knowledge with users via the Internet as well as discussions between users and the program office. In effect, users become members of a virtual program office. With the KM/IT tools available, any number of users (and others) can instantly be added to the "staff" of a program office without having to be physically collocated; and all the knowledge resources could be made available immediately to new members of the virtual team.

After a product is fielded, users at times will need assistance from the program office concerning problems with the product. For example, questions could arise when a maintenance manual does not cover a problem they are encountering or when a product needs to be used for new applications. An analogous situation in the civilian sector is when consumers call a technical support center for problems they are having with a product.

During our research, we found that some KM/IT tools greatly facilitate fast, reliable answers to caller questions. These tools allow a program office to easily build a Kbase of FAQs and answers. Subsequent callers with similar questions get an immediate answer to their specific questions as well as knowledge on related topics. On those occasions where the Kbase does not have an adequate answer, the KM/IT tools provide an easy way to find the subject-matter expert for an answer and an easy way to add that new knowledge to the Kbase for future use. The Kbase can also be shared with other program offices so all

organizations with common problems will not have to "reinvent the wheel" each time a help call is received.

KM/IT Technology in 1999

At the same time that IT has been growing and evolving, America's workforce has continued to grow into a knowledge workforce; and, as previously discussed, KM/IT systems have been developed to enable this knowledge workforce to work effectively in a knowledge environment. Although "there's nothing totally new about the use of technology to help 'spread the word,' "[18] the state of the art has advanced; and, more importantly, workers' use of the technology has changed. The major gains come from significant advancements in GroupWare technology, development of additional KM tools, and explosive growth in use of the Intranet and Internet — the "nets."

GroupWare has matured to the point where geographically dispersed teams can communicate, share work products, and concurrently develop work products as effectively as if they were collocated. Communication pipes have grown to the point that they now provide the bandwidth to support the graphics-intensive WWW as well as personal VTCs and streaming audio/video. With infrastructure hardware and software as inexpensive as they currently are, both companies and government agencies are racing to publish their own new websites. Reacting to this explosion of information on the nets, the KM industry has developed software to help humans sift through information quickly to find what they need without suffering information overload. These software tools include KM software that greatly eases the time and effort required to perform the following functions:

- capturing information and knowledge from people as they go about their daily tasks;
- identifying the associations among objects in the Kbase;
- interacting with a Kbase to retrieve relevant knowledge; and
- understanding the captured and retrieved knowledge.

Although not a feature of KM per se, another recent technological advancement worth mentioning is voice recognition. Fundamentally, "people want to converse naturally with information,"[19] and "speech is the most common and natural and efficient means of communicating. … There is nothing natural about banging on plastic keys."[20] Taking advantage of voice recognition, you call your KM system and, using natural language, ask it for information, which it will read to you over the telephone; or the KM system can send information to you by computer or by fax. It might make sense to ask the KM system for information by voice because "speaking into a computer is faster than typing. The average person types 20–50 words a minute on a keyboard, versus 80–100 words a minute with speech-recognition software."[21] But, it might be better to get information from a KM system electronically or by hard copy (e.g., from a fax or printer) because people read faster than they can listen. Also, in the case of charts, photos, and videos, "a picture is worth a thousand words." In any case, KM systems can provide the information by whatever means you choose.

Scenario

To illustrate technological gains made in the last few years, consider the following scenario. A weapon system PM receives a call from headquarters relaying an urgent request for immediate modification to correct occurrences of power fluctuations in the weapon system. The PM remembers hearing something about a similar problem in the past, but that problem

was solved a couple of years before the PM was assigned to the position.

Typical Solution

The typical response from a PM in this situation would probably be to call a staff meeting to discuss the problem. At the meeting a few people might recall a similar problem, but those who knew anything about it have since retired or moved on to new jobs. The staff directors would then call their own individual staff meetings and would also speak with their contractors, and the scenario would be replayed at that level. People would be asked to search through their office files to see if they can locate anything on the subject. After a few days of pouring through the files, everyone concludes that nothing of real value was found. An Integrated Product Team (IPT) (including both government and contractor personnel) would be appointed to work the issue. The team leader would call a meeting of the team and weapon system operators to begin aggressively working the problem. The meeting would take place only after wasting a few days trying to resolve schedule conflicts and making travel arrangements. Then, after weeks of research and testing, the team would discover the nature of the problem and call a meeting to plan the next step toward finding a solution. In ensuing weeks, however, much of the team's attention is diverted to answering questions from the users, headquarters, General Accounting Office (GAO), news media, and others. To add to an already full plate, the team leader and the PM are required to make, on average, two trips per week to the Pentagon to brief various generals and other acquisition executives.

Does this scenario sound familiar? We believe this scenario is played out in most program offices with greater frequency than anyone would admit.

KM/IT-Powered Solution

So how would KM/IT help? A KM/IT system would have captured the knowledge from the earlier team while they were working the problem. The system would have also captured and categorized E-mails, memos, white papers, charts, photos, VTC sessions, voice messages, presentation charts, etc. The best time to capture knowledge is while it is being generated, not while it is being documented after the fact. The reason for this is quite simple — all too often, people have neither the time nor the inclination to document what has already been accomplished. They finish their task and then move on to their next project. The KM/IT system takes much of the work (and pain) out of the process by capturing (documenting) knowledge while the team goes about the business of finding a solution.

For the present IPT, getting information is as simple — and as quick — as asking the KM system to provide all information related to "power fluctuations." That simple query would bring up all "hits" for that search criteria. If necessary, the search could be further refined to reduce the number of hits to a manageable number of objects. Once a relevant hit is confirmed, the KM system can be instructed to bring up all related objects, even though they did not meet the search criteria initially. The Kbase ensures that the information is available and easily retrievable when needed.

Getting the information from the Kbase is valuable. Perhaps even more valuable, the KM system provides the names of people who produce or "own" objects of interest. If the Air Force or DoD has an enterprise-wide expert base, the current team could easily contact members of the previous team to seek their assistance as team members or as consultants wherever they are located. Using today's KM/IT tools, these resources could be integrated into the team with a minimum

of disruption to their current duties. They could have a virtual presence, i.e., they would not have to travel to "attend" meetings. By sending them a copy of the team's corporate portal, the consultants would have immediate access to all information available to the team thereby allowing the consultants to get "up to speed" as quickly as possible. Other consultants may be available as well. Using the expert base, the team can find other subject-matter experts to solicit their help. If they help, the corporate portal would get them up to speed quickly also.

Getting the right resources to work the problem solves part of the challenge for this team. Another challenge is to free the team from having to devote so much time to answering questions and providing briefings. Again, the KM/IT system can help. The team can easily set up one or more special corporate portals to provide all of the latest information required by the Pentagon and others. All "outside" individuals and organizations can, at the click of a mouse, get all the latest information they need, including recorded briefings or VTCs. This availability of current information would dramatically reduce or eliminate the need for the twice-a-week trips to the Pentagon.

The team can solve the problem in a fraction of the time that it would otherwise take by getting immediate access to the earlier team's knowledge. History and advice from the previous team members, help from subject-matter experts, and support by all the GroupWare and collaboration tools all increase the speed with which the team solves the problem. In addition, this team's knowledge is automatically captured by the Kbase for future use.

Concluding Remarks on Technology

Corporate knowledge is a vital asset to modern organizations. As with all vital corporate assets, it deserves and demands management's attention. To provide the best value to its customers, an organization has to manage that asset carefully.

As important as IT is, you should bear in mind that IT *enables* an organization to manage knowledge. It does not make it happen; it merely provides the tools. Unless you have a Workforce *willing* and *able* to *use* the tools, you cannot have an effective KM system.

Furthermore, you cannot have a successful KM program if people cannot gain access to the KM system. Because of security concerns, some repositories of information are sealed off behind firewalls. While most would agree that security of some Defense information is necessary for national and operational security, careful consideration needs to be given to determine what information needs that protection. Information or knowledge that is not relatively easy to access will, as a practical matter, not be used; and unused information or knowledge has little or no value. But, since giving free access to everybody on the WWW poses security risks, there has to be a trade-off between access and security. Deciding where to draw the line would be a major study, well beyond the scope of this report. Suffice it to say we are our worst enemy at either extreme. Making all of our information freely available to the world could seriously undermine our national security; but closing off everything for fear of any disclosure would effectively prevent DoD from fully benefiting from the collective knowledge of its workers. "When skills belong to the company as a whole, they create competitive advantages that others can't match. The organization becomes more than the sum of its parts."[22]

ENDNOTES

1. As testimony to this view, Andy Moore said of AMS (a large consulting company): "Without a technological infrastructure, AMS's knowledge management initiatives would have been impossible. Their primary enablers are Lotus Notes, … voice mail, E-mail and video teleconferencing." "An Environment for Innovation: American Management Systems," *KM World*, (Feb 99), 14.
2. Survey conducted by OSD(A&T)/API in 1Q98.
3. Cromar, P., Wiley, A., and Tremaine, R., *Navigating the Digital Environment: A Program Manager's Perspective*, (Ft. Belvoir VA: DSMC Press, December 1996).
4. An "object" is a discrete item placed into the Kbase. It can be a text document, presentation chart, audio/video file, fax, scanned document, spreadsheet, photograph, etc.
5. Metadata labels are data about data. For example, an electronic balance sheet might have an associated metadata label identifying the author of the balance sheet, the period the sheet covers, which company it is for, and the security level of the document.
6. A web browser is a computer program that allows you to view documents, photographs, charts, logos, and other objects located at someone's website. The two most popular browsers being used today are Netscape and Internet Explorer.
7. A search engine is a computer program that searches a database to find those objects that meet the search criteria you specify. For example, you might instruct the search engine to find all those objects that deal with "defective Pratt and Whitney engines." The search engine would present a list of all the objects in the Kbase dealing with that topic, including Point Papers, E-mails, presentations, online training courses, recorded streaming-video conferences, etc. All of the material would be instantly accessible by clicking on the listed object.
8. For example, you might have asked for "all Point Papers about missile attacks." KM/IT systems can interpret the context of your inquiry and also retrieve "reports" as well as "point papers" about "RPVs" as well as "missile" attacks.
9. O'Dell, C. and Grayson, C. J., Jr. *IF ONLY WE KNEW WHAT WE KNOW: The Transfer of Internal Knowledge and Best Practice.* New York: The Free Press (1998), 88.
10. Ibid., 98, quoting Andy Michuda, President and CEO of Teltech Resource Network Corporation.
11. A "hotlink" is an electronic pointer that navigates your browser to the location of another file or site.
12. Eckerson, W., *Business Portals: Drivers, Definitions, and Rules*, (Gaithersburg, MD: The Data Warehousing Institute, April 1999), 1.
13. Ibid.
14. Ibid., 2.
15. Ibid., 3.
16. GroupWare is software that facilitates the mechanics of a group of people working together as an efficient and effective team toward a common goal.
17. Quoted from a set of briefing charts used during the "International Knowledge Management Conference 99," sponsored by The Delphi Group: *Corporate Portals*, (Boston, MA, 1999), 1.
18. O'Dell and Grayson, 87.
19. Walker, L., E5, "The Web Prepares for Oral Exams," *Washington Post*, (Washington, DC: 6 May 99), quoting Osborne, W. S., General Manager of IBM's speech technology efforts.

20. Walker, E5, quoting J. Baker, Cofounder of Dragon Systems, Inc.
21. Walker, L., E5.
22. Kunar, J., "Leveraging Knowledge for Product Innovation," Handout material for the "International Knowledge Management Conference 99," sponsored by The Delphi Group: San Diego, CA, 29–31 March 1999.

6

IMPLEMENTATION

"The Future Ain't What It Used To Be."
—Yogi Berra

There is a famous line that logisticians use to trumpet their importance. They quote an anonymous general who, upon hearing that other successful generals credit much of their success to good logistics, once said, "I don't know what this logistics is, but I want some of it." Similarly, while many people may not completely understand it, KM has the quality that makes those who have heard enough about it want to use it to their advantage. The question is "How do I leverage KM in my workplace?"

There are many approaches for implementing a KM system. This chapter presents some basic steps for making KM a reality.[1]

Provide Leadership

Not surprisingly, a key step for successfully implementing a KM program is providing leadership. The first thing leaders need to do in this regard is establish a compelling need for change.[2] Unless people "buy into" the need for change, the path to implement a KM program will almost certainly be lined with obstacles. Ultimately, it is the leader's responsibility to ensure workers understand the business problems that need to be solved.

To understand the problems, workers have to understand the goal. Leaders have to provide a clear focus on desired results. Without a goal, any activity in this area would result in serendipitous benefits at best. While the leadership can — and should — involve the workers in shaping the goals for the organization, it is ultimately the leader's responsibility to ensure the workers understand the goals for establishing a KM system. Beyond understanding those goals, the success of the KM program can be greatly enhanced by getting the workers to clearly understand the linkage between implementing a KM system and the overall corporate objectives.

While leaders have to communicate the need, goals, and linkages to corporate strategies at the outset of the KM program, their involvement does not end there. They must also directly support the KM program and become personally involved and interested in it on an ongoing basis. Otherwise, their apparent lack of interest and support will almost surely result in gradual erosion in interest and support from all other parts of the organization. If that happens, the organization will be on a slippery slope and, as a result, revert to a state where knowledge is painstaking to generate, store, retrieve, or share.

Establish Cross-Functional Teams to Map Knowledge and Plan an Initiative

Early on, a team has to be established to get the effort started. It should be cross-functional to ensure all viewpoints and interests are represented. Additionally, having a cross-functional team ensures all parts of the organization take ownership of the program. It is widely recognized that people are more likely to try to make a project succeed when they have been involved in it from the beginning and have a stake in the outcome.

One of the first tasks for the team is to conduct a knowledge audit. A knowledge audit answers the question, "What knowledge do we currently have?" The team examines the organization's explicit knowledge as well as the formal processes that generate it. The team itemizes the knowledge products and constructs an inventory of them.

Other team tasks are to identify and track knowledge flow. Focusing its attention on tacit knowledge and informal processes, the team documents how knowledge is currently being generated, transformed, transferred, and reused. This activity is designed to answer the question, "How do we add to the current body of knowledge?"

With information gained from the above studies, the team can construct a Kmap, which shows where knowledge resides or is generated within the organization.

The next question for the team to answer is, "What knowledge does the organization need?" This question is easier to pose than to answer. Nevertheless, the team needs to find the answer because this will, to a large degree, establish the bearing for the team's journey to become a high-performing knowledge organization.

Taking the results of the above tasks in combination, the team has to ask itself this question: "Given what we know today and what we need to know to be a high performing knowledge organization, will our current knowledge processes get us there?" If the answer is "No," then the team takes the next step to find the right processes to enable the organization to become a knowledge organization and to prepare a plan on how to get those processes implemented.

Ensure that a Process is in Place

If the knowledge audit shows there are gaps in knowledge, or the ability to capture and distribute new knowledge, the team needs to look for ways to fill those gaps. While a KM system does not *create* knowledge itself, it does *facilitate* the creation, collection and distribution of knowledge. The team needs to determine what additional knowledge needs to be created, who needs to generate it, how to capture it, and how to distribute it.

The team should strive to design the KM system to capture knowledge when and where it is being created, as transparently to workers as possible. The less onerous it is for the workers to contribute their knowledge to the Kbase, the more likely they are to contribute. An important design criterion has to be based on the question, "How easily can people contribute knowledge to the Kbase?"

Capturing knowledge is important, but equally important is reuse of that knowledge. The team should remember that, if knowledge is not easily accessible, it will not be used and that unused knowledge is an oxymoron. The team has to design its processes and technologies to connect all repositories of knowledge so everyone can easily find what they need irrespective of where the knowledge is warehoused or when they need it.

Another critical KM process for the team to consider is providing a way for workers to find and communicate with experts and other members of their communities of interest. There must be a process that enables anyone to find both knowledge objects and knowledgeable people. As valuable as the knowledge objects are, their value does not stack up against the value of a subject-matter expert's hands-on experiences dealing with the same problem you are now trying to solve. Any successful KM program has to provide the capability of getting access to that kind of invaluable tacit knowledge.

Develop or Implement Technology to Make KM Flourish

As the team designs processes and technologies to implement a KM system, it should adopt the philosophy that centralized standards and architecture are needed to implement the system, but the execution of the system should be decentralized. A fully integrated KM system for DoD is simply too big to swallow in one bite. A DoD-level team should establish guidelines for the Services and agencies to follow, based upon COTS products and open standards. For example, the DoD-level team should mandate that all deployed KM systems will be accessible via the WWW using either of the two most popular COTS browsers. Each organization would be encouraged to develop its own KM systems in a way that allows it to be integrated into larger Service or DoD KM systems with a minimum amount of effort and expense.

In addition to using COTS technology and open standards, the KM system should be scalable. That is, it should include processes and technologies that can accommodate the inevitable growth of knowledge over time. As *ways* of generating knowledge increases with the *amount* of knowledge, the KM system (including the processes and the technologies) has to grow in its capability to support the knowledge requirements of the organization.

Develop and Nurture a Sharing Culture

"No knowledge management system can work without an organization undergoing a significant cultural change."[3] It is essential that part of the implementation plan addresses cultural issues (such as those discussed in Chapter 3) because it is inevitable that they will arise. As one practitioner has noted, "In evaluating … projects that have failed … the primary reason for failure was a scope that … did not adequately address human issues."[4]

One way to avoid or minimize cultural issues is to educate the community about KM. Because KM is a relatively new discipline, many people have misconceptions about it or have not heard of it at all. Knowing this, the implementation team needs to allay the fears of people as they decide how to react to not only a new way of doing business but also a new set of worker responsibilities, interdependencies, and rewards. If an implementation plan does not show how every worker will benefit from adopting the new KM system, the organization runs the risk of becoming just another that tried and failed to find a technology solution to a human issue. The plan needs to include carefully crafted education and training for everyone in the Workforce so they feel comfortable with the new KM environment.

The implementation plan needs to include provisions for emphasizing that everyone has a personal responsibility to participate in communities of practice where everyone shares their knowledge and seeks ways to increase the body of knowledge. They have to be able to see that everyone is willing to contribute (as well as use) knowledge and that the organization values

their participation and is ready to reward them for it. As discussed in Chapter 3, you can reward knowledge sharing in several ways. The implementation plan has to include ways of using incentives to encourage knowledge sharing based upon the particular culture of the Workforce. Whether the rewards are money, praise, or something else, there must be some inducement for everyone to want to participate.

Demonstrate the Value of KM to Encourage Buy-in

Any new business model is viewed skeptically as the management's "flavor of the month," including implementing a KM environment; consequently, KM runs the risk of being considered a passing fad that will not last long. Even worse, it could be thought of as counterproductive. To overcome these risks, part of the implementation plan should include ways to generate some early successes together with an effective way of communicating those success stories to the entire organization. Boeing, for example, built a KM "War Room" at corporate headquarters where it used conventional as well as electronic media very effectively to tell the story behind the KM effort. Part of the story included accounts of how Boeing's KM program dramatically improved the company's effectiveness, efficiency, and profitability. In addition to showing anecdotal successes, Boeing built some walls made from tiles that were autographed by War Room visitors who wanted to demonstrate their support for the KM program. As you walk around the Room, you can see the signatures of CEOs and chairmen of major, world-class corporations; high-ranking politicians; military and government executives; and even three DSMC Research Fellows. Visitors, as well as Boeing employees, cannot help but be impressed with the scope of their KM program, the support from top management, and the successes the KM effort has enjoyed thus far. Every organization should find an appropriate means for collecting success stories and communicating them to all levels of the organization. This is another important component in successfully dealing with people and culture.

As a closing comment about success stories, the team should keep in mind that a more compelling case is made if they can point to *measurable* results. While human interest and anecdotal stories are fun, people tend to rally around hard data when evaluating the value of a KM program. As Admiral Grace Hopper once said, "One accurate measurement is worth more than a thousand expert opinions." Or in the words of W. Edwards Deming, "In God we trust, everyone else … bring data!"

View KM as a Work in Progress

In his book, *Anna Karenina*, Leo Tolstoy begins by observing, "Happy families are all alike; every unhappy family is unhappy in its own way." Similarly, every business organization has unique cultures, capabilities, and challenges. Implementing a KM program at any organization will be unique to that organization. When obstacles arise — and they will — you can look for guidance by drawing from the experience of others who have traveled down the KM path. But in the end, you will have to find the unique solution that fits your unique organization. It would be best to forewarn everyone that the road to knowledge has some bumps, potholes, and obstacles and that they should view KM as work in progress. They should start with something small and scale up after some early successes; and, even after a successful KM program is put in place, there is always room for improvement.

Closing Remarks

As you set about to implement a KM program, remember that there are three essential components to consider: people, processes, and technology. You cannot do without any one of these components; they are equally important. Effective processes and technology can provide you with virtually all the knowledge of the organization; but, "to leverage knowledge, you can't focus on the knowledge itself. You need to focus on the communities that own it and the people that use it."[5]

ENDNOTE

1. Greengard, S., "How to Make KM a Reality," http://www.workforceonline.com, 1-3.
2. J. Kotter, *Leading Change*, (Boston MA: Harvard Business School Press, 1996)
3. Greengard, 2.
4. Bruss, L., "Ten Steps to Achieve KM Success," *KM World*, (Camden, ME: Knowledge Asset Media, Inc., April 1999), 37.
5. McDermott, R., "Building Global Communities of Practice," handout material for the "International Knowledge Management Conference 99," held in San Diego, CA, 29–31 March 1999, (Boston, MA: Delphi Group).

7

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

We have seen the significant competitive advantage that exists if we can harness the collective knowledge of any organization. Clearly this advantage applies to the DoD acquisition community as well as commercial business. Bringing together the knowledge and experience of the entire 149,000 members of the Workforce as a collective entity, vice many separate subsets as we have now, promises to bring tremendous efficiencies and effectiveness to our community.

The advantages are more than simply doing business better than we do it now. A collective knowledge-sharing culture, coupled with a technologically robust infrastructure, provides the opportunity to take advantage of the collective innovation of the Workforce as well. It is through a framework, such as what was described earlier in this report, that we have the opportunity to completely revamp the way we manage our programs. It may allow us to maximize our effectiveness by constantly adding and replacing team members as the situation requires rather than the more static program structures of today. Similar to the engineering concept of "power by the hour," we may be able to use "brain power by the hour" by forming and disbanding teams literally in real time. This procedure will make use of our best people where they can do the most good and then allow them to move on to another program that requires their talents and knowledge. Since we can do this virtually and in a collaborative environment, the people remain where they are located; and their knowledge moves wherever it is needed.

Other innovative concepts, such as forming program offices independent of the Service, may allow specialization or "clusters" of acquisition expertise. Instead of each Service having separate acquisition or engineering centers physically tied to specific locations, we could place combined groups of our experts near universities or other areas of innovation and take better advantage of the free flow of academic knowledge. The clustering of experts would allow us to be more closely coupled with the leading edge of scientific thinking as well as provide a morale boost to the Workforce by providing them the opportunity to work closely with acknowledged academic thinkers and leaders in their fields. In fact, we could easily include those academics as part of our virtual teams, thereby accessing knowledge that previously was not available due to the program office collocation requirements.

One of the great promises of KM is that it provides a means to evolve our management practices in ways we cannot imagine today. The ability to bring together people with like interests and problems and the ability to find and consult with the expertise of the entire Department without regard to physical location or organizational structure means that we will bring their innovative juices together as well. Where that leads us in the future is anyone's guess.

While the advantages are great, the difficulty in achieving a robust knowledge-sharing framework cannot be ignored. Technological advances and tools allow us, for the first time, to have the means to implement these practices. But it is the people and process cornerstones that pose our biggest hurdles. Implementing KM requires a cultural shift away from many of our existing organizational structures and hierarchical thinking. Making this change with our existing Workforce and managers will take time and significant effort. Without them, however, we will doom KM to the category of management's "flavor of the month" and lose an opportunity to truly change our way of doing business.

Recommendations

To facilitate implementation of KM in the DoD acquisition community, we recommend the following actions be implemented:

- KM should be embraced as a fundamental tenet of acquisition management practice in DoD. The Under Secretary of Defense (AT&L) (USD(AT&L)) should direct that KM be used in designated pilot programs with the eventual goal of department-wide implementation. Implementation initiatives should be coordinated from the USD(AT&L) Acquisition Reform Office.

- Pilot projects should be designated to serve as the starting point for conversion to this concept and to begin the education of the Workforce in its use and benefits. Those pilots should include the following efforts: developing virtual collaboration, preparing Kmaps, forming communities of practice, and establishing virtual program offices.

- KM techniques should be introduced and taught in all DAU acquisition courses.

- The first communities of practice should be organized around the graduates of the DAU Acquisition Workforce courses. While many other communities of practice will eventually form throughout the department, these courses serve as an excellent foundation for development of functional communities with similar issues, problems, and education as the basis for the community. These communities of practice should be organized and facilitated by The Defense Systems Management College (DSMC) under the auspices of the USD(AT&L) Acquisition Reform Office. Not only does DSMC have access to the graduates of the courses, but this College can also implement both the KM techniques and the lessons learned from the communities into their courses.

- A WWW-accessible Kmap should be developed and implemented as the first department-wide initiative. Knowing what expertise exists in the Workforce and where that knowledge resides is a crucial first step in sharing our knowledge.

- Related to the Kmaps, the Army Knowledge Online initiative of providing a lifetime (at least lifetime of DoD employment) E-mail address to each member of the community should be expanded. One of the biggest issues facing the development of a Kmap is

the frequent movement of DoD personnel; and, therefore, E-mail address changes are needed for large sections of the Workforce. If members of the acquisition community maintained an unchanging address or forwarding mailbox capability, then the effort to maintain the Kmap would be much easier and more useful to knowledge seekers. The Harvard Business School (among others) uses this concept to allow its thousands of graduates to maintain contact despite frequent job and career changes.

- An open system architecture for the implementation of KM technology and tools should be set and maintained. Forbid the development of any tool or technology that is not a commercially available product. The use of KM in business will far outstrip use within DoD, and we should take advantage of the economies of scale that the commercial effort will provide. From a KM perspective, nothing in the DoD acquisition environment should be so different from good business practices that it warrants a DoD-unique tool.

- We should recognize that the whole concept of KM is predicated on free and easy knowledge sharing among a large, dispersed government and contractor workforce. This may, at times, run counter to the desires of the security community to tightly control the access to DoD information. While those concerns are valid, they must be implemented in the acquisition community in a way that balances the need to share knowledge. If these restrictions are too severe or if they make it too difficult to share knowledge, this effort will quickly fail.

We believe that the use of KM concepts by the DoD acquisition community will have a profound impact on our ability to conduct acquisitions. It will provide the framework to allow a greater transfer of innovative ideas and best practices, to utilize our Workforce more effectively than is now possible, to form teams in near real time, and to include the users of our systems to a much greater extent than is possible under our present practices. With KM, we can “do it smarter”!

APPENDIX A

Acronyms

ACRONYMS

Acronym	Term
AETC	Air Education & Training Command (USAF)
AMS	American Management Systems
BP	British Petroleum
CEO	Chief Executive Officer
COTS	Commercial Off-The-Shelf
CP	Community of Practice
DAU	Defense Acquisition University
DBMS	Database Management System
DoD	Department of Defense
DSMC	Defense Systems Management College
EC	Electronic Commerce
EDI	Electronic Data Interchange
FAQ	Frequently Asked Question
FERC	Federal Energy Regulatory Commission
GAO	General Accounting Office
HBS	Harvard Business School
HTML	Hypertext Markup Language
IBM	International Business Machines
IDE	Integrated Digital Environment
IPT	Integrated Product Team or Integrated Project Team
IT	Information Technology
JFCOM	Joint Forces Command (previously known as USACOM)
Kbase	Knowledge base
KM	Knowledge Management
Kmap	Knowledge map
Ksharing	Knowledge sharing
LAN	Local Area Network
NSA	National Security Agency
OSD	Office of the Secretary of Defense
PEO	Program Executive Officer
PM	Program Manager
QA	Quality Assurance
RFP	Request for Proposal
TI	Texas Instruments
USAA	United Services Automobile Association
USACOM	United States Atlantic Command
USAF	United States Air Force
USN	United States Navy
VTC	Video Teleconferencing
WWW	World Wide Web

APPENDIX B

Contacts

CONTACTS

While conducting our research we contacted many people within government, industry, and academia. Some of those contacts are listed below:

GOVERNMENT
Under Secretary of Defense, Acquisition, Technology, and Logistics, Acquisition Research Symposium, Washington, DC, Jun 99
DSMC Executive Institute Walter LaBerge, Fort Belvoir, VA, 12 Feb 99 Edward Hirsh, Fort Belvoir, VA, Aug 98–May 99 Joann Langston, Fort Belvoir, VA, Aug 98–May 99
Global Positioning System (GPS) Program Office Capt Jason Christ, USAF, Torrance, CA, 2 Apr 99
Joint Strike Fighter (JSF) Program Office Col Robert Lyons, USAF, Arlington, VA, 10 May 99 CAPT Earl Smith, USN, Arlington, VA, 10 May 99
National Security Agency William Spencer, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99 Anne Wright, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99
Office of the Assistant Secretary of Defense (C3I) Michael S. Yeomans, Arlington, VA, 10 May 99
Space and Naval Warfare Systems Command Linda Kusar-Fischer, Norfolk Naval Base, VA, 23 Mar 99 Peggy Ingerski, San Diego, CA, 1 Apr 99
Office of the Deputy Assistant Secretary of the Air Force (Contracting) Brig Gen Frank Anderson, HQ USAF, Washington, DC, Aug 98–Jun 99 Col Terry Raney, HQ USAF, Washington, DC, Aug 98–Jun 99 Maj Brian Bellacicco, HQ USAF, Washington, DC, Aug 98–Jun 99 Maj Becky Weirick, HQ USAF, Washington, DC, Aug 98–Jun 99
Headquarters Air Education and Training Command (Contracting) Maj Jon Tigges, HQ USAF, Washington, DC, Aug 98–Jun 99 Maj Scott King, HQ USAF, Washington, DC, Aug 98–Jun 99

U.S. Atlantic Command
LTC Don Jones, USA, Norfolk Naval Base, VA, 23 Mar 99
LTC Michael Dorohovich, USA, Norfolk Naval Base, VA, 23 Mar 99

United States Army
LTC Nick Justice, USA, Fort Belvoir, VA, 30 Mar 99

Commander-in-Chief U.S. Pacific Fleet
CDR Nancy Jenkins, USN, Norfolk Naval Base, VA, 23 Mar 99
Melanie Winters, Norfolk Naval Base, VA, 23 Mar 99

INDUSTRY

American Institute of Aeronautics and Astronautics (AIAA)
Acquisition Reform Conference, Washington, DC, 28–29 Jan 99

American Management Systems (AMS)
Susan Hanley, Fairfax, VA, 7 Apr 99

American Telephone and Telegraph (AT&T)
Jan Scites, San Diego, CA, 28 Mar 99

Applied Knowledge Group
Carol Willett, Reston, VA, 4 May 99

Arthur D. Little, Inc.
Michael Keating, Washington, DC, 5 May 99
Zachary Sikes, Washington, DC, 5 May 99
Vinnie McCollough, Washington, DC, 5 May 99
Laird Hepburn, Washington, DC, 5 May 99

Boeing Company
Frank Goodell, Seattle, WA, Washington DC, Feb 99,
Graeber Jordan, Seattle, WA, 13 May 99
Rick Liechty, Seattle, WA, 13 May 99

Booz, Allen, Hamilton
Ronald Mui, telephone interview, Mar 99

Buckman Laboratories
Robert Buckman, Memphis, TN, 26 Mar 99
Melissie Rumizan, Memphis, TN, 26 Mar 99
Patricia Brown, Memphis, TN, 26 Mar 99
Anita Kirkman, Memphis, TN, 26 Mar 99
Y. Tony Lin, Memphis, TN, 26 Mar 99

Buckman Laboratories — Continued
Marty Martin, Memphis, TN, 26 Mar 99
Timothy Meek, Memphis, TN, 26 Mar 99

Cambridge Technology
Kirk Klasson, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

Delphi Group
Stacie Capshaw, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

Electronic Data Systems (EDS)
Joseph Williamson, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

Ford Motor Company
Dar Wolford, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

Government Technology Services, Inc. (GTSI)
E-Gov Conference (www.e-gov.com), Washington, DC, 28 Jun–1 Jul 99

ICM Group
Patricia Sullivan, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

International Business Machines (IBM)
David Snowden, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

International Quality & Productivity Center
Balanced Scorecard in Government Agencies Conference, Arlington, VA, 23–24 Feb 99

Litton/PRC
Douglas Weidner, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

Northop Grumman
Dr. Scott Shaffer, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99
Bob Payne, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

Rand Corporation
Nancy Moore, Washington, DC, Aug 98–Jun 99
Laura Baldwin, Washington, DC, Aug 98–Jun 99
Frank Camm, Washington, DC, Aug 98–Jun 99
Mary Chenoweth, Washington, DC, 6 Jan 99

Rockwell E-Commerce
Kenneth Venner, International Knowledge Management Executive Summit, San Diego, CA, 28 Mar 99

SAIC
Sam Spadero, San Diego CA, 1 Apr 99
Anthony Gillotti, Torrance, CA, 2 Apr 99

Shell Oil Company
R. John Jackson, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

SGI (formerly known as Silicon Graphics)
Steve O'Connor, Mountain View, CA, 19 May 99

SITEL
Bard Chadera, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

Sun Micosystems
Shyam Rangole, Palo Alto, CA, 20 May 99

TransCanada Pipelines
Scott Chate, telephone interview, 10 Mar 99

Warner-Lambert
Charles Seeley, International Knowledge Management Executive Summit, San Diego, CA, 29–31 Mar 99

ACADEMIA

Harvard Business School (HBS)
David Bell, Cambridge, MA, Sep–Nov 98
Stephen Bradley, Cambridge, MA, Sep–Nov 98
Ronald Fox, Fort Belvoir, VA, Dec 98–Jun 99
Robert Kaplan, Cambridge, MA, Sep–Nov 98
John Kotter, Cambridge, MA, Sep–Nov 98
Dorothy Leonard, Cambridge, MA, Sep–Nov 98

Harvard Business School (HBS) — Continued

George Lodge, Cambridge, MA, Sep–Nov 98
Richard Nolan, Cambridge, MA, Sep–Nov 98
Thomas Piper, Cambridge, MA, Sep–Nov 98
Michael Porter, Cambridge, MA, Sep–Nov 98
Earl Sasser, Cambridge, MA, Sep–Nov 98
Michael Yoshida, Cambridge, MA, Sep–Nov 98

Defense Systems Management College (DSMC)

Executive Institute, Fort Belvoir, VA, Aug 98–Mar 99
Faculty Forum, Fort Belvoir, VA, Dec 98–Jun99
Nina Brokaw, Fort Belvoir, VA, Jan–Jun 99
Cal Brown, Fort Belvoir, VA, Aug 98–Jun 99
Craig Lush, Fort Belvoir, VA, Dec 98–Jun 99
John Hickock, Fort Belvoir, VA, Nov 98–Jun 99
Jim Price, Fort Belvoir, VA, Aug 98–Apr 99
John Riffee, Fort Belvoir, VA, Aug 98–Jun 99

APPENDIX C

KM and Related Products

KM AND RELATED PRODUCTS

Name of Product	Vendor
Abuzz	Abuzz (www.abuzz.com)
Communiqué; IntelAssist Knowledge.Works	Cipher (www.cipher-sys.com)
Correlate	Correlate (www.correlate.com)
Dataware II Knowledge Query Server	Dataware Technologies
Enterprise Document Management System	Documentum, Inc. (www.documentum.com)
Exchange	Microsoft Corporation (www.microsoft.com)
E-Portal Suite	Viador (www.viador.com)
GroupWise	Novell (www.novell.com)
Hyperknowledge	Hyperknowledge, N. America (www.hyperknowledge.com)
InfoWorkSpace	GTE Government Sys Corp. (www.infoworkspace.com)
Insight	Verge Software Corporation (www.vergesoft.com)
Knowledger.Innovation	Knowledge Associates (www.knowledgeassociates.com)
Knowledge Center	KnowledgeTrack Corporation (www.knowledgetrack.com)
Lotus Notes/Domino	Lotus Development Corporation (www.lotus.com)
Octel Unified Messenger	Lucent Technologies (www.lucent.com)
One to One Knowledge	BroadVision, Inc. (www.broadvision.com)
PC Docs/Fulcrum	PC DOCS, Inc. (www.pcdocsfulcrum.com)
PersonaServer	Orbital Software, Inc. (www.orbitalsw.com)
Portico	General Magic, Inc. (www.progressive.net)
ResearchAccelerator	Globalserve Corporation (www.globalservecorp.com)
RetrievalWare	Excalibur Technologies Corporation (www.excalib.com)
Solution Series WebPack	Primus Knowledge Solutions, Inc. (www.primus.com)
Trusted Intranet Service	DCS Corporation (www.dcscorp.com)

APPENDIX D

Additional Sources of Information

ADDITIONAL SOURCES OF INFORMATION
Learn More …

Books (Title and Author)

The Knowledge Creating Company ..... Ikujiro Nonaka and Hirotaka Takeuchi
Wellsprings of Knowledge ..... Dorothy Leonard
Working Knowledge ..... Thomas Davenport and Lawrence Prusak
If We Only Knew What We Know ..... Carla O'Dell
21st Century Intranet ..... Jennifer Stone Gonzalez
Value Based Knowledge Management ..... Rene Tissen
Top 100 KM Books on Strategy, Culture, Process, and Technology ..... www.kmmag.com

Magazines (Title and Website)

CIO ..... www.cio.com/forums/knowledge
Knowledge Management ..... www.kmmag.com
KM Journal ..... www.kmag.com
KM Review ..... www.km-review.com
KM World ..... www.KMWorld.com
Knowledge Transfer International ..... www.ktic.com
E-Gov Journal ..... www.e-gov.com

Websites (Subject and Website)

VARIETY OF KM TOPICS

Knowledge, Inc. ..... www.knowledgeinc.com
Buckman Labs ..... www.knowledge-nurture.com
(See Harvard Business School Case)
The BizTech Network ..... www.brint.com
Benchnet ..... www.benchnet.com/index.htm
Delphi Group ..... www.delphigroup.com/km/
American Management Systems, Inc. ..... www.amsinc.com/KnowledgeMgmt
Arthur Anderson Knowledge Space ..... www.knowledgespace.com
Ernst & Young Center for Business Innovation ..... www.businessinnovation.ey.com/journal/features/toc/loader.htm
Consortium for Advanced Manufacturing Internat'l. ... www.cam-i.org/sitemap.html
Federation for Enterprise Knowledge Development ..... www.fend.es/
Lepak Archives ..... www.lepak.com
Microsoft Office www.library.microsoft.com/il98/knowledge.htm

Culture

Deep Woods Technology ..... www.deepwoods.com
Work Force On Line ..... www.workforceonline.com/archive/
Reengineering Resource Center ..... www.reengineering.com/articles
Engage ..... www.engage.com/

Knowledge Maps

Dataware ..... www.dataware.com/km/august.htm

Communities of Practice

Knowledge Ability www.knowab.co.uk/wbw2c.html
Knowledge Ecology Consortium ..... www.co-I-l.com
Netage ..... www.netage.com
Toolkit for Online Communities ..... www.partnerships.org.uk/internet/index.htm
Awakening Technology ..... www.awaken.com
(See Lessons Learned Report)
Collaborative Strategies ..... www.collaborate.com/publications/publications.html
Electric Minds ..... www.minds.com
Training SuperSite ..... www.trainingsupersite.com/archive/
(Search for "Building a Virtual Team" and "Tools for Teaming")
Hosts on Hosting ..... www.fullcirc.com/community/hostsonhosts.htm
Cybersoc ..... www.cybersoc.com/vc/toolkit.html
Deep Woods Technology ..... www.deepwoods.com/transform/pubs/DDB.htm

Schools and Consortiums

University of Michigan ..... www.si.umich.edu/Community/
University of Texas ..... www.bus.utexas.edu/kman
Defense Systems Management College ..... www.dsmc.dsm.mil
University of Arizona ..... www.cmi.arizona.edu/research/virt_org/
Knowledge Management Consortium Internat'l. ..... www.kmci.org

Examples of KM Sites

Government

Navy Acquisition Center of Excellence ..... www.ace.navy.mil
Air Force Business Solutions Exchange ..... www.bsx.org
Air Force Knowledge Management Best
Practices and Lessons Learned ..... www.afkm.wpafb.af.mil
(Includes DoD, NASA, state and local government websites)
Army Knowledge Online ..... www.army.mil/ako/
Coast Guard Lessons Learned ..... www.uscg.mil/hq/g-m/moa/safea.htm

Commercial

Knowledge Exchange Auction ..... www.knexa.com
Microsoft Office ..... www.microsoft.com/office/features/default.htm
Ask-A-Tech ..... www.ask-a-tech.org
Experts Exchange ..... www.experts-exchange.com

APPENDIX E

About the Authors

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Lt Col George Cho, USAF, has worked in various jobs related to acquisition program management. These included program control, management information systems, contracting, program management, and the Headquarters staff. During his field assignments, he worked on programs involved with antisatellite weapons, intercontinental ballistic missiles, information distribution systems, airborne radar surveillance systems, and information warfare. Most recently, he was the Deputy Chief of the Acquisition Management Policy Division, the office responsible for developing and reinventing acquisition processes and policies for AF acquisitions. Lt Col Cho holds a Bachelor of Arts in Psychology, Masters in Business Administration, and Juris Doctor from Washington University in St. Louis. He holds teaching credentials in biology, is a Certified Level III Acquisition Program Manager, and a member of the California Bar. He is also a graduate of the Program for Management Development at the Harvard Business School. (Gcho@pmd73.hbs.edu)

Lt Col Hans J. Jerrell, USAF, has served in a variety of acquisition positions on installation, depot, major command and Air Force Secretariat staffs. While on the Secretariat's Contracting Staff, he developed and defined Air Force services contracting policies and was chairman of the Defense Acquisition Regulation (DAR) Council's Services and A-76 Committee. Prior assignments included Headquarters Air Training Command where he served as the contracting program manager for the Congressionally mandated Office of Management and Budget A-76 program. In Europe, as a regional contracting commander, he oversaw contracting support to five wings, two groups, and one squadron in northwest Germany and the Netherlands. Selected for the Logistics Professional Development Program, the Lt Col served as the T-38 deputy program manager, a C-5 maintenance officer, a contracting specialist and a finance officer. Lt Col Jerrell holds a Bachelor of Arts in History from the University of West Florida, a Masters in Public Administration from Troy State and is a graduate of the Program for Management Development at the Harvard Business School. He is a Certified Acquisition Professional in Contracting, Program Management, and Acquisition Logistics. (Hjerrell@pmd73.hbs.edu)

CAPT William E. Landay III, USN, was commissioned as a Surface Warfare Officer. His first assignment was as Gunnery Assistant and Combat Information Center Officer on USS HEPBURN (FF1055). Subsequent sea tours included Ship Control Officer on USS NICHOLAS (FFG 47), Commanding Officer of USS AQUILA (PHM 4), and Commanding Officer of USS PAUL HAMILTON (DDG 60). Ashore, he has served as a Team Training Instructor and Harpoon course director at Fleet Combat Training Center, Pacific and Executive Assistant to the Director of Command, Control, Communications, and Computer Systems at the United States Transportation Command. His last shore assignment was as the Surface, Strike, and Underwater Warfare Manager and Fleet Support Officer in the AEGIS Program Office. He holds a Bachelor of Science in Systems Engineering from the Naval Academy, a Masters in Systems Technology from the Naval Postgraduate School, and is a graduate of the Program for Management Development at the Harvard Business School. He is a Level III Certified Acquisition Professional and a Proven Subspecialist in C4I Systems. (Wlanday@pmd73.hbs.edu)

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