9-13-2006

Investigating Barriers to Knowledge Management: A Case Study of the Air Force Center of Excellence for Knowledge Management

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INVESTIGATING BARRIERS TO KNOWLEDGE MANAGEMENT: A CASE STUDY OF THE AIR FORCE CENTER OF EXCELLENCE FOR KNOWLEDGE MANAGEMENT

THESIS

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AFIT/GIR/ENV/06-01S

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THESIS

Presented to the Faculty

Department of Systems and Engineering Management

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Information Resource Management

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September 2006

AFIT/GIR/ENV/06-01S

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Abstract

Knowledge is becoming recognized as an organization's most valuable and powerful resource. As a resource, knowledge is used to improve an organization's efficiency and effectiveness, to create innovative solutions, and to enhance decision-making capabilities. Being such an important resource, it stands to reason that an organization's knowledge resources must be effectively managed. However, while an organization attempts to manage its knowledge, its efforts are constrained by a variety of influences acting as barriers. Using Holsapple and Joshi's (2000) "influences on the management of knowledge" framework, the purpose of this research is to identify those barriers that are acting as barriers to knowledge management (KM) efforts guided by the Air Force Center of Excellence for Knowledge Management. Based on the results of this research, a variety of managerial, resource, and environmental influences acting as barriers were found. It was also determined that the overarching problem of a lack of KM understanding throughout the Air Force serves as the greatest barrier to KM efforts guided by the Air Force Center of Excellence for Knowledge Management.

Acknowledgements

I would first like to first thank God for blessing me with the support I needed to accomplish this monumental task. Second, I would thank my advisor, Lt Col Summer Bartczak, for her guidance, encouragement, and patience throughout this process. I owe her an unending debt of gratitude that simply cannot be expressed in words. Without her, I would have never been able to accomplish this. Finally, but most importantly, I would like to thank my children. They provided me the motivation and determination to keep pushing forward no matter what challenges I faced. They have made me a better person and to them I will eternally be grateful.

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INVESTIGATING BARRIERS TO KNOWLEDGE MANAGEMENT: A CASE STUDY OF THE AIR FORCE CENTER OF EXCELLENCE FOR KNOWLEDGE MANAGEMENT

I. Introduction

Overview

Every few hundred years, Western civilization undergoes a major transformation marked by society's changing view of knowledge (Drucker, 1993). We are in the midst a transformation, a transition from an age of management to one of knowledge. In this era, which Drucker (1993) calls the "Knowledge Revolution," we are observing shifts in many traditional paradigms.

One such shift is the way that organizations value their resources. There is a departure from emphasizing the traditional resources of land, labor, and capital, to a new perspective where knowledge is viewed as an organization's most valuable and strategic resource (Drucker, 1993; Skyrme & Amidon, 1998; Zack, 1999). Where the traditional resources of land, labor, and capital were once sources of advantage, knowledge is now the new competitive resource (Nissen, 2006; Nonaka & Takeuchi, 1995). According to Nonaka (1991), "In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge" (p. 22).

As with any resource, in order to maximize its benefits, knowledge must be effectively managed. "If knowledge is viewed as a resource that is critical to an

organization's survival and success in the global market, then like any other resource it demands good management" (Holsapple & Joshi, 2002a, p. 47). Approaching knowledge with the purpose of organizing it and making it available, wherever and whenever it is needed, is the essence of knowledge management (KM) (Sabherwal & Becerra-Fernandez, 2003).

The United States Air Force, an organization faced with ever-increasing mission requirements and ever-decreasing resources, has recognized the necessity to effectively manage its knowledge. "Precision is one of the fundamental requirements that underpin the effectiveness of air and space power. To be precise in the application of force requires knowledge" (Department of the Air Force, 2003, p. 80). Unfortunately, the recognition of a need occurs much easier than the execution of a solution (Davenport & Prusak, 1998).

As with any implementation, the Air Force's efforts to implement KM is facing a variety of barriers (Bartczak, 2002). This research is intended as an extension of Bartczak's (2002) research on barriers to KM in military, focusing specifically on the case study covering KM efforts in the Air Force Material Command (AFMC). To investigate the barriers to KM in an Air Force context, this research will use Holsapple and Joshi's (2000) "influences on the management of knowledge" framework. Holsapple and Joshi's (2000) "influences on the management of knowledge" framework identifies three major influence areas that impact KM: managerial influences, resource influences, and environmental influences.

Research Questions

Using Holsapple and Joshi's (2000) 'influences on the management of knowledge" framework as a guide, the following research questions provide the basis for investigating those factors which act as barriers to KM implementation efforts guided by the Air Force Center of Excellence for Knowledge Management.

1. What are the managerial influences that act as barriers to KM programs in the Air Force Center of Excellence for Knowledge Management?
    a. How do leadership commitment and KM reinforcing behaviors from managers at various levels impact KM efforts?
    b. What coordination issues (e.g., strategy alignment, outside organization relationships, disparate KM efforts) impact KM efforts?
    c. What technical, social, and legal control issues (e.g., issues concerning the protection and quality of knowledge resources) impact KM efforts?
    d. What "measuring" or "valuing" issues impact KM efforts?
2. What are the resource influences that act as barriers to KM programs in the Air Force Center of Excellence for Knowledge Management?
    a. How do financial resource issues impact KM efforts?
    b. How do human resource issues (e.g., manpower availability, KM expertise/skill, outsourcing) impact KM efforts?
    c. How do material resource issues (e.g., existing technical infrastructure, computer systems) impact KM efforts?

d. How do knowledge resource issues (e.g., human/computer-based knowledge, organizational culture, purpose/strategy, infrastructure, knowledge artifacts) impact KM efforts?

3. What are the (external) environmental influences that act as barriers to KM programs in the Air Force Center of Excellence for Knowledge Management?
   a. How does technology (external to the military) impact military KM efforts?
   b. How have past military or industry KM strategies and results impacted current KM efforts and strategies?
   c. How does "time" (i.e. response time, development time, crisis scenarios) impact the KM efforts? Has the impact of time on KM efforts changed over the past few years?

Methodology

Because this study will investigate the Air Force Center of Excellence for Knowledge Management, a contemporary phenomenon within it real-life context, a case study research design will be used. Data will be collected from multiple sources such as organization documentation, archival records, and interviews After collection, the data will be categorized to allow for analysis. A pattern matching technique will be used to identify which influences are acting as barriers to KM in the Air Force Center of Excellence for Knowledge Management.

Benefits of Research

This study will provide greater insight into which influences act as barriers to KM implementation efforts guided by the Air Force Center of Excellence for

Knowledge Management. While there has been research dealing with influences to KM in the private sector, little work has been done investigating KM in the military. This research will further add to the KM body of knowledge by augmenting Bartczak's (2002) research on barriers to KM implementation efforts in the Air Force Material Command's Air Force Knowledge Management (AFKM) program, which subsequently became the Air Force Center of Excellence for Knowledge Management.

Thesis Overview

The remainder of this thesis will report the efforts taken to address the research questions presented in this chapter. In Chapter II, a review of academic literature pertaining to this topic will be provided. In Chapter III, the methodology used for this research will be outlined. In Chapter IV, the data collected will be presented. And, in Chapter V, the researcher's final conclusions and recommendations will be offered.

II. Literature Review

The Knowledge Revolution

Every few hundred years, Western civilization undergoes a major transformation marked by society's changing view of knowledge (Drucker, 1993). We are in the midst a transformation, a transition from an age of management to one of knowledge. Figure 1 shows the major historical phases that Western culture has progressed through and how the view of knowledge has changed in each phase. In this era, which Drucker (1993) calls the "Knowledge Revolution," we are observing shifts in many traditional paradigms.

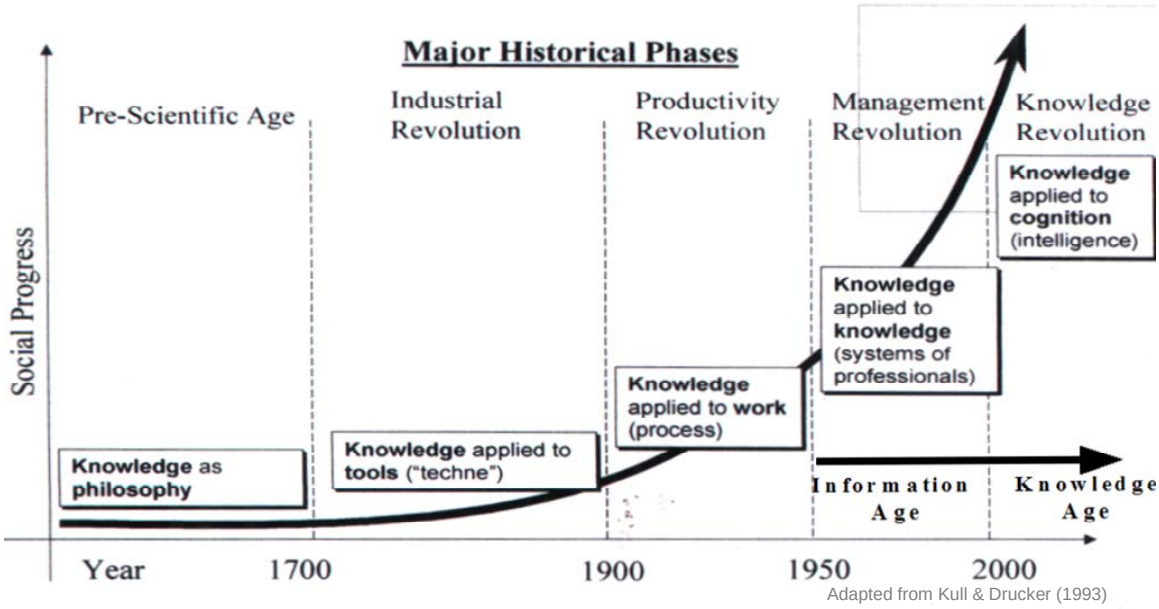

Figure 1. Historical Phases With Views of Knowledge (Bartczak, 2002)

One such shift is the way that organizations value their resources. There is a departure from emphasizing the traditional resources of land, labor, and capital, to a new perspective where an organization's intangible resources, such as knowledge, are

determining its value and potential (Drucker, 1993; Skyrme & Amidon, 1998; Zack, 1999). In fact, twenty years ago, traditional resources composed around 80 percent of a company's market value, but now they only account for about 25 percent (Ballow, Burgman, & Molnar, 2004; Green, 2005). Skyrme and Amidon (1998) identify intangible assets as having a much greater impact on organizational success in the post-industrial economy.

Of the intangible resources, researchers see knowledge replacing traditional resources and wealth as the primary source of power in today's world (Drucker, 1993; Nissen, 2006; Nonaka & Takeuchi, 1995; Skyrme & Amidon, 1998; Toffler, 1990; Zack, 1999). Leading researchers are recognizing knowledge as the resource that will drive organizational success. In fact, even tangible resource-based services will be driven by an organization's knowledge of how to apply those resources, and success will be determined by the knowledge of how to coordinate and combine those resources in ways that a competitor cannot (Alavi & Leidner, 2001; Zack, 1999). Success will be measured by how efficiently and effectively an organization's resources provide a satisfying product to its customers (Wigg, 1997). Because of the role that knowledge plays, increasing numbers of organizations are taking a knowledge-centric view of their resources (Figure 2). Figure 2 represents the ability to use knowledge to manipulate traditional resources.

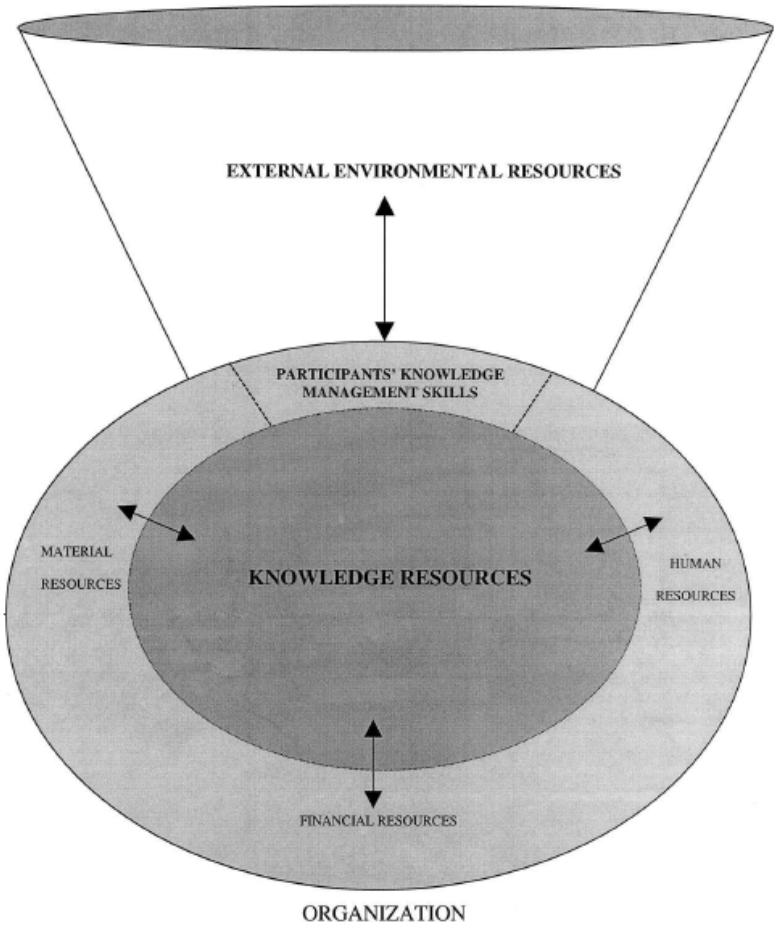

Figure 2. Knowledge-Centric View of Resources (Holsapple & Joshi, 2002a)

Benefits of Knowledge.

With knowledge being recognized as a critical resource for organizations, it is important to identify what benefits knowledge offers. The overarching benefit that knowledge provides is the ability to create and sustain a competitive advantage (Davenport & Prusak, 1998; Drucker, 1993; Nissen, 2006; Nonaka, 1991; Zack, 1999). The leading way that knowledge provides a competitive advantage is through innovation. This is expressed by Wayne Toms, "The single differentiator that is likely to last is innovation, and the raw material of innovation is knowledge" (as cited in Hibbard, 1997, p. 48). The power of innovation lies in knowledge creation. Creating new knowledge

sparks innovation and that new knowledge combined with the time it takes competitors to acquire similar knowledge results in a competitive advantage for the organizations (Nonaka & Takeuchi, 1995; Zack, 1999). "In an economy where the only certainty is uncertainty, the one sure source of lasting competitive advantage is knowledge" (Nonaka, 1991, p. 22). In addition to a competitive advantage, knowledge allows organizations to improve performance efficiencies, problem solving, product development, and decision making (Bixler, 2005; Nonaka & Takeuchi, 1995; Skyrme & Amidon, 1998).

One aspect of knowledge that truly separates it from traditional resources is that knowledge increases through use, where traditional resources are depleted through use (Ballow et al., 2004; Davenport & Prusak, 1998; Nissen, 2006; Tirpak, 2005). The ability to produce an indefinite potential for market growth makes knowledge an organization's most valuable and powerful resource (Davenport & Prusak, 1998; Grover & Davenport, 2001; Nonaka, 1991). As a sustainable resource with growth potential, many organizations are beginning to attribute their successes to knowledge.

Knowledge

After discussing how society's view of resources has shifted towards valuing knowledge as a critical resource, it is important to take some time to define what knowledge is. Unfortunately, defining knowledge is more difficult than looking up the term in a dictionary. It became clear while conducting this literature review that an agreed upon definition was not to be found. However, this is not a new phenomenon, as attempts of defining knowledge have occupied the minds of philosophers since the classical Greek era (Alavi & Leidner, 2001). While this study will not attempt to address

every existing definition of knowledge, it will explore the concept of the knowledge hierarchy and will offer some of the more commonly accepted definitions of knowledge.

Grover and Davenport (2001) describe knowledge as, "the most valuable form of content in a continuum starting at data, encompassing information, and ending at knowledge" (p. 6). The idea of a successive hierarchy is mentioned throughout the literature and serves as the foundation for understanding the origins of knowledge (Davenport & Prusak, 1998; Nissen, 2006; Nonaka & Takeuchi, 1995). As stated by Davenport and Prusak (1998), "Knowledge derives from information as information derives from data" (p. 6). At this point, it is important to note that some researchers also include higher level concepts such as wisdom and insight in the hierarchy (Davenport & Prusak, 1998; Spiegler, 2000). However, based on the purposes of this study, the hierarchy will be limited to data, information, and knowledge. Figure 4 gives a representation of the knowledge hierarchy. In addition to data, information, and knowledge, Nissen (2006) uses the terms actionability and abundance to better differentiate and relate each level of the hierarchy. According to Davenport and Prusak (1998), knowledge is more closely tied to action than is data or information. Figure 3 represents how the tie to action increases as one moves up the hierarchy from data to information to knowledge. Nissen (2006) uses the base of the knowledge hierarchy to represent the abundance of each level of the hierarchy within any one domain. As can be seen in Figure 3, data is more abundant than information and information is more more abundant than knowledge.

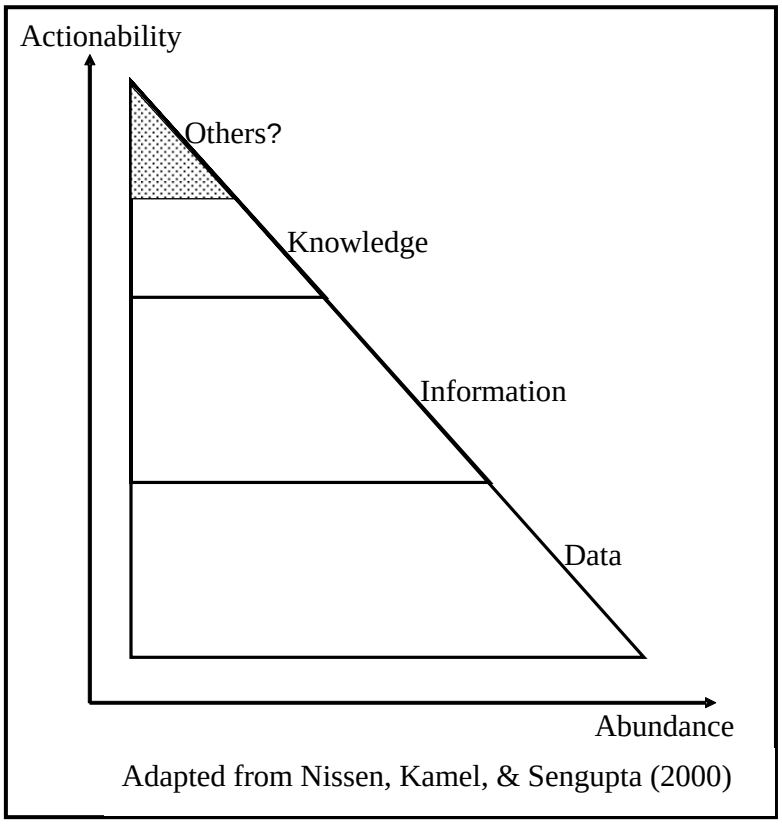

Figure 3. Knowledge Hierarchy (Nissen, 2006)

Starting at the bottom, or what some may consider the foundation of the hierarchy, we begin with data. Davenport and Prusak (1998) describe data as "a set of discrete, objective facts about events" (p. 2). Data can be thought of as the facts that exist, which hold no specific meaning by themselves. It is suggested that data has little relevance or purpose by itself; however, its importance lies in its role as the building block for information (Davenport & Prusak, 1998).

Therefore, unlike raw data, information is data that makes a difference or data that conveys a meaningful message (Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995). Ultimately, information is created by adding value or meaning to data for the user or receiver (Bartczak, 2002; Davenport & Prusak, 1998). For example, a memo sent to a company's director of operations may contain quarterly production figures. To the

director of operations, this is information because of the value and meaning of the figures. However, to the trash collector, it may only be data because of its lack of meaningful value. Similar to the development of information from data, "information is a necessary medium or material for eliciting and constructing knowledge" (Nonaka & Takeuchi, 1995, p. 58).

According to Spiegler (2000), "Knowledge is that slippery and fragile thing or process that we have a hard time defining" (p.9). That statement certainly held true during this literature review. While certainly not all-inclusive, some of the definitions of knowledge found during this literature review include:

- Knowledge is the fact or condition of knowing something with a considerable degree of familiarity gained through experience of or contact or association with the individual or thing s known (Gove, 1961, p. 1252).
- Knowledge is information combined with experience, context, interpretation, and reflection (Davenport, Delong, & Beers, 1998, p. 43).
- Knowledge is information possessed in the mind of individuals: it is personalized information (which may or may not be new, unique, useful, or accurate) related to facts, procedures, concepts, interpretations, ideas, observations, and judgments (Alavi & Leidner, 2001, p. 109).
- Knowledge is the process of knowing, a reflexive process that takes data and information, in a social context … and generates new data, information, and/or knowledge (Spiegler, 2000, p. 11).
- Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and

incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms (Davenport & Prusak, 1998, p. 5).

As can be seen, finding a single, agreed upon definition for knowledge is quite unlikely. However, after searching the literature, several common reoccurring elements can be identified. First, knowledge is a humanistic concept that requires human elements such as emotion, values, and ideals to exist (Nonaka, 1991; Nonaka & Takeuchi, 1995). Second, knowledge is tied to both data and information (Davenport & Prusak, 1998; Grover & Davenport, 2001; Kanter, 1999; Nissen, 2006; Nonaka & Takeuchi, 1995). Third, knowledge is tied to action (Davenport & Prusak, 1998; Kanter, 1999; Nonaka & Takeuchi, 1995).

Explicit and Tacit Knowledge.

Defining knowledge can prove challenging in itself, but further complicating the concept of knowledge is the fact that it can be separated into two separate categories: explicit knowledge and tacit knowledge. Distinction between the two categories of knowledge is important because each requires different actions in order for a knowledge transfer to occur.

Explicit knowledge can be described as formal and systematic, allowing it to be easily communicated and shared in manuals, books, and specifications as words and numbers (Alavi & Leidner, 2001; Nonaka, 1991; Nonaka & Konno, 1998). Because of its objective nature, explicit knowledge can be codified, processed by a computer, transmitted electronically, and stored in databases (Alavi & Leidner, 2001; Nonaka &

Takeuchi, 1995). This characteristic of explicit knowledge lends itself to more technology-based solutions.

Unlike explicit knowledge, tacit knowledge is more personal in nature and is not easily shared or communicated to others (Nonaka, 1991; Nonaka & Konno, 1998). Nonaka and Konno (1998) explain that tacit knowledge includes subjective insights, intuitions, and hunches that are deeply rooted in an individual's experiences, ideals, values, and emotions. Tacit knowledge can be thought of as knowledge residing one's head, which hard to see, explain, or understand (Kanter, 1999; Salisbury, 2003). Tacit knowledge is ingrained into an individual's behavior, skills, and profession and is "deeply rooted" in a person's "know-how," making it difficult to process or transmit in any systematic or logical manner (Nonaka, 1991; Nonaka & Takeuchi, 1995). According to Nonaka and Toyama (2003):

> Since tacit knowledge is difficult to formalize and often times space-specific, tacit knowledge can be acquired only through shared direct experience, such as spending time together or living in the same environment, typically a traditional apprenticeship where apprentices learn the tacit knowledge needed in their craft through hands-on experiences. (p. 4)

It is because of its nature that tacit knowledge is obtained and transferred through person-to-person interactions, unlike explicit knowledge which can be written down (Davenport & Prusak, 1998).

Knowledge Management

However, as with any resource, in order to maximize its benefits, knowledge must be effectively managed. "If knowledge is viewed as a resource that is critical to an organization's survival and success in the global market, then like any other resource it demands good management" (Holsapple & Joshi, 2002a, p. 47). Approaching knowledge with the purpose of organizing it and making it available, wherever and whenever it is needed, is the essence knowledge management (KM) (Sabherwal & Becerra-Fernandez, 2003). Therefore, for an organization to advance, it is important that they explore and practice the field of KM (Wiig, 1997; Wong, 2005).

In fact, organizations are beginning to see the benefits of KM on their bottom lines. For example, Hoffmann-LaRoche, a Swiss pharmaceutical firm, credits a knowledge management initiative in 1993-1994 with saving them $1 million per day by reducing the application time for new FDA and European regulatory authority drug approvals (Davenport & Prusak, 1998). Ford Motor used a best practices KM program that saved it over $547 million over a two year period by implementing over 4000 high-leverage best practices (Cho, Jerrell, & Landay, 2000). Hewlett-Packard used a KM tool called "case-based reasoning" to enhance its customer support knowledge that ultimately reduced call times by two-thirds and cut the cost per call by 50 percent (Davenport & Prusak, 1998).

If knowledge is being recognized as organizations' most valuable resource, then, as with any resource, it must be effectively managed (Holsapple & Joshi, 2000). Therefore, knowledge management (KM) is becoming a core competency that organizations must develop to be successful in a global economy (Skyrme & Amidon,

1998). The effective acquisition, creation, utilization, and retention of knowledge is paramount if an organization is going to create and sustain a competitive advantage into the future (Bixler, 2005; Nonaka & Takeuchi, 1995; Snowden, 2000). However, the challenge of managing knowledge is that its transfer is not simple, and a competitive advantage can only be attained if the workforce is able to access and share knowledge wherever and whenever it is needed (Davenport & Prusak, 1998).

Similar to defining knowledge, defining KM can prove quite challenging. The following are examples of knowledge management definitions identified during this literature review:

- The systematic process of discovering, selecting, organizing, distilling, sharing, developing and using information in a social-domain context to improve warfighter effectiveness (Department of Defense, 2005d, p. 4)
- Turning data (raw material) into information (finished goods) and from there into knowledge (actionable finished goods) (Kanter, 1999, p. 3).
- The process of capturing a company's collective expertise wherever it resides—in databases, on paper, or in people's heads—and distributing it to wherever it can help produce the biggest payoff (Hibbard, 1997, p. 48).
- Identifying and leveraging the collective knowledge in an organization to help the organization compete (Alavi & Leidner, 2001, p. 113).
- Organizing and making available important knowledge, wherever and whenever it is needed. (Sabherwal & Becerra-Fernandez, 2003, p. 227).
- The deployment of a comprehensive system that enhances the growth of an organization's knowledge (Salisbury, 2003, p. 128).

Snowden (2000) offers a definition that encompasses both the explicit and tacit elements of knowledge:

> KM can be defined as the identification, optimization, and active management of intellectual assets, either in the form of explicit knowledge held in artifacts or as tacit knowledge possessed by individuals or communities. The optimization of explicit knowledge is achieved by the consolidation and making available of artifacts. The optimization of tacit knowledge is achieved through the creation of communities to hold, share, and grow the tacit knowledge. The active management of intellectual assets is the creation of management processes and infrastructure to bring together artifacts and communities in a common ecology that will sustain the creation, utilization, and retention of intellectual capital. (p. 58)

Having explored what KM is, it is important to understand what benefits it provides to an organization..

Benefits of Knowledge Management.

In a 2000 report, KPMG consulting surveyed 423 organizations across the United Kingdom, mainland Europe, and the US regarding knowledge management issues, including KM benefits achieved. They found that the top six benefits of KM realized by organizations were: better decision making, better customer handling, faster response to key business issues, improved employee skills, and increased profits (KPMG Consulting, 2000). Figure 4 shows the entire list of expected and realized benefits of KM.

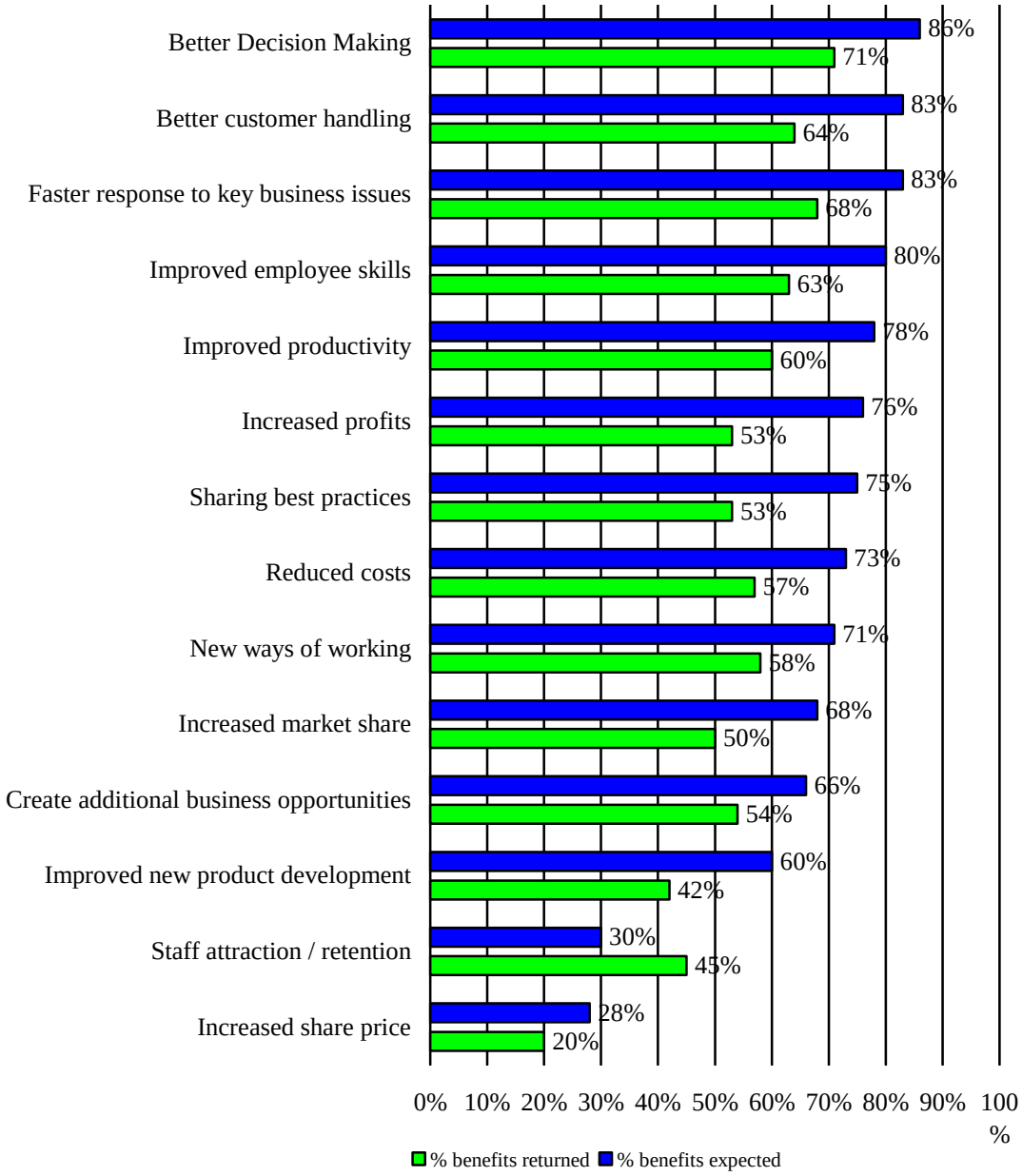

Figure 4. Expected and Realized KM Benefits (KPMG, 2000)

After looking at the befits that KM provides to an organization, it is important to understand what influence impact its execution and effectiveness.

Knowledge Management Influences

Examples of KM influences can be found throughout KM literature where the influences are typically presented as either barriers or as enablers. For the purposes of this research, a complementary view of barriers and enablers is taken. Instead of treating the two as entirely separate of each other, both barriers and enablers will be considered as opposite effects of the same influence or as "two sides of the same coin" (Bartczak, 2002, p. 38). Therefore, an identified influence that has a negative impact on KM implementation efforts represents a barrier, and an influence that has a positive impact on KM implementation efforts represents an enabler (Bartczak, 2002).

Throughout the literature there exists a broad range of KM implementation influences. Wong (2005) identifies influences such as management leadership and support, culture, IT, strategy and purpose, measurement, organizational infrastructure, processes and activities, motivational aids, resources, training and education, and human resource management. Skyrme and Amidon (1997) offer a strong link to a business imperative, a compelling vision and architecture, knowledge leadership, a knowledge creating and sharing culture, continuous learning, a well-developed technology infrastructure, and systematic organizational learning processes. Cho, Jerrell, and Landay (2000) identify influences as people, processes, and technology. Disterer (2001) separates influences into individual barriers and social barriers; offering loss of power, revelation, uncertainty, and motivation as individual barriers, and language, conflict avoidance, beurarcracy and hierarchy, and incoherent paradigms as social barriers (Disterer, 2001). Liebowitz (1999) identified the following influences: senior leadership support, a CKO and a KM infrastructure, knowledge ontologies and repositories, KM

systems and tools, incentives for KM sharing, a supportive culture. As can be seen, a variety of influences are offered throughout the literature. While not all of the influences offered are labeled identically, many convey similar concepts. Some of these themes identified in the literature include concepts such as management and leadership, resources, culture, and external forces such as competition. After identifying influences that affect KM, a framework for identifying those barriers must be identified.

A Knowledge Management Influences Framework

As the purpose of this study is to identify those influences that acts as barriers to KM implementation efforts in the Air Force Center of Excellence for Knowledge Management, a framework that will be used as a guide must be examined. Holsapple and Joshi's (2000) "influences on the management of knowledge" framework was selected because it provided a comprehensive investigation of KM influences. However, before describing Holsapple and Joshi's (2000) KM "influences on the management of knowledge" framework, it is important to understand how the framework relates to their higher level concept of a knowledge management episode (KME) (Figure 5).

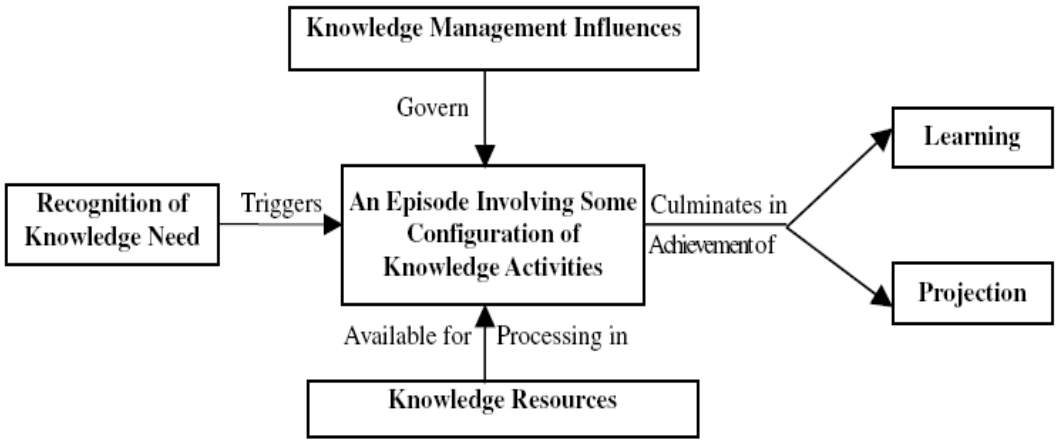

Figure 5. Architecture of a Knowledge Management Episode (Holsapple & Joshi, 2000)

The KME can be thought of as process that begins with the recognition of a knowledge need and ends with that need either being satisfied or abandoned (Holsapple & Joshi, 2001). Within a KME there are knowledge processors or knowledge workers which can be either human or automated that implement a knowledge action on knowledge resources to develop the knowledge needed (Holsapple and Joshi, 2000, 2004). Holsapple and Joshi offer the following as generic examples of knowledge activities used by knowledge processors:

> Acquiring knowledge (from sources external to the organization), selecting knowledge (from the organization's own resources), generating knowledge (by deriving it or discovering it), internalizing knowledge (through storage and/or distribution within the organization), and externalizing knowledge (either explicitly or implicitly in the organization's outputs) (Holsapple and Joshi, 2000, p. 237).

If the knowledge need is satisfied, it will result in either learning, projection, or a combination of the two. Learning is a change in the current state of an entity's knowledge, where projection is an emission or output such as a decision, a service, or a tangible product for a customer. However, while this is occurring, the knowledge activities performed by the knowledge processors can be either constrained or facilitated by various knowledge management influences (Holsapple & Joshi, 2001, 2002b). It will be these KM influences which will be the focus of this research.

Based on the work that Holsapple and Joshi conducted as part of their "three-fold" framework, they developed their "influences on the management of knowledge" framework to address the knowledge management influences identified in their

architecture of a KME (Holsapple & Joshi, 2000, 2002a) In an effort to identify potential KM influences, Holsapple and Joshi (2000) reviewed literature and found a broad range of influences (Table 1).

Table 1. Holsapple and Joshi's Preliminary List of Influences (2000b)

Influences	Sources
Culture	• Leonard-Barton, 1995 • Arthur Andersen and APQC, 1996 • Szulanski, 1996 • van der Spek and Spijkervet, 1997
Leadership	• Arthur Andersen and APQC, 1996
Technology	• Arthur Andersen and APQC, 1996 • van der Spek and Spijkervet, 1997
Organizational adjustments	• Szulanski, 1996 • van der Spek and Spijkervet, 1997
Evaluation of knowledge management activities and/or knowledge resources	• Wiig, 1993 • Andersen and APQC, 1996 • van der Spek and Spijkervet, 1997
Governing/administering knowledge activities and/or knowledge resources	• Wiig, 1993 • Leonard-Barton, 1995 • Szulanski, 1996 • van der Spek and Spijkervet, 1997
Employee motivation	• Szulanski, 1996 • van der Spek and Spijkervet, 1997
External factors	• van der Spek and Spijkervet, 1997

Based on the results of the Delphi study, a final "influences on the management of knowledge" framework was developed (Figure 6) (Holsapple & Joshi, 2000). The framework is organized into three main categories: managerial influences, resource influences, and environmental influences (Holsapple & Joshi, 2000).

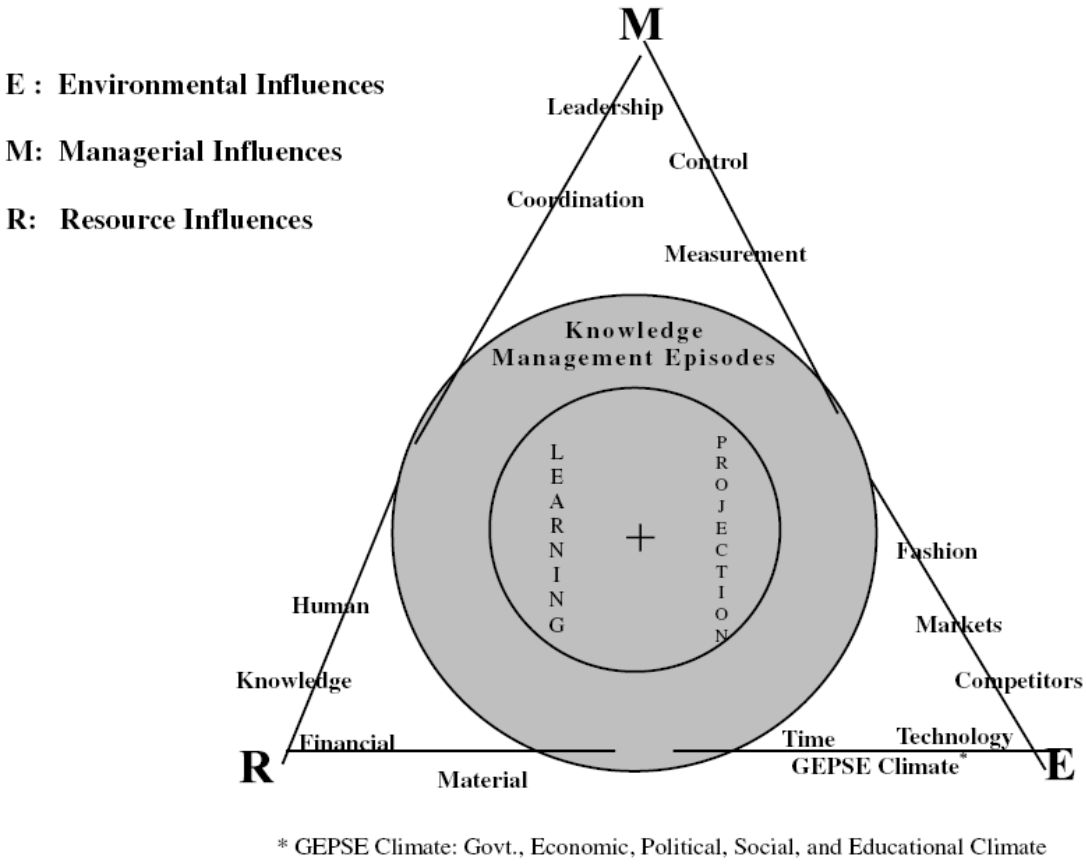

Figure 6. Knowledge Management Influences (Holsapple & Joshi, 2000)

Managerial Influences.

Managerial influences are affected by those individuals responsible for administering the knowledge in an organization. "The framework partitions these influences into four main factors: exhibiting leadership in the management of knowledge, coordinating the management of knowledge, controlling the management of knowledge, and measuring the management of knowledge" (Holsapple & Joshi, 2000, p. 239).

Leadership.

Of the four managerial influences, Holsapple and Joshi (2000, 2002a, 2004) identify leadership as primary. This position is supported by the literature as critical to

the success of KM initiatives (Davenport et al, 1998; Davenport and Prusak, 1998; Grover and Davenport, 2001; Wong, 2005). According to Holsapple and Joshi (2000), "[The] distinguishing characteristic of leadership is that of being a catalyst through such traits as inspiring, mentoring, setting examples, engendering trust and respect, instilling a cohesive and creative culture, listening, learning, teaching (e.g., through storytelling), and knowledge sharing" (p.241). It is quality of leadership and resources that allow KM initiatives to achieve their greatest impact (Tirpak, 2005).

For KM to be successful, KM leaders must exist at every level of the organization. It is important that KM leaders possess the qualities and skills necessary to represent KM in an organization. Holsapple and Joshi (2000) describe a KM leader as someone who, "creates conditions that allow participants to readily exercise and cultivate their knowledge manipulation skills, to contribute their own individual knowledge resources to the organization's pool of knowledge, and have easy access to relevant knowledge resources" (p. 241). The most visible proponent of KM in an organization will most likely be a Chief Knowledge Officer (CKO), but often it is those who are practicing and employing KM techniques daily that make KM a success. It is often the less visible, "cadre of managers who understand knowledge and its uses in various aspects of the business, the motivational and attitudinal factors necessary to get people to create, share, and use knowledge effectively, and the ways to use technology to enhance knowledge activities" (Grover and Davenport, 2001, p. 10), who make KM a organizational success. Heibeler (1996) identifies, "a lack of commitment of top leadership to sharing organizational knowledge or there are too few role models who exhibit the desired behaviors" (p. 24), as reasons why organizations are unable to

effectively leverage their knowledge assets. For KM success, organizations need to develop leaders at all levels to appreciate knowledge resources, knowledge activities, and KM influences (Holsapple and Joshi, 2000b).

Coordination.

According to Malone and Crowston (1994), "coordination is managing dependencies between activities" (p.87). Coordination promotes knowledge development by determining which KM activities to perform, the sequence to perform those activities in, who will perform those activities, and which knowledge resources will be utilized by each activity (Holsapple and Joshi, 2000). As part of this planned approach, there are many dependencies that must be managed, which include:

> Those among knowledge resources (e.g., alignment of participants' knowledge with strategy, diffusion of knowledge among participants), those among knowledge activities (e.g., which activities are undertaken under varying circumstances), those between knowledge resources and other resources (e.g., what financial resources are to be allocated for knowledge manipulation activities, which participants are assigned to which infrastructure roles), and those between resources and knowledge activities (e.g., use of knowledge activities to improve knowledge resources, allocating knowledge resources among competing knowledge manipulation activities (Holsapple & Joshi, 2002a, pp. 59-60).

Furthermore, Holsapple and Joshi (2000) add:

> Coordination involves not only managing dependencies, but marshaling sufficient skills for executing various activities, arrangement of those activities in time (within and across KM episodes), and integrating knowledge processing with an

organization's operations (e.g., What knowledge activities are involved and necessary for managing inventory operations?). (p. 240)

Organizations use various coordination approaches to manage dependencies such as, linking rewards to sharing, establishing communications for knowledge sharing, and creating programs for learning (Holsapple and Joshi, 2002a).

Control.

"Control is concerned with ensuring that needed knowledge resources and processors are available in sufficient quality and quantity, subject to required security" (Holsapple and Joshi, 2000, p. 240). Of the three, the protection of and quality of knowledge resources are the two primary control issues (Holsapple and Joshi, 2000). Holsapple and Joshi (2000) state the following:

> Protecting knowledge resources from "loss, obsolescence, unauthorized exposure, unauthorized modification, and erroneous assimilation is crucial for the effective management of knowledge. Approaches include legal protection (e.g., patents, copyrights), social protection (e.g., hiring people who can blend with the current culture and help sustain current values and norms), and technological protection (e.g. security safeguards). (p. 240)

Holsapple and Joshi (2000) describe knowledge quality control issues as:

> In establishing sufficient controls to govern the quality of knowledge used in an organization, management needs to consider two dimensions: knowledge validity and knowledge utility. Validity is concerned with accuracy, consistency, and certainty; utility is concerned with clarity, meaning, relevance, and importance. (p. 240)

Measurement.

Measurement serves as the mechanism to measure knowledge resources, knowledge manipulation skills and activities, the results of organizational learning in reference to KM, and the valuation of knowledge resources and processors (Holsapple and Joshi, 2002a). It also offers management and stakeholders a means to assess and compare KM activities, to determine the value or worthiness of a KM initiative, and ways of evaluating the impact of KM on bottom-line performance (Holsapple and Joshi, 2000; Wong, 2005). Additionally, measurement serves as a basis for evaluating leadership, coordination, and control (Holsapple and Joshi, 2000). Skyrme and Amidon (1998) add that the three main reasons for measuring intangible assets are to provide a basis for company valuation, focus management efforts, and justifying KM activities.

However, measuring knowledge resources is a difficult process and there are opposing views as to whether or not it can actually be accomplished. It must be noted that measurement indicators need not be strictly financial , but that they can also be non-financial (Holsapple & Joshi, 2000, 2002a; Webber, 1996; Wong, 2005) However, Holsapple and Joshi (2002a) emphasize that it is best to link those indicators to financial impacts to achieve greater results. Despite the varying opinions, Holsapple and Joshi (2000) state that "the framework contends that KM initiatives are impacted whether an organization attempts to measure its knowledge resources and/or performance of its knowledge activities, how it goes about measuring these, and how effective the measures are" (p. 240).

Resource Influences.

Similar to managerial influences, resource influences affect the conduct of an organization's KM efforts. Resources are critical because they can govern the quantity and quality of KM efforts (Wong, 2005). Resource influences are an organization's resources that are used to affect, either positively or negatively, its conduct of knowledge management (Holsapple & Joshi, 2004). Holsapple and Joshi (2000) separate the resources influences into: financial resources, human resources, material resources, and knowledge resources.

Financial Resources.

Financial resources are important to KM because they ultimately determine how much can be expended on knowledge activities. "Increasing the financial resources available for a knowledge activity (e.g. acquiring some needed knowledge) may affect the efficiency of that activity or the quality of its results positively or negatively" (Holsapple & Joshi, 2000, p. 241). Additionally, the factors of leadership, coordination, control, and measurement are impacted by the availability of financial resources (Holsapple & Joshi, 2000).

Human Resources.

The essential mechanism for performing the knowledge activities that make up a KME are called knowledge manipulation skills (Holsapple and Joshi, 2000). These knowledge manipulation skills can serve to either enhance or restrict KM in an organization and reside in two places. The first is in humans, which then the skills are considered human resources. Human resources also involve the effective recruitment of employees to bring new knowledge and competences to an organization and efforts taken

to retain knowledge from being lost (Wong, 2005). "Human resources are needed to coordinate and mange the implementation processes as well as to take up knowledge-related roles" (Wong, 2005, p. 272). In addition to impacting KMEs, human resources can directly enable or restrict the managerial influences.

Material Resources.

As was stated previously, the knowledge manipulation skills used to perform a knowledge activity reside in two places. The first was in humans, the second is in computers. When knowledge activities are performed by a computer, the knowledge manipulation skills are considered material resources. Wong (2005) identifies information technology as an essential enabling factor for KM. Similar to human resources, material resources can serve to enhance or restrict KM in an organization.

Knowledge Resources.

Ultimately, knowledge resources are the primary focus when attempting to manage knowledge. Holsapple and Joshi (2000) state:

> As the raw materials for knowledge activities, knowledge resources available in an organization necessarily influence its KM and the resultant learning, projection, and innovation. Some knowledge resources also affect KM by serving as the basis for coordination, control, measurement, and leadership. (p. 241)

Holsapple and Joshi (2000) describe major types of knowledge resources as including "participants' knowledge (both human and computer-based), artifacts, culture, and strategy. Each can be examined along various attribute dimensions (e.g., tacit vs. explicit, descriptive vs. procedural vs. reasoning) and studied from the standpoint of its influence on KM" (p.241). As can be seen in Figure 7, Holsapple and Joshi (2002a)

identify participant's knowledge, artifacts, infrastructure, culture, strategy, and purpose as the types of knowledge resources.

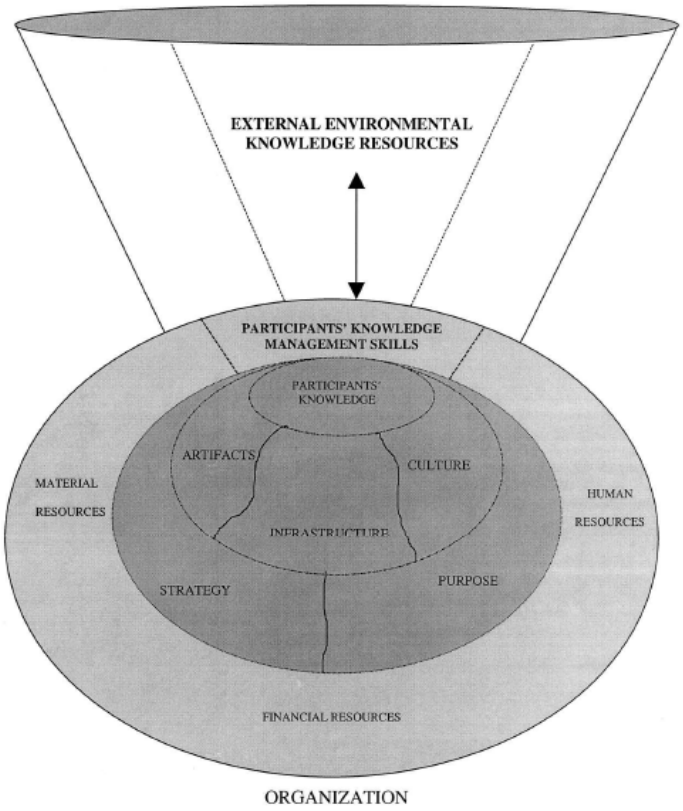

Figure 7. Types of Knowledge Resources (Holsapple & Joshi, 2002a)

Environmental Influences.

Unlike the managerial and resource influences, environmental influences can be considered as external to an organization. "The environment determines or constrains what knowledge resources should or can be acquired, as well as what the knowledge manipulation skills are available (via a labor pool or available technology)" (Holsapple & Joshi, 2002a, p. 60). The environmental factors identified in the Holsapple and Joshi's (2000) "influences on the management of knowledge" framework include competition, fashion, markets, technology, time, and the GEPSE (governmental, economic, political,

social, and educational) climate. Because this category of environmental influences is external to the organization, the organization has little to no control over the factors listed; therefore, not much research in the KM literature can be found (Bartczak, 2002; Holsapple & Joshi, 2000, 2002a; Wong, 2005).

Knowledge Management in the United States Air Force

The Department of Defense (DoD) feels future wars will be waged by joint forces consisting of the different branches of the military and coalition partners.; the Chairman of the Joint Chiefs of Staff has identified knowledge as one of the key enablers required for this integration to happen (Department of Defense [DoD], 2005a). The DoD's goal for these joint forces is "to have the technical connectivity and interoperability necessary to rapidly and dynamically share knowledge amongst decision-makers" (DoD, 2005d, p. 3). As can be seen in Figure 8, being knowledge empowered is identified as an essential characteristic of a joint force (DoD, 2005a).

The future joint force must be:

Knowledge empowered
Networked
Interoperable
Expeditionary
Adaptable / Tailorable
Enduring / Persistent
Precise
Fast
Resilient
Agile
Lethal

Figure 8. Joint Forces Characteristics (DOD, 2005a)

Paragraph 4.E.1., titled Knowledge Empowered, of the *Capstone Concept for Joint Operations* (2005a) states:

> The future joint force will emphasize better decisions made faster throughout all levels of command. The fundamentals of this knowledge empowerment are experienced and empowered decision makers benefiting from an enhanced understanding of the environment, potential adversaries and cultures, as well as enhanced collaborative decision making processes. Although we will never eliminate the fog of war, an increased level of understanding should empower leaders through the joint force. This will enable them to anticipate the act as opportunities are present, apply innovative solutions, mitigate risk, and increase the pace, coherence, and effectiveness of operations even in complex environments. A knowledge-empowered force, capable of effective information sharing across all agencies and partners, will be able to make better decisions quicker, increasing joint force effectiveness. (p. 21)

According to the *Major Combat Operations Joint Operating Environment*, "A pervasive knowledge capability is the first step in creating the sense of futility and impunity in the mind of our adversary" (DoD, 2004, p. 16). By converting superior information to superior knowledge these joint forces will be able to attain decision superiority, giving the joint forces a combat advantage (DoD, 2003). In order for this knowledge empowerment to occur, the DoD envisions joint forces operating in a network-centric operating environment (NCOE).

In describing a NCOE, the *Net-Centric Environment Joint Functional Concept* states, "The central idea this concept proposes is that if the Joint Force fully exploits both

shared knowledge and technical connectivity, then the resulting capabilities will dramatically increase mission effectiveness and efficiency" (DoD, 2005c, p. v). The "resulting capabilities" are further explained as, "human interaction through knowledge sharing enabled by the dramatic advances in information technology" (DoD, 2005c, p. 1). The NCOE offers many advantages to the warfighter, some of which include efficiency, cross functional synergy, joint cohesion, collaboration with mission partners, decision superiority, and rapid adaptability at the tactical, operational and strategic levels (DoD, 2005d). To achieve these advantages, fundamental actions such as acquiring, refining, and sharing knowledge must be taken (DoD, 2005a). Figure 9 shows the current state of knowledge sharing in the DoD and how the DoD sees knowledge sharing's role in a NCOE.

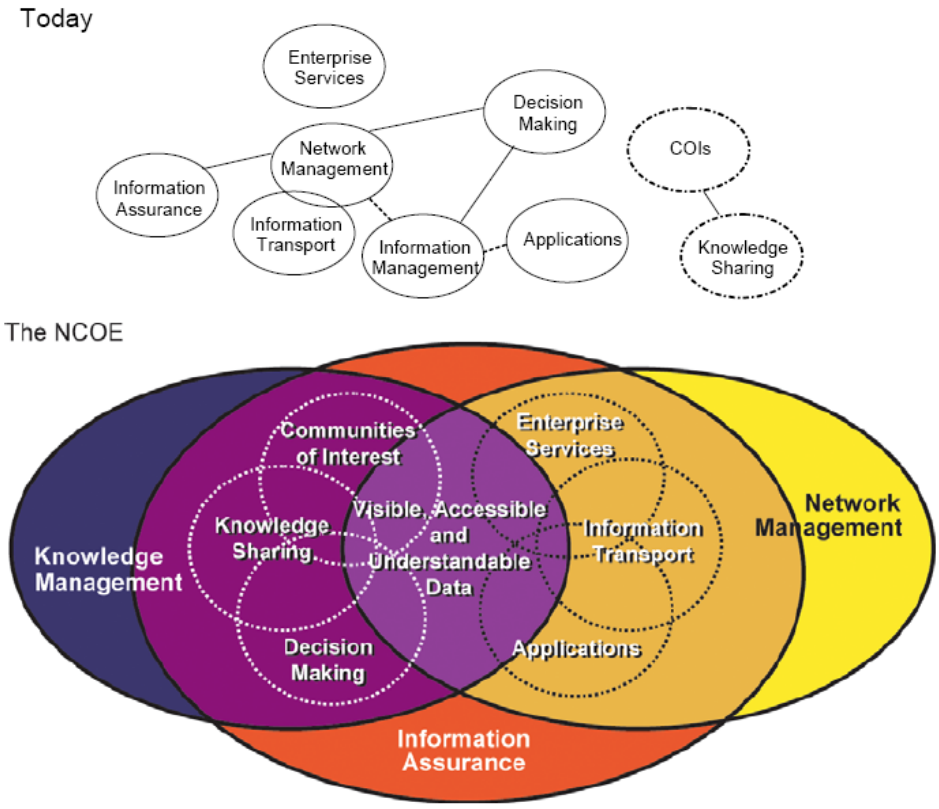

Figure 9. Transformation to the NCOE (DoD, 2005d)

The DoD sees the importance of knowledge growing significantly in the future. In fact, they feel "knowledge will be so critical to success that there will be a knowledge superiority organization responsible for ISR, IO, knowledge management, knowledge readiness, cyber collection, and non-traditional collection and analysis" (DoD, 2005b, p. 86). And because of the importance of knowledge, "adversaries will wage a 'knowledge war' over valuable knowledge – physically and in cyberspace" (DoD, 2005b, p. 80). A knowledge war is described as, "[a] future leader will attack, destroy, or disturb knowledge and knowledge machinery supporting an adversary's decision making processes and apparatus" (DoD, 2005b, p. 90). "The United States will need its best and brightest as knowledge warriors who will engage adversary capabilities in knowledge war" (DoD, 2005b, p. 87). Following DoD guidance, the different branches of the military are pursuing KM efforts as well.

The United States Air Force, an organization faced with ever-increasing mission requirements and ever-decreasing resources, has recognized the necessity to effectively manage its knowledge. "Precision is one of the fundamental requirements that underpin the effectiveness of air and space power. To be precise in the application of force requires knowledge" (Department of the Air Force [DoAF], 2003, p. 80). The *Air Force Information Strategy* (2002) identifies as one of its nine main goals as, "Implement knowledge management practices and technologies to assure knowledge is identified, captured, and shared" (DoAF, 2003, p. 4). It goes on to state, "Knowledge management practices are an essential element to an overall information management strategy for the Air Force" (DoAF, 2003, p. 11). In an effort to ensure KM received the attention it

needed, in February of 2004, former Air Force Chief Information Officer Mr. John Gillian signed a memorandum that appointed the Air Force Material Command's Air Force Knowledge Now program as the Air Force Center of Excellence for Knowledge Management. In that memorandum, Mr. Gilligan stated, "Knowledge Management is a key component in our Air Force strategy to enable effective net centric operators. That is, Knowledge Management enables transfer and retention of expertise and organization knowledge across boundaries" (Gilligan, 2004). While the Air Force has made progress in the area of KM, overall KM in the Air Force is moving at a slow pace (Bartczak, 2002; Nguyen, 2000).

Efforts are being made within the Air Force to develop a greater knowledge-centric view of operations. Nguyen (2000) offered a plan which stated:

> The Air Force must ensure that its warfighters have access to the knowledge they need, when they need it, and in the required form, in order to achieve desired mission outcomes and information superiority. To that end, it faces the challenge of implementing Knowledge Management (KM) principles and standards across the Air Force in order to retain the knowledge that exists in the minds of those who are leaving, so that it can be transferred to its younger and less-experienced personnel. (p. 1)

Further efforts have resulted in the Air Force's Knowledge Based Operations (KBO) concept. The vision of the Air Force's KBO is stated as, "[Providing] information, tools, and services to enable timely, effective decision making and knowledge building across all domains and functional areas within the Air Force enterprise." (DoAF, 2006, pp. 5-6).

Within the KBO Strategic Plan, the KBO Enabling Concept is identified as the document responsible for:

> [Describing] how KBO will work in the Air Force and the effects it will have on the daily mission of Airmen. This document will also describe operational scenarios to assist the warfighter, policy maker, and supporter's understanding of the overall strategy (DoAF, 2006, pp. 5-6).

However, the KBO Enabling Concept focuses primarily on information management and information technologies. In response to the KBO Enabling Concept's information focus and lack of KM attention, the Air Force Center of Excellence for Knowledge Management wrote the U*.S. Air Force Knowledge-Centric Operations (KCO) Enabling Concept*. The KCO was intended as a complement to the KBO and was written to address the "people" element , which was missing in the KBO (Sasser, 2006). According to an employee of the Air Force Center of Excellence for Knowledge Management, "Both documents are still in draft form and seem to have stalled. We haven't seen any movement in months." The following section will discuss the Air Force Center of Excellence for Knowledge Management in more detail.

The Air Force Center of Excellence for Knowledge Management

Organizational Command Structure.

The Air Force Material Command (AFMC) is one of the United States Air Force's nine major commands (MAJCOMs) (Figure 10). It currently employs nearly 78,000 personnel comprised of approximately 21,000 military and 57,000 civil service employees (Air Force Material Command [AFMC] Pamphlet, 2006). For fiscal year

2006, AFMC had a $44.7 billion budget, which was approximately 30 percent of the Air Force's total budget (AFMC Pamphlet, 2006). AFMC's mission is:

> [To deliver] war-winning expeditionary capabilities to the warfighter through development and transition of technology, professional acquisition management, exacting test and evaluation, and world-class sustainment of all Air Force weapon systems. From cradle-to-grave, AFMC provides the work force and infrastructure necessary to ensure the United States remains the world's most respected Air and Space Force. (AFMC Fact Sheet, 2006)

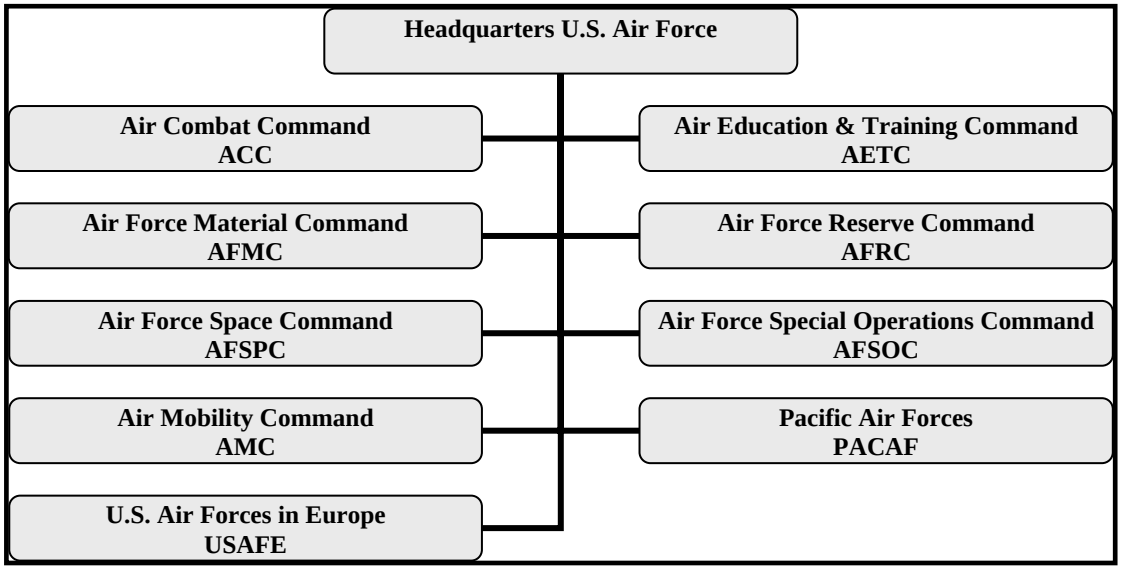

Figure 10. United States Air Force Major Commands

AFMC accomplishes its mission through specialized laboratories, product centers, test centers, field operating agencies, air logistic centers, and other specialized centers (Figure 11). These units provide the "cradle-to-grave" oversight for the Air Forces weapons systems, which include aircraft and munitions. This is done through product development, acquisition, testing, maintenance, and retirement of those weapon systems.

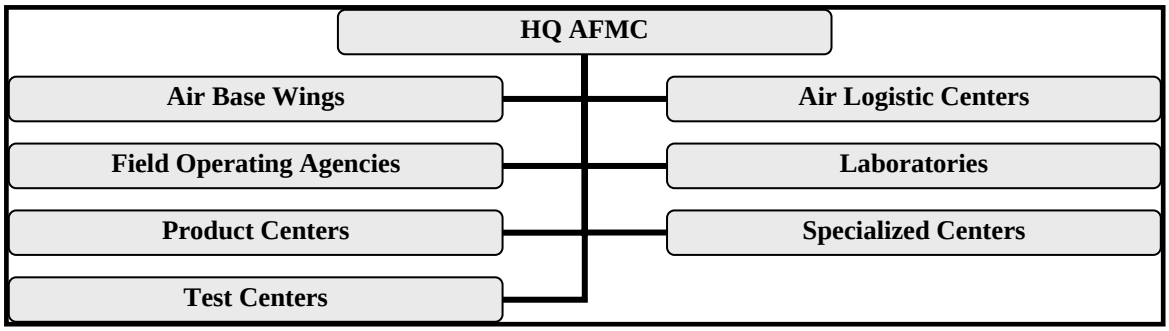

Figure 11. Air Force Material Command

AFMC's headquarters (HQ) function is responsible for providing support and guidance to its operational units. HQ AFMC is broken down into a series of directorates and functional areas (Figure 12). It is within A8, the Strategic Plans and Programs Directorate, as an element of A8C, the Strategic Organizational Development Division, that the Air Force Center of Excellence for Knowledge Management resides (Figure 13). The mission of the A8 directorate is to provides the strategic planning and programming for AFMC.

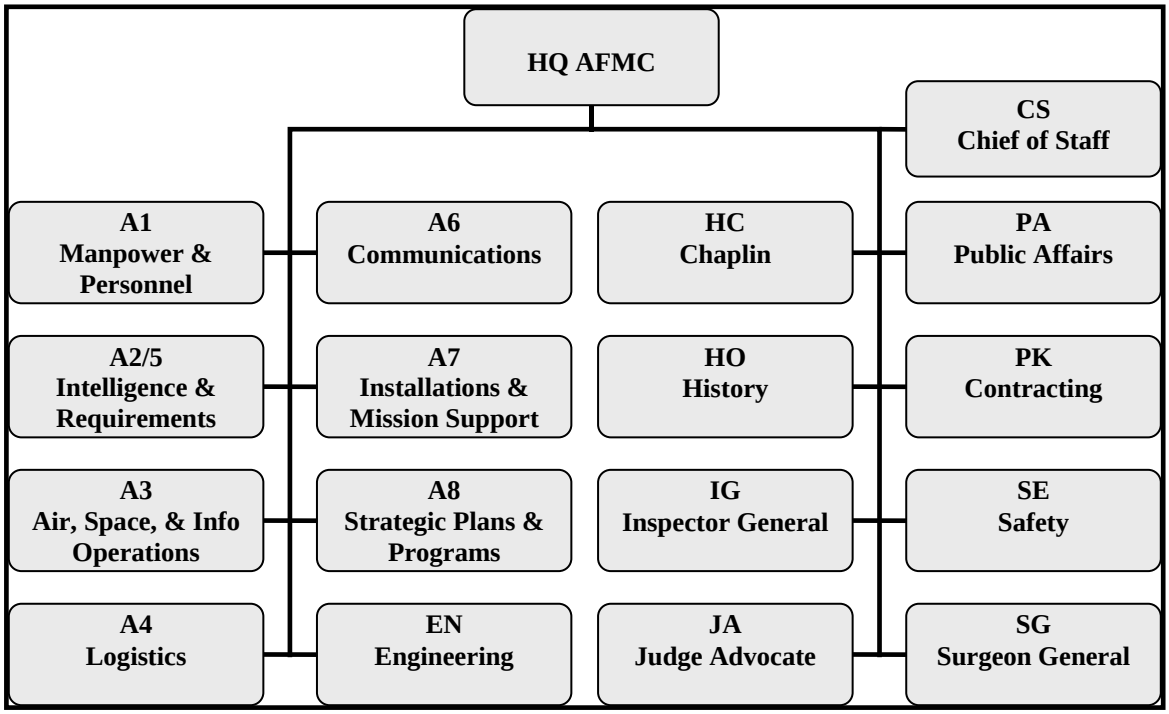

Figure 12. HQ AFMC Organizational Structure

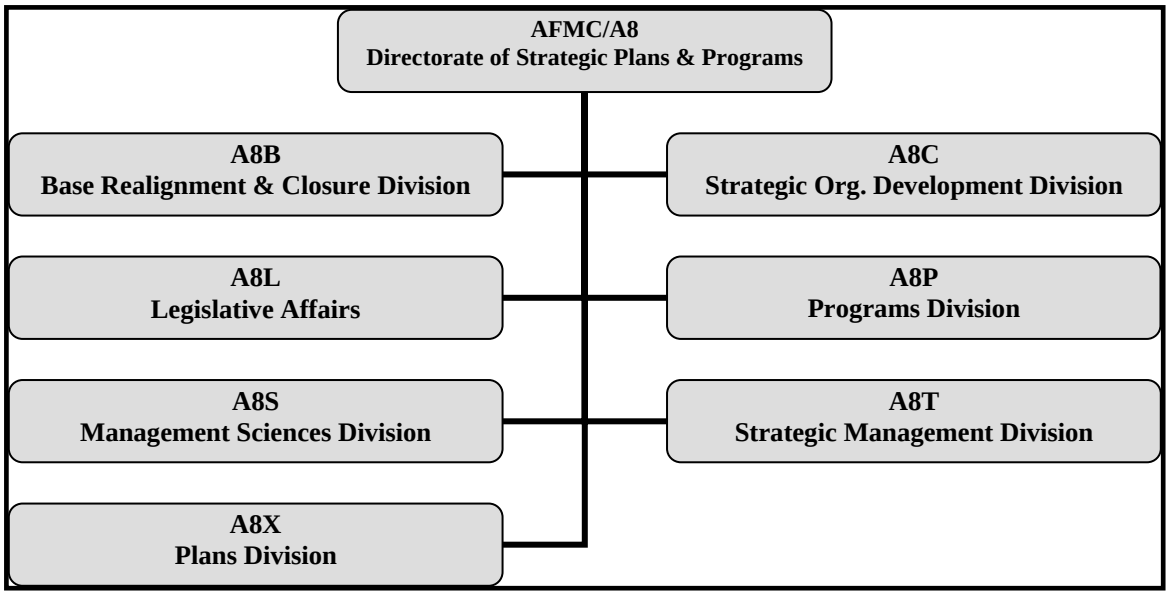

Figure 13. AFMC/A8 Organizational Structure

History.

The Air Force's KM efforts grew out of an AFMC office responsible for maintaining the Air Force's documents in the Defense Acquisition Deskbook program. After using only $500,000 of its $1,500,000 budget, the Deskbook team was presented with an opportunity to pursue an Air Force Lessons Learned program (Bartczak & England, 2005). While researching the system's design, the team encountered the concept of KM and adopted it because they felt that it accurately represented what they were trying to accomplish. Because of the importance of knowledge for decision making, the team decided to take the approach of designing their system to enhance the creation, sharing, and use of knowledge (Bartczak & England, 2005). Along with the Deskbook and Lessons Learned project, a web-based training program was developed by Mr. Randy Adkins, a AFMC civilian employee with over 20 years of experience. Mr. Robert Mulcahy, the deputy director of requirements, placed Mr. Adkins in charge of an effort to combine the Desktop, Lessons Learned, and the web-based training into a new

program called the Air Force Knowledge Management (AFKM) program (Bartczak & England, 2005). In 2002, this single site became known as the Air Force Knowledge Now (AFKN) (Adkins, 2005). Then in 2004, Mr. John Gilligan, former Air Force Chief Information Officer, wrote a memorandum that identified the AFKN team as the Air Force Center of Excellence for Knowledge Management. Within that memorandum, he wrote, "I have reviewed several Knowledge Management initiatives across the Air Force and determined the most mature and successful to date is the 'Air Force Knowledge Now' that has been developed by AFMC" (Gilligan, 2004).

Manning.

In September of 2006, the Air Force Center of Excellence for Knowledge Management employed 37 personnel, which consisted of 3 military, 9 civil service employees, and 25 contractors (Figure 14). The contractor staff consists of the following five contractor companies: IM Systems Group, LogTec, Sawdey Solution Services, SRA, and Triune.

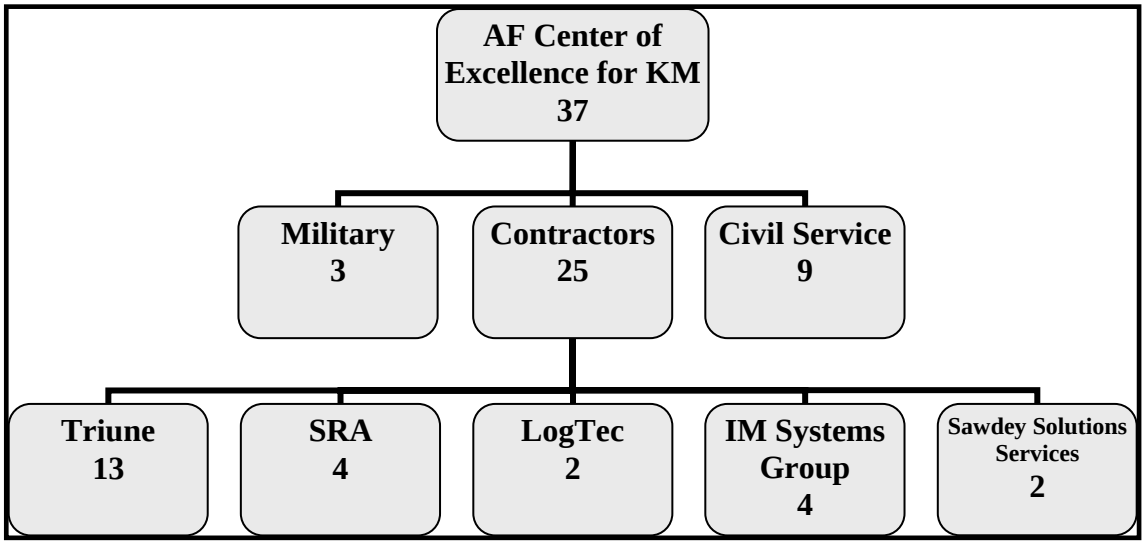

Figure 14. Air Force Center of Excellence for Knowledge Management Manning

Services.

The Air Force Center of Excellence for Knowledge Management has two primary areas of service: the AFKN website and workshops. The AFKN website is the technical element, or the tool, and the workshops are individualized KM education and solutions provided by consultants. The methodology used by the Air Force Center of Excellence for Knowledge Management is shown in Figure 15.

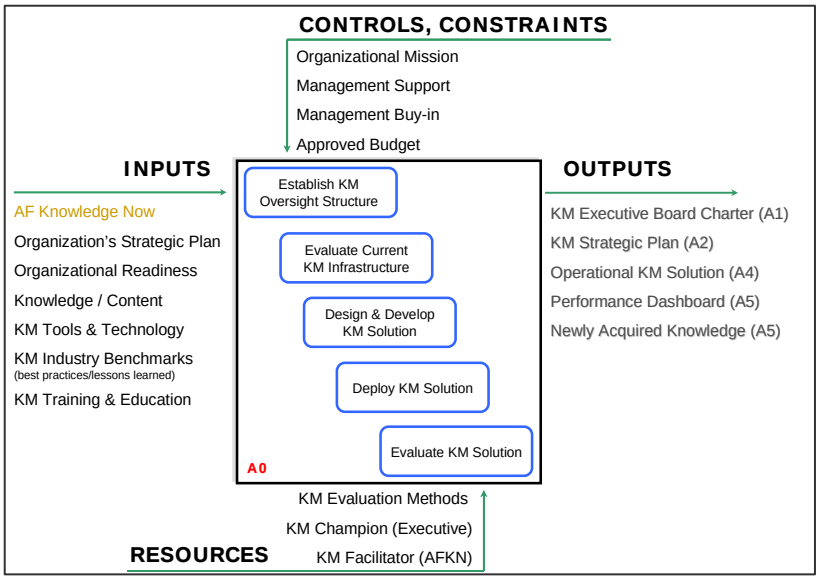

Figure 15. The AFKN Methodology

Air Force Knowledge Now.

Born out of Deskbook, Lessons learned, Help Desk, and the Virtual Schoolhouse, AFKN is the technical element of the Air Force Center of Excellence for Knowledge Management. AFKN promotes online knowledge sharing through virtual interaction and collaboration. Within AFKN, there are several key areas that are used to facilitate knowledge sharing and they are: Knowledge Discovery, Air Force Deskbook, Communities of Practice (CoPs), and Wisdom Exchange. Each of these areas will now be discussed in detail.

Knowledge Discovery.

AFKN employs the powerful Verity search engine to search through websites, Air Force Deskbook, AFKN CoPs, AFKN Documents, publications, and Points of Contact (POCs). Figure 16 shows the basic search provided from the AFKN homepage. The Search Smarter feature allows users to select a more restrictive set of parameters (Figure 17).

Figure 16. The Basic AFKN Search Feature

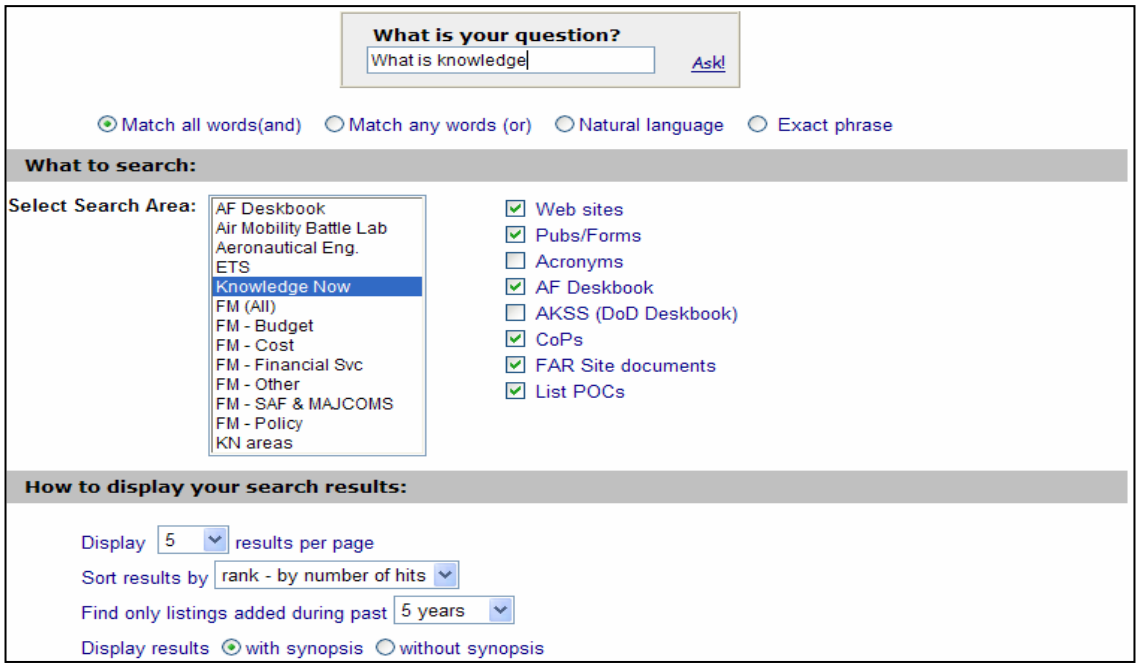

Figure 17. The AFKN "Search Smarter" Function

Air Force Deskbook.

AF Deskbook is an annually validated information section of AFKN. The types of information contained in AF Deskbook include: acronyms, common practices, forms, keywords, references, samples and examples, website links, and lessons learned. Additionally, AF Deskbook provides users the capability of rating the information based on its perceived usefulness. Figure 18 shows the AF Deskbook function of AFKN.

Figure 18. Air Force Deskbook

Communities of Practice.

A CoP is a virtual workspace where community members can access shared information. As of September 2006, AFKN had approximately 4,500 CoPs. There are varying levels of control within the CoPs and they are: open CoPs that are open to anyone in AFKN; entry CoPs that can only be accessed by password, but have an description that can be read; and closed CoPs that require a password for access and do not have a description. Each CoP can be customized to meet security and knowledge needs of its users. Figure 19 is an example of the top layer of a CoP.

Figure 19. Community of Practice Workspace

Wisdom Exchange.

The AFKN Wisdom Exchange allows users to post questions on a bulletin board. Those questions are then responded to by subject matter experts (SMEs). From that point, the user and the SME can continue a virtual dialogue to resolve the issue. The dialogs within the Wisdom Exchange are searchable by AFKN users. The screen used to post a question is shown in Figure 20.

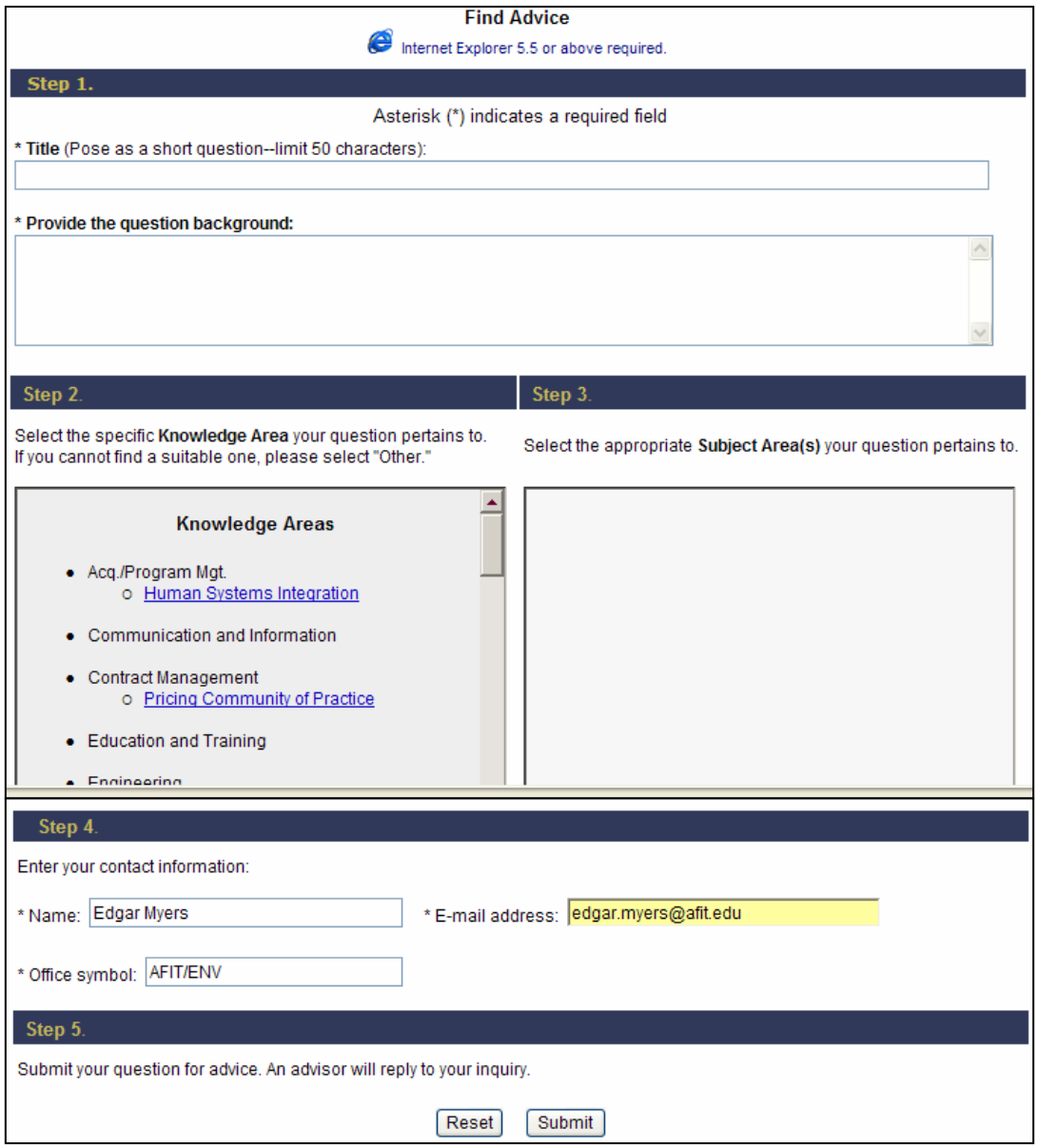

Figure 20. Wisdom Exchange

KM Workshops.

In addition to offering the AFKN website, the Air Force Center of Excellence for Knowledge Management provides personalized KM workshops. During a workshop, consultants provide a variety of services that include: KM education, AFKN website training, tying KM to the customer's mission, strategic planning, and change management. Because these workshops are offered for a fee, the depth and breadth of

training and guidance is dependent on the customer's budget. Figure 21 represents the input and output concepts that are discussed during a workshop.

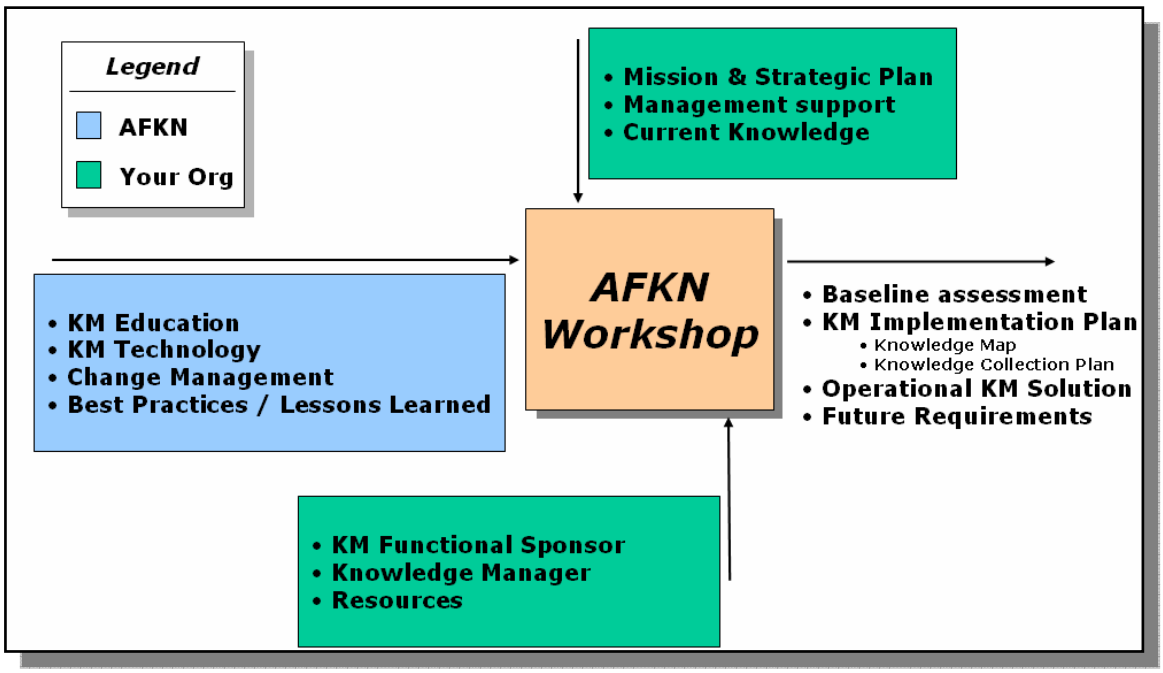

Figure 21. AFKN Workshop Inputs and Outputs (Brook, 2005)

AFKN Usage Metrics.

AFKN provides a great deal of metrics for the Air Force Center of Excellence for Knowledge Management. Because of the large amount of data that has been stored, the Air Force Center of Excellence for Knowledge Management is capable of doing a great deal of trend analysis on user access patterns. This data shows the exponential growth that is occurring with both the number of users and the number of CoPs in AFKN. Figure 22 shows the growth in user accounts from 409 user accounts in May 2002, to 117,885 user accounts in August 2006. Figure 23 shows the growth in number of CoPs from 120 CoPs in November 2002, to 4,590 CoPs in July of 2006.

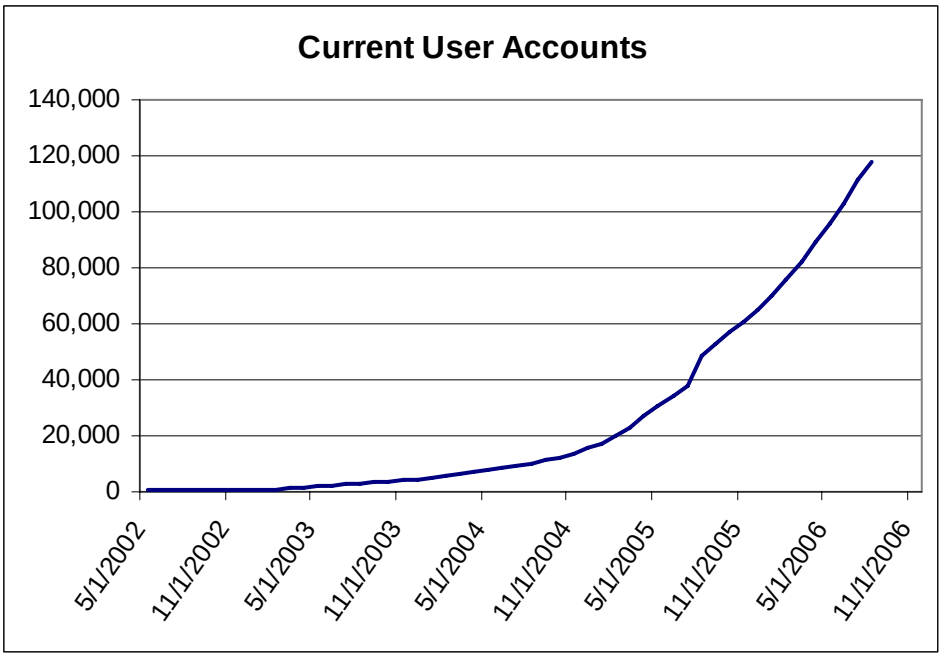

Figure 22. Air Force Knowledge Now User Account Metrics

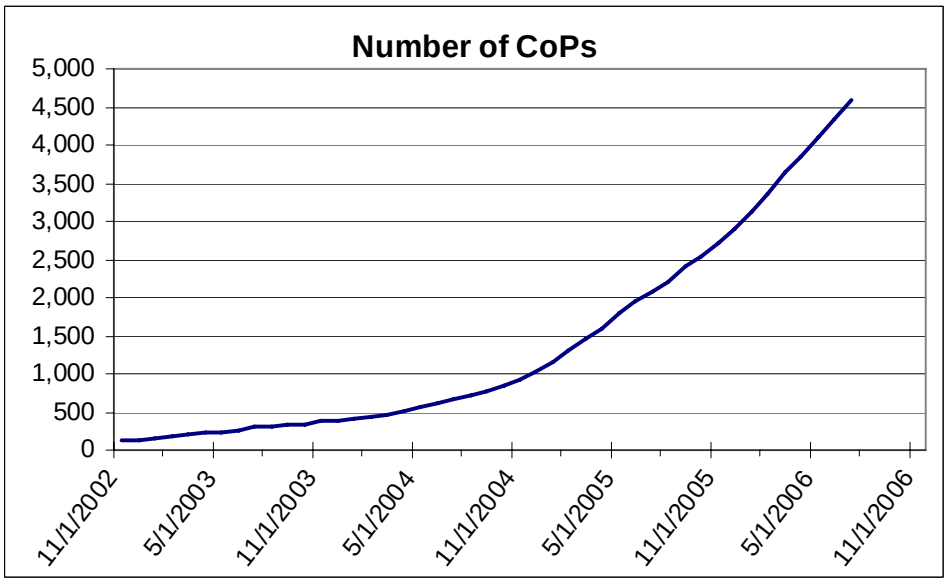

Figure 23. Air Force Knowledge Now CoP Metrics

Chapter II has provided working definitions of knowledge and knowledge management. Additionally, the theoretical framework being used in this research, Holsapple and Joshi's (2000) "influences on the management of knowledge" framework, was presented. Chapter II also provided a discussion on KM in the Air Force and a

description of the Air Force Center of Excellence for Knowledge Management. Chapter III will describe the research design, data collection and analysis techniques, and the limitations of this study.

III. Methodology

Overview

The purpose of this study is to identify those influences which act as barriers to knowledge management (KM) implementation efforts in the Air Force Center of Excellence for Knowledge Management. Holsapple and Joshi's "influences on the management of knowledge" framework (2000) will be used as the guide. A case study design will be used to examine the KM influences in the Air Force's Center of Excellence for Knowledge Management. A explanation of case study research, explanation of the components of a case study research design, an overview of how the research will be conducted, and a review of the research questions are presented in this chapter.

Research Strategies

When selecting a research strategy, the researcher is driven by the conditions that surround the research. Yin (2003b) offers that there are five primary research strategies: experiments, surveys, archival analysis, histories, and case studies. The following three conditions direct which strategy should be selected: 1) the type of research question posed, 2) the extent of control an investigator has over actual behavioral events, and 3) the degree of focus on contemporary as opposed to historical events (Yin, 2003b).

Yin (2003b) suggests that the most important of the three conditions is the type of research question being asked. When discussing "what" questions, Yin (2003b) offers the following:

> If the research questions focus mainly on "what" questions, either of two possibilities arises. First, some types of "what" questions are exploratory.… The goal being to develop pertinent hypotheses and propositions for further inquiry. However, as an exploratory study, any of the five research strategies can be used – for example, an exploratory survey, an exploratory experiment, or an exploratory case study. The second type of "what" question is actually a form of a "how many" or "how much" line of inquiry…. Identifying such outcomes is more likely to favor survey or archival strategies than others. For example a survey can be readily designed to determine the "what," whereas a case study would not be an advantageous strategy. (pp. 5-6)

Similar to the second type of "what" questions, "who," "where," "how many," and "how much" questions tend to lend themselves to surveys or the archival record analysis (Yin, 2003b). In contrast, "how" and "why" questions are more explanatory and lead to the use of case studies, histories, and experiments (Yin, 2003b). In summary, Yin (2003b) states:

> The first and most important condition for differentiating among the various research strategies is to identify the type of research question being asked. In general, "what" questions may either be exploratory (in which case any of the strategies could be used) or about prevalence (in which surveys or the analysis of archival records would be favored). "How" and "why" questions are likely to favor the use of case studies, experiments, or histories. (p. 7)

Based on the first criteria, this research's questions "how" and "why" questions favored a case study strategy.

The second condition used when selecting a research strategy is based on the extent of control that investigator has over actual behavior events (Yin, 2003b). "Assuming that 'how' and 'why' questions are to be the focus of the study, a further distinction among history, case study, and experiment is the extent of the investigator's control over and access to actual behavioral events" (Yin, 2003b, p. 7). Because the investigator had no control over actual behavioral events, the research was better suited for any of the strategies other than an experiment, which includes a survey, an archival analysis, a history, or a case study.

The third condition explored when determining a research strategy is the degree of focus on contemporary versus historical events. When the investigator has no access or control over an event, histories are the preferred strategy; however, if the research involves a contemporary event, then the case study is the preferred strategy. Because this research was focused on a contemporary event, identifying barriers to KM in the Air Force Center of Excellence for Knowledge Management, a case study was the preferred method. Table 2 shows how each of the three conditions apply to the different research strategies.

Table 2. Relevant Situations for Different Research Strategies (Yin, 2003b)

Strategy	Form of Research Question	Requires Control of Behavioral Events?	Focuses on Contemporary Events?
Experiment	how, why?	Yes	Yes
Survey	who, what, where, how many, how much?	No	Yes
Archival analysis	who, what, where, how many, how much?	No	Yes / No
History	how, why?	No	No
Case study	how, why?	No	Yes

After comparing the three conditions used to direct the research strategy with the details of this research, a case study became the apparent choice. This research asked "how" and "why" questions, the investigator had no control over actual behavioral events, and a contemporary event was investigated.

Case Study Research

Yin (2003b) offers that the ideal situation where a case study should be used is one where, "a "how" or "why" question is being asked about a contemporary set of events, over which the investigator has little or no control" (p. 9). After examining the research design in relation to the proposed research questions, it appeared that a case study design would be most appropriate for this study.

In defining a case study as a research strategy, Yin (2003b) offers two technical definitions. Yin (2003b) begins by defining a case study as an inquiry that "investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (p. 13). Therefore, a case study strategy is appropriate if the goal of the researcher is to cover contextual issues believed to be pertinent to the phenomenon of study (Yin, 2003b).

The second technical definition occurs because "phenomenon and context are not always distinguishable in real-life situations" (Yin, 2003b, p. 13). In this definition, data collection and analysis strategies are included to create a case study inquiry that:

- copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result

- relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result
- benefits from the prior development of theoretical propositions to guide data collection and analysis" (Yin, 2003b, pp. 13-14).

"The case study as a research strategy comprises an all-encompassing method—covering the logic of design, data collection techniques, and specific approaches to data analysis" (Yin, 2003b, p. 14). Because this study investigated a contemporary phenomenon, the Air Force Center of Excellence for Knowledge Management, within it's real-life context, it proved to be aligned with the usage criteria of a case study methodology.

Case Study Designs

According to Yin (2003a) the four types of designs for case studies (Figure 24) are: single-case (holistic) designs, single-case (embedded) designs, multiple-case (holistic) designs, and multiple-case (embedded) designs.

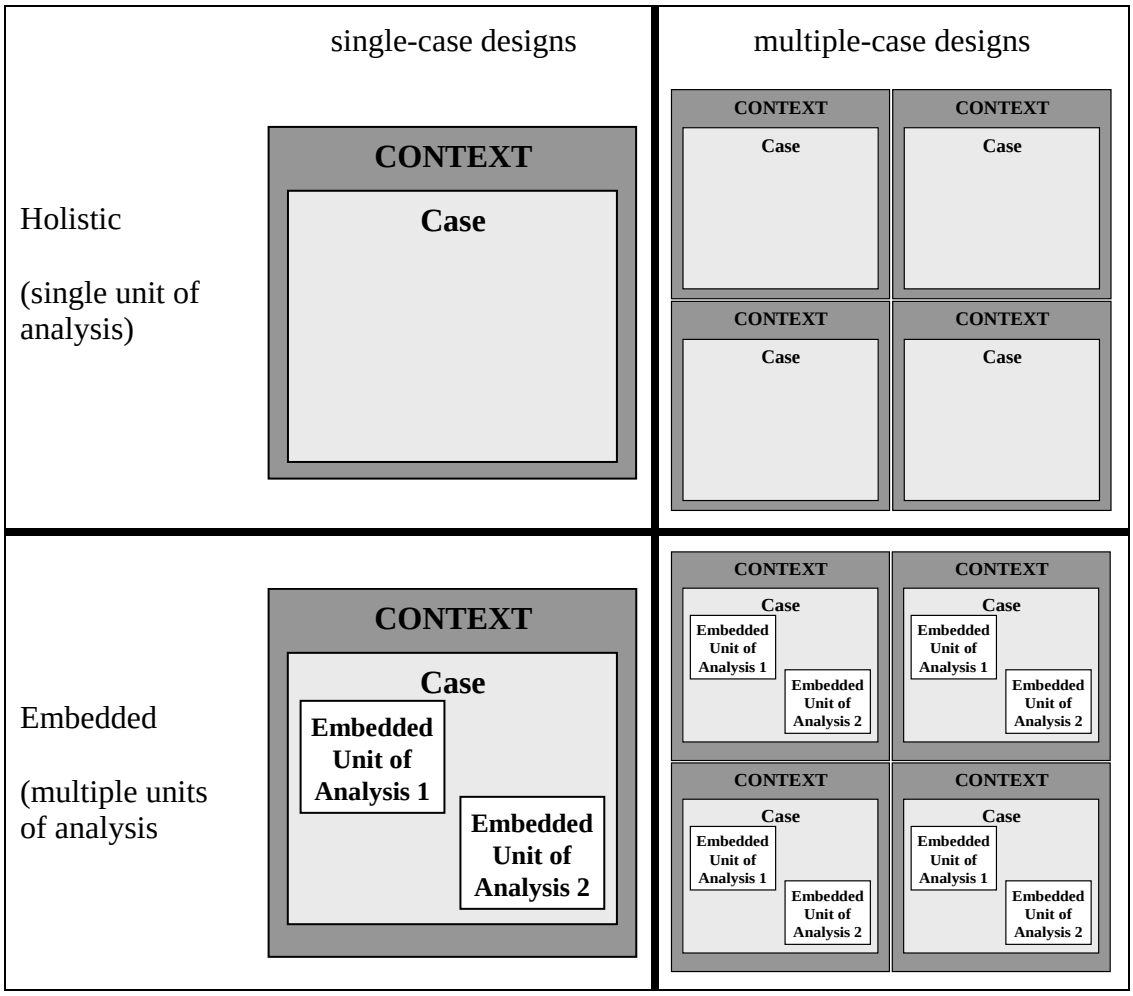

Figure 24. Basic Types of Designs for Case Studies (Yin, 2003b)

When beginning the case study design one of the first choices that the researcher must make is whether to use a single-case or multiple-case design. Yin (2003b) offers five rationales for selecting a single-case study:

1. the case represents a critical test of existing theory
2. the case is extreme or unique
3. the case represents the norm or is considered typical
4. the case is revelatory
5. the case serves a longitudinal purpose

For the purposes of this research, a single-case design was chosen for several reasons. First, the case is considered representative of the norm (Yin, 2003b). The Air Force Center of Excellence for Knowledge Management can be considered representative of organizations throughout the Air Force that are undertaking KM efforts. Second, the results of this research can be applied to previous research. Bartczak (2002) conducted a case study that identified barriers to the KM efforts guided by Air Force Knowledge Management program, which ultimately became the Air Force Center of Excellence for Knowledge Management. Therefore, the research conducted in this study can be used in conjunction with the Bartczak (2002) study to identify any trends within the KM barriers.

After determining whether the research should be a single-case design or a multiple-case design, the researcher must decide if the case or cases will be holistic or embedded. A holistic design is used when the organization or program is considered to be of a global nature (Yin, 2003b). However, if there is a need to give attention to subunits of the organization, which involves more than one unit of analysis, an embedded approach is appropriate (Yin, 2003b). Because the Air Force Center of Excellence for Knowledge Management lacked the logical subunits for an embedded approach, a holistic design was selected for this research. After making this decision, the final choice is to decide the research purpose.

The three purposes for research can be either exploratory, descriptive, or explanatory. Yin (2003a) defines each as:

- An exploratory case study is aimed at defining the questions and hypothesis of subsequent study or at determining the feasibility of the desired research procedures.

- A descriptive case study presents a complete description of a phenomenon within its context.
- An explanatory case study presents data bearing on cause-effect relationships – explaining how events happened.

Because this research is presenting data bearing on a cause-effect relationship, determining if Holsapple and Joshi's "influences on the management of knowledge" framework is appropriate for identifying barriers to KM implementation in the Air Force Center of Excellence for Knowledge Management, it is an explanatory case study.

In summary, the design of this case study consists of several key characteristics. Because of the nature of the research and the nature of the organization being researched, it was determined that a holistic, explanatory, single-case design was the most appropriate design. Table 3 is a summary of the research design characteristics used in this study.

Table 3. Characteristics of this Study's Research Design

Characteristic	Description
Case Study	An empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident (Yin, 2003b, p. 13)
Explanatory	Presents data bearing on cause-effect relationships (Yin, 2003a).
Holistic	Examines the global nature of an organization or program (Yin, 2003b).
Single-Case	A research design that involves only one case (Yin, 2003b).

Components of Case Study Designs.

Yin (2003a) defines research design as "the logical plan for getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about these questions." Additionally, a research design is more than a work plan, its main purpose is "to avoid the situation in which the evidence does not address the initial research questions" (Yin, 2003a). According to Yin (2003a), the five key components of a case study design are:

1. a study's questions;
2. its propositions, if any;
3. its unit(s) of analysis;
4. the logic linking the data to the propositions; and
5. the criteria for interpreting the findings.

A discussion of these five components are addressed below.

Study's Questions.

The research questions for this investigation were derived from Holsapple and Joshi's "influences on the management of knowledge" framework (Holsapple & Joshi, 2000). As stated earlier, generally "how" or "why" questions are more in aligned with the case study strategy, but due to overlaps among the strategies, "what" questions are appropriate for case studies as well (Yin, 2003b). These guiding questions were used to begin the case study design:

1. What are the managerial influences that act as barriers to KM programs in the Air Force Center of Excellence for Knowledge Management?

2. What are the resource influences that act as barriers to KM programs in the Air Force Center of Excellence for Knowledge Management?
3. What are the environmental influences that act as barriers to KM programs in the Air Force Center of Excellence for Knowledge Management?

These guiding questions served as the foundation from which more specific sub-questions were created. The guiding questions were based on Holsapple and Joshi's (2000) "influences on the management of knowledge" framework. The sub questions asked address the influence factors that fall under the three major influence categories which includes managerial influences, resource influences, and environmental influences. The following is a discussion of each question and its sub-questions.

Research Question #1. The first research question was written to identify which managerial influences act as barriers to KM in the Air Force Center of Excellence for Knowledge Management. Holsapple and Joshi (2004) state, "In the case of an organization, managerial influences emanate from those organizational participants responsible for directing its KM initiatives." This guiding question's sub-questions were:

a. How do leadership commitment and KM reinforcing behaviors from managers at various levels impact the Air Force Center of Excellence for Knowledge Management KM implementation efforts?
b. What coordination issues (e.g., strategy alignment, outside organization relationships, disparate KM efforts) impact the Air Force Center of Excellence for Knowledge Management KM implementation efforts?

c. What technical, social, and legal control issues (e.g., issues concerning the protection and quality of knowledge resources) impact the Air Force Center of Excellence for Knowledge Management KM implementation efforts?

d. What "measuring" or "valuing" issues impact the Air Force Center of Excellence for Knowledge Management KM implementation efforts?

The sub-questions presented attempt to address the four key managerial influences factors which are: leadership, coordination, control, and measurement (Holsapple & Joshi, 2000). Question 1(a) addresses the managerial influence factor of leadership. Leadership is regarded as the primary managerial influence factor (Holsapple & Joshi, 2000, 2004) Holsapple and Joshi (2000, 2004) identify positive KM behaviors as "such traits as inspiring, mentoring, setting examples, engendering trust and respect, instilling a creative and cohesive culture, listening, learning, teaching (e.g. through story telling), and knowledge sharing." Question 1(b) addresses the managerial influence factor of coordination. The intent of this question is to identify how well management coordinates KM efforts with other efforts of the organization. This can include managing dependencies between knowledge resources and knowledge manipulation activities, and other resources; aligning KM efforts with strategy; ensuring sufficient skills for executing activities are provided when needed; and linking reward programs to knowledge sharing (Holsapple & Joshi, 2000, 2004). Question 1(c) addresses the managerial influence factor of control. Holsapple and Joshi offer, "control is concerned with ensuring that needed knowledge resources and processors are available in sufficient quality and quantity, subject to required security" (Holsapple & Joshi, 2000; 2004). This question attempts to identify any technical (e.g., security safeguards), social (e.g., hiring people

with similar cultural values), and legal (e.g., copyrights and patents) efforts to protect knowledge resources from loss, obsolescence, unauthorized exposure, unauthorized modification, or erroneous assimilation (Holsapple & Joshi, 2000). Question 1(d) addresses the managerial influence factor of measurement. The intent of this question is to determine effects on KM initiatives bases on how the organization attempts to measure knowledge resources and knowledge activity performance, how it goes about measuring these knowledge resources and activities, and the effectiveness of these measures (Holsapple & Joshi, 2000, 2002).

Research Question #2. The second research question was written to identify which resource influences act as barriers to KM in the Air Force Center of Excellence for Knowledge Management? An organization's resources used to affect, either positively or negatively, its conduct of knowledge management are considered resource influences (Holsapple & Joshi, 2004). These resources include both traditional resources and knowledge resources. Additionally, the resource influences affect the managerial influences (Holsapple & Joshi, 2000). Guiding question #2's sub-questions were:

a. How do financial resource issues impact the Air Force Center of Excellence for Knowledge Management KM implementation efforts?
b. How do human resource issues (e.g., manpower availability, KM expertise/skill, outsourcing) impact the Air Force Center of Excellence for Knowledge Management KM implementation efforts?
c. How do material resource issues (e.g., existing technical infrastructure, computer systems) impact the Air Force Center of Excellence for Knowledge Management KM implementation efforts?

d. How do knowledge resource issues (e.g., human/computer-based knowledge, organizational culture, purpose/strategy, infrastructure, knowledge artifacts) impact the Air Force Center of Excellence for Knowledge Management KM implementation efforts?

The sub-questions presented attempt to address the four key managerial influences factors which are: financial resources, human resources, material resources, and knowledge resources (Holsapple & Joshi, 2000). Question 2(a) addresses the resource influence factor of finances. Financial resources are important because they dictate the amount of capital that will be spent on knowledge activates, which can affect the efficiency or quality of their results (Holsapple & Joshi, 2000). Question 2(b) addresses the resource influence factor of human resources. Human resources are revolve around the knowledge manipulation skills of an organization's members that both constrain and facilitate KM when performing knowledge activities (Holsapple & Joshi, 2000). This question was intended to identify those human resource issues (e.g., manpower availability, KM expertise/skill, outsourcing) that are impacting KM efforts. Question 2(c) addressed the resource influence factor of material resources. Similar to human resources, material resources revolve around the knowledge manipulation skills that both constrain and facilitate KM when performing knowledge activities, with the difference being, material resources are centered around computer-based participants (Holsapple & Joshi, 2000, 2002). Material resources are the capabilities of an organization's material assets which include technical infrastructure, physical plant, and computing equipment (Bartczak, 2002). Therefore, this question was intended to identify those material resources (e.g., existing technical infrastructure, computer systems) which impact KM

efforts. Question 2(d) addressed the resources influence factor of knowledge resources. "As the raw materials for knowledge activities, knowledge resources available in an organization necessarily influence its KM and the resultant learning, projection, and innovation" (Holsapple & Joshi, 2000). Knowledge resources include: knowledge (both human and computer-based), culture, strategy, infrastructure (e.g., roles, regulations, relationships), and artifacts (e.g., manuals, books, video tapes, products) (Holsapple & Joshi, 2000). This question was intended to capture those knowledge resources (e.g., human/computer-based knowledge, organizational culture, purpose/strategy, infrastructure, knowledge artifacts) that impact KM efforts.

Research Question #3. The third research question was written to identify which environmental influences act as barriers to KM in the Air Force Center of Excellence for Knowledge Management? Of the three categories of influences, Holsapple and Joshi (2000, 2002a, 2004) give the environmental influences the least amount of explanation or attention. Because this category of environmental influences is external to the organization, the organization has little to no control over the factors listed; therefore, not much research in the KM literature can be found (Bartczak, 2002; Holsapple & Joshi, 2000, 2002a; Wong, 2005). Additionally, some of the factors (e.g. fashion, markets, and competition) do not directly translate from their private sector definition for use in the military. However, when viewed through a "military lens," they can have offer opportunities for examination. Unlike the managerial and resource influences, environmental influences are external to the organization. The third guiding question's sub-questions were:

a. How does technology (external to the military) impact the Air Force Center of Excellence for Knowledge Management KM implementation efforts?
b. How have past Air Force Center of Excellence for Knowledge Management or industry KM strategies and results impacted current KM efforts and strategies?
c. How does "time" (i.e., response time, development time, crisis scenarios) impact the KM efforts? Has the impact of "time" on KM efforts changed over the past few years?

The sub-questions presented attempt to address five environmental influences factors which are: technology; competition; fashion; markets; and time. Question 3(a) addresses the environmental factor of technology. Unlike question 2(c), which addressed effective technology implementation, question 3(a) takes a look at the technology opportunities that exist external to the Air Force Center of Excellence for Knowledge Management. Question 3(b) addresses the environmental influence factors of competition, fashion, and market. In the sense of competition, this question focuses on how the Air Force Center of Excellence for Knowledge Management uses KM in competition amongst other organizations in the Air Force and Air Force Material . Fashion is addressed by attempting to see if the Air Force Center of Excellence for Knowledge Management has adopted industry strategies as a means of improving its own KM efforts. And market influences are investigated by examining the Air Force Center of Excellence for Knowledge Management's ability to acquire needed knowledge resources from external sources. Question 3(c) addressed the environmental influence factor of time. This question was looking for those external entities or situations that impose time constraints

on KM efforts. The second part of this question was looking to identify any changing situations that may have affected time's impact on KM efforts.

Study Propositions.

Yin (2003b) states, "a proposition directs attention to something that should be examined within the scope of the study" (p. 22). This research presents two different propositions. First, Holsapple and Joshi's (2000) "influences on the management of knowledge" framework (2000) will be appropriate in identifying KM barriers in the Air Force Center of Excellence for Knowledge Management. Second, the barriers identified in the Air Force Center of Excellence for Knowledge Management will have changed since the Bartczak (2002) study. The second proposition was expected because of the changing events identified in Chapter 2 that have occurred at the Air Force Center of Excellence for Knowledge Management since 2002.

Unit of Analysis.

An essential element of research is defining what the unit being studied will be. Examples of unit of analyses can be an individual, group, organization, or program (Yin, 2003b). As a general rule, the unit of analysis is based on the way you have defined (Yin, 2003b). For this research, a military organization, identified as being actively involved in KM efforts, was chosen. The unit of analysis for this case study was the Air Force Center of Excellence for Knowledge Management.

Logic linking data to propositions, and criteria for interpreting the findings.

According to Yin (2003b), logic linking data to propositions and the criteria for interpreting the findings are the least developed components of case studies. What the

logic that links data to the propositions and the criteria for interpreting the findings do is outline the data analysis steps in case study research and lay a foundation for the analysis (Yin, 2003b).

The logic that linked the data to the propositions is a comparison of the research results to Holsapple and Joshi's "influences on the management of knowledge" framework (2000). The initial proposition was that Holsapple and Joshi's (2000) "influences on the management of knowledge" framework (2000) will be appropriate in identifying KM barriers in the Air Force Center of Excellence for Knowledge Management. The second proposition offered that the barriers identified in the Air Force Center of Excellence for Knowledge Management will have changed since the Bartczak (2002) study.

The criteria for interpreting the findings was based on the use of multiple methods of data collection. The practice of triangulation was employed across multiple data sources (e.g. interviews, documents, archival records, observations, etc.). Findings were interpreted by asking the questions: "Are the influences identified acting as barriers to KM?"

Theory Development.

Regardless of the case study's purpose, theory development is an essential part of case study design (Yin, 2003b). By addressing the five case study design components, the researcher is forced into constructing a preliminary theory related to the topic of study (Yin, 2003b).

In an effort to develop theory, several different approaches were taken. First, the topic and ideas were discussed with teachers and advisors. Second, an in-depth literature

review was conducted in order to determine the direction of research and research question development. Finally, the use of existing theory was used to guide further investigation. All these efforts led to the decision to use Holsapple and Joshi's "influences on the management of knowledge" framework (2000). This framework offered three categories of influences (managerial, resource, and environmental), which impact KM efforts in organizations. The framework guided research question development and research theory.

Case Study Design Quality.

When conducting research, there are areas of concern dealing with the quality of the design that must be addressed (Yin, 2003b). Fortunately, there are certain logical tests that can be used to judge the quality of the research design (Yin, 2003b). The four most common tests are: construct validity, internal validity, external validity, and reliability (Yin, 2003b). Kidder and Judd (1986) define these four tests as:

- *Construct validity*: establishing correct operational measures for the concepts being studied
- *Internal validity*: establishing a casual relationship, whereby certain conditions are shown to lead to other conditions, as distinguished from spurious relationships
- *External validity*: establishing the domain to which a study's findings can be generalized
- *Reliability*: demonstrating that the operations of a study—such as the data collection procedures can be repeated, with the same results (pp. 26-29)

In Table 4, Yin (2003b) offers the case study tactic used to satisfy each test, as well as the phase of research when the tactic is to be used.

Table 4. Yin (2003a) Case Study Tactics for Four Design Tests

Tests	*Case Study Tactic*	*Phase of research in which tactic occurs*
Construct Validity	• Use multiple sources of evidence	data collection
	• Establish chain of evidence	data collection
Internal Validity	• Do pattern-matching	data analysis
	• Do explanation-building	data analysis
	• Address rival explanations	data analysis
	• Use logic models	data analysis
External Validity	• Use theory in single-case studies	research design
	• Use replication logic in multiple-case studies	research design
Reliability	• Use case study protocol	data collection
	• Develop case study database	data collection

The following sections will address the efforts taken to incorporate these quality tests into this research.

Construct Validity.

The issue of construct validity was addressed through the use of three different tactics. First, multiple sources of evidence (organization documentation, archival records, interviews, direct observations, and physical artifacts) were collected allowing the data to be triangulated. "With data triangulation, the potential problems of construct validity also can be addressed because the multiple sources of evidence essentially

provide multiple measures of the same phenomenon" (Yin, 2003b, p. 99). The second tactic used, which also addressed construct validity, was the establishing a chain of evidence. This was accomplished by creating a case study database. The database included four key components: notes, documents, quantitative performance data, and responses to open-ended interview questions (Yin, 2003b). The third tactic had all of the key respondents review a draft of the case study report prior to finalizing it.

Internal Validity.

Addressing internal validity in case study research can prove challenging because it relates to the problem of making inferences (Yin, 2003b). "A case study involves an inference every time an event cannot be directly observed. An interview will 'infer' that a particular event resulted from some earlier occurrence, based on interview and documentary evidence collected as pat of the case study" (Yin, 2003b, p. 36). To address internal validity, this research used several different techniques. First, pattern matching was used. Coinciding patterns help to strengthen a case study's internal validity (Yin, 2003b). The second tactic used was explanation building. Explanation building is a special type of pattern matching, in which, iterations of the explanation are revised based on findings made during the case study (Yin, 2003b)

External Validity.

External validity determines whether the results of the study are generalizable beyond the immediate case study (Yin, 2003b). Because this study was a single-case study design, theory was used to establish external validity. Because Holsapple and Joshi's (2000) "influences on the management of knowledge" framework has proven

representative of barriers to KM implementation efforts found in military organizations, it should be representative of those barriers found in the Air Force Center of Excellence for Knowledge Management as well.

Reliability.

The objective of reliability is to ensure that if another researcher conducted the same case study, following the same procedures as the first, the results would be the same (Yin, 2003b). Reliability for this research was achieved through the use of a case study protocol and a case study database. According to Yin (2003b), "the protocol is a major way of increasing the reliability of case study research" (p. 67). The following section will address how the actual research was conducted.

In summary, the case study tactics employed to achieve a quality research design for this case study are listed in Table 5.

Table 5. Tactics Used for this Case Study

Tests	*Case Study Tactic*
Construct Validity	• Used multiple sources of evidence • Established chain of evidence • Had key informants review draft of case study report
Internal Validity	• Pattern matching • Explanation building
External Validity	• Used theory in single-case studies
Reliability	• Used case study protocol • Developed case study database

Conducting the Research

Where the previous section outlined the design characteristics of this study, this section will focus on how the actual research was conducted.

Role of the Researcher.

Characteristics of a good researcher should include the ability to ask good questions and interpret the answers, good listening techniques, adaptability and flexibility, a grasp of the issues being studied, and a lack of bias (Yin, 2003b). As the researcher, a great deal of effort was taken towards being as effective and as unbiased as possible. However, one characteristic of the researcher needs to be discussed. Because of a military affiliation, the researcher came into this research with some bias. Twelve years of military experience has left me with an ever-optimistic view of the Air Force, which often has me looking for the positive in almost any military relate scenario. As I entered this research I knew that I would

have to approach this with in a completely open-minded, unbiased approach. When interpreting the data, I made a conscious effort of removing any opinions or preconceived notions that I may have, in order to provide a just analysis.

Subject Safety.

The role of the Institutional Review Board (IRB) is to ensure the safety and protection of human research subjects is upheld. In accordance with 32 CFR 219 *Protection of Human Subjects*, AFI 40-202 *Protection of Human Subjects in Biomedical and Behavioral research*, ENOI 40-1 *Protection of Human Subjects in Research*, and IRB guidance, the following efforts were taken to ensure the protection of the subjects in this study: 1) the researcher received IRB approval, protocol number F-WR-2006-0067-E, 2) the researcher successfully completed the Human Research Subject training course, 3) the researcher requested no identifying information from the subjects, 4) any identifying information obtained through interviews was retained and not reported in the final thesis, 5) the subject was informed of the purpose for this research both verbally and in writing, 6) the subject was informed that data collection will include written interview responses, handwritten interviewer notes, and interview tapes, 7) written consent from the subject for permission to proceed with the interview, 8) the subject's relative level in the organization was codified to ensure subject anonymity, and 9) individual subject responses were not disclosed.

Data Collection Planning.

A protocol is important because it keeps the researcher focused on the subject of the study and it allows the researcher to anticipate problems (Yin, 2003b). This study made use of a case study protocol as a means of improving reliability. "The protocol is a

major way of increasing the reliability of case study research and is intended to guide the investigator in carrying out the data collection from a single-case study" (Yin, 2003b, p.67). According to Yin (2003b), a case study protocol should include:

- An overview of the case study project (project objectives, case study issues, and relevant readings about the topic being investigated)
- Field procedures (credentials, access to the study sites, general sources of information, and procedural reminders)
- Case study questions (the specific questions that the cases study investigator must keep in mind in collecting data and potential sources of information for answering each question)
- A guide for the case study report (outline, format for the data, other documentation, and bibliographical information) (p.69)

The following paragraph will explain how this study's protocol incorporated each of the aforementioned sections.

The case study overview was written to serve as a guide to aid the researcher in maintaining his focus. Aside from covering the background information for the study, it established the study's purpose and field procedures to assist the researcher in data collection. The procedures included guidelines for contacting the Air Force Center of Excellence for Knowledge Management, selecting its employees that were interviewed, setting interview dates and times, establishing interview procedures, and ensuring adequate resource availability while in the field. The case study questions were devised to ensure the investigator remained focused on the intent of the research and helped the researcher make sure all the necessary information was collected. The case study

questions reminded the researcher of what information needed to be collected and why, but unlike the questions posed to the interviewees, these questions are posed to the investigator (Yin, 2003a). Finally, a case study report guide was used to make certain that all of the data required for the study was collected. It was used to determine what sections would be in the case study report such as: description of the organization and analysis of KM influences (i.e. managerial, resource, and environmental).

Data Collection.

According to Yin (2003a), "any finding or conclusion in a case study is likely to be much more convincing and accurate if it is based on several different sources." Following that logic, data was collected from multiple sources: documentation, archival records, interviews. Table 6 lists the strengths and weaknesses of each source of evidence that was used.

Table 6. Sources of Evidence: Strengths and Weaknesses (Yin, 2003b)

Source of Evidence	*Strengths*	*Weaknesses*
Documentation	• stable–can be reviewed repeatedly • unobtrusive–not created as a result of the case study • exact–contains exact names, references, and details of an event • broad coverage–long span of time, many events, and many settings	• retrievability–can be low • biased selectivity, if collection is incomplete • reporting bias–reflects (unknown bias of author) • access–may be deliberately blocked
Archival Records	• [*Same as above for documentation*] • precise and quantitative	• [*Same as above for documentation*] • accessibility due to privacy reasons
Interviews	• targeted—focuses directly on case study topic • insightful—provides perceived casual inferences	• bias due to poorly constructed questions • response bias • inaccuracies due to poor recall • reflexivity—interviewee gives what interviewer wants to hear

The collected data was then triangulated, strengthening the conclusions made. The following paragraphs will describe how each of the data sources was used.

A variety of documentation was collected throughout the process of this study. The documentation came from a variety of sources which included newspaper and mass media articles pertaining to the organization, evaluations of the organization, organization administrative documents, and website research. A good deal of the documentation collection was done prior to the actual interviews, which provided the researcher with an introductory understanding of the organization.

Archival records provided another source for data collection. The use of archival records allowed the researcher to understand the development of the organization so that any major changes could be identified and accounted for. Examples of the archival data collected were organizational charts, organizational budgets, personal records, and service records like the Air Force Knowledge Now knowledge portal usage statistics.

Interviews served as the key source for data in this research. The researcher established a list of nine interviewees that included three members from each of the senior-levels, mid-levels, and lower levels of the Air Force Center of Excellence for Knowledge Management. Open-ended interview questions were used so that the interviewees were able to provide their own opinions and insights (Yin, 2003b). Opportunity was given to the interviewee to add anything they felt might be pertinent to the investigation which might have fallen outside of the line of questions being asked. To ensure maximum accuracy, interviews were taped and transcribed into the case study database to allow for accurate data analysis.

Data Analysis

General Analytic Strategy.

"The analysis of case study evidence is one of the least developed and most difficult aspects of doing case studies" (Yin, 2003b, p. 109). With this in mind, Yin (2003b) suggests that the first thing a researcher must do is identify a general analytic strategy. Based on the nature of the research and its original objectives, a strategy of "relying on theoretical propositions" was chosen (Yin, 2003b). This strategy is based on the theoretical propositions that led to the case strategy.

Analytic Technique.

After selecting a general analytic strategy to guide by, the next step is to select analytic techniques for analyzing the data (Yin, 2003b). To analyze this data, a pattern matching technique was applied to a within-case situation. Pattern matching was used to analyze data obtained from organization documentation, archival records, and interviews. The data from all of the sources were categorized to allow pattern identification. Items were categorized by the influences identified in Holsapple and Joshi's (2000) "influences on the management of knowledge" framework.

Limitations

This research had several limitations that must be noted. First, the lack of multiple researchers was a limitation to this research. The amount of data collected and the depth of analysis was potentially limited by the ability and experience of having a single researcher versus multiple researchers. Second, because this was a single-case case study, the generalizability of this research could be limited. Third, the potential for

bias by the researcher based on his affiliation with the U.S. Air Force. Fourth, the Holsapple and Joshi's (2000) "influences on the management of knowledge" framework lacks a great degree of clarity when describing the influences. For example, all six environmental influences are described in a single paragraph, which only identifies the influences, but does not describe any of them in detail (Holsapple & Joshi, 2000). Without clear definitions for the influences, it may prove difficult to properly identify and categorize barriers to KM efforts guided by the Air Force Center of Excellence for Knowledge Management. And finally, the dual nature of the Air Force Center of Excellence for Knowledge Management could impact the responses provided by the interviewees. While appointed an Air Force level program, the Air Force Center of Excellence for Knowledge Management resides within the Air Force Material Command (AFMC). This potentially creates challenges with interviewee responses, as they may refer to barriers faced at either to Air Force level or from within AFMC.

Chapter III has described the research design and methodology of this study. It began with a discussion of research strategies and an explanation why a single-case case study was appropriate as the research design. Additionally, Chapter III discussed the steps taken to ensure design quality, data collection and analysis techniques, and the limitations of this study. Chapter IV will discuss the results of the data that was collected.

IV. Results

Overview

This chapter will provide the findings from the research performed at the Air Force Center of Excellence for Knowledge Management. The research was based on Holsapple and Joshi's (2000) "influences on the management of knowledge" framework, which separates knowledge management influences into the three following categories: managerial, resource, and environmental influences. The findings are discussed in a manner consistent with order that the research questions from Chapter III were presented.

Managerial Influences

The purpose of the first research question was to identify which managerial influences act as barriers to knowledge management (KM) in the Air Force Center of Excellence for Knowledge Management. Using Holsapple and Joshi's (2000) "influences on the management of knowledge" framework as a guide, the following influences will be discussed: leadership, coordination, control, and measurement.

Leadership Barriers.

Lack of leadership commitment. One of the Air Force Center of Excellence for Knowledge Management's largest challenges is a lack of leadership commitment at all levels. This lack of leadership commitment is felt from the highest levels of Air Force leadership down to the operational levels and according to several employees of the Air Force Center of Excellence for Knowledge Management, the lack of leadership commitment appears to be a byproduct of the general lack of KM education that exists

throughout the Air Force. However, the lack of KM education has broader impacts than on just leadership and is discussed in more detail later in this chapter.

At the highest levels of Air Force leadership, support seems to be fairly non-existent. After the departure of the former Air Force Chief Information Officer (CIO), Mr. John Gilligan, support at the Air Staff levels has seemingly fallen off. While Mr. Gilligan was a huge proponent of KM, his successor has not accepted KM with the same fervor. The current CIO has not endorsed the Air Force Center of Excellence for Knowledge Management's letter of appointment. As one member of the Air Force Center of Excellence for Knowledge Management stated, "The new CIO hasn't taken our moniker away from us, but doesn't seen very supportive." The general feeling is that high-level leadership support left with Mr. Gilligan.

Within AFMC, the Air Force Center of Excellence for Knowledge Management develops short periods of leadership support, but no long-term commitments. This is largely due to high rates of leadership turnover. The leadership turnover faced by the Air Force Center of Excellence for Knowledge Management is due to both the Air Force's trend of regular leadership reassignments and the Air Force Center of Excellence for Knowledge Management's office relocations with AFMC. Each time the Air Force Center of Excellence for Knowledge Management is faced with a new leader in its chain of command, it is forced to justify its existence to the new leadership.

As it is within AFMC's leadership, leadership at the operational level exhibits little commitment to KM efforts. This lack of leadership commitment at the operational level, is directly related to a lack of support or direction from higher levels of leadership and often results in a lack of resources such as time, money, and manpower. Due to the

lack of resources, the Air Force Center of Excellence for Knowledge Management's customers are often limited to Air Force Knowledge Now (AFKN) use because of a lack of leadership commitment to pursue larger KM endeavors. Therefore, they are unable to explore larger KM efforts and are limited to AFKN's technical solutions.

Lack of reinforcing behaviors. With a general lack of leadership commitment, it should be of no surprise that leadership does not demonstrate KM reinforcing behaviors. What is absent are leaders who openly discuss the need to practice KM principles and allow those working for them the opportunity to pursue KM. Furthermore, there is a lack of promotion by leadership to expose those working for them KM tools, such as AFKN. One consultant stated, "95% of those coming to us are grassroots driven. We need more top driven initiatives."

Lack of a KM champion. With the departure of Mr. Gilligan, former Air Force CIO, the Air Force Center of Excellence for Knowledge Management lost its high-level KM champion and no one in a senior leadership position has taken his place. This lack of a senior-level champion has made it difficult for the Air Force Center of Excellence for Knowledge Management to affect change or to promote KM at a high level. Many would say that the Air Force's current KM champion is Mr. Adkins, the Director of the Air Force Center of Excellence for Knowledge Management. However, as a GS-14, Mr. Adkins lacks the power to enact change at high levels and is forced into the position of providing education to leaders in hopes that they will support and promote KM.

Coordination

Lack of an Air Force KM strategy. Lacking adequate senior leader support, there has been little progress towards developing an Air Force level KM strategy. While

documents have been developed, they tend to fall short of a true KM strategy. One example is the Knowledge Based Operations (KBO) strategy. By the title, the KBO sounds as if it would serve as a KM strategy; however, it too falls short. According to an Air Force Center of Excellence for Knowledge Management manager, "The KBO was very information management-oriented, not knowledge management-oriented. We wrote the [Knowledge Centric Operations] (KCO) to answer the people piece." As was stated, in response to this shortcoming, the Air Force Center of Excellence for Knowledge Management developed the KCO document. The goal was not to have the KCO replace the KBO or even to have the KCO published separately, but instead, to convince leadership that the ideals presented in the KCO should be incorporated in the KBO. However, it seems that the KBO has stalled and does not seem to be making any further developments towards being released as an official Air Force document. Therefore, the Air Force is still lacking a guiding KM strategy document.

Attempting to provide an enterprise solution while assigned to AFMC. The Air Force Center of Excellence for Knowledge Management's roots are in AFMC, but its reach goes far beyond the MAJCOM. While being attached to AFMC has proved helpful in some regards, such as allowing the Air Force Center of Excellence for Knowledge Management to operate "under the radar" and to have a great deal of liberty when making decisions, it has also presented challenges. One problem being in AFMC creates is the Air Force Center of Excellence for Knowledge Management's potential customer perceptions. While the majority of AFKN users are from MAJCOMs other than AFMC, because it is a web-based tool, the association of AFKN and AFMC is often never made. However, it is not uncommon for users to be surprised when they find out that the Air

Force Center of Excellence for Knowledge Management provides workshops and consulting to customers outside of AFMC. As one consultant commented, "We still get people who say, 'Oh, you do stuff for other people? I thought you were just AFMC.'" Another problem that being in AFMC creates is the willingness for other MAJCOMs and agencies to attempt their own KM initiatives because of what they perceive as a lack of a KM governing office in the Air Force. As one manager stated, "Others don't necessarily view us as an Air Force answer because we are in AFMC. So, AFCA and other organizations are developing their own approaches." And probably the greatest challenge presented to the Air Force Center of Excellence for Knowledge Management by being in AFMC has to do with funding. Both competing KM solutions and funding issues will discussed later in this chapter.

Confusion as to the Air Force Center of Excellence for Knowledge Management's place within AFMC. Another barrier that has arisen from being attached to AFMC is a great deal of organizational uncertainty. As one employee stated, "Leadership seems to have no idea where we belong." Another said, "We've probably moved four to five times this past year. The question seems to be, "Where do we fit?'" These regular reorganizations create multiple problems for the Air Force Center of Excellence for Knowledge Management. With each reorganization, the Air Force Center of Excellence for Knowledge Management has to justify itself to a new leader in order to maintain its funding. And as one member put it, "We're competing with bombs, and when you compete with bombs as a soft issue, you lose." Convincing leadership of KM's value and the Air Force Center of Excellence for Knowledge Management's need for funding often requires multiple education and training sessions with the leaders. Not only do leaders

question the Air Force Center of Excellence for Knowledge Management's funding or which directorate they should report to, but they also doubt whether the Air Force Center of Excellence for Knowledge Management belongs in AFMC at all. The Air Force Center of Excellence for Knowledge Management must then educate leadership as to the nature of its mission. These reorganizations and leadership doubts have an impact on the Air Force Center of Excellence for Knowledge Management's employees. The employees begin to question their job security and begin to feel as if no one wants them or cares enough to support them. The reorganizations also impact the Air Force Center of Excellence for Knowledge Management's ability to develop relationships and alliances within AFMC. As one worker put it, "Moving around, people begin to question your viability."

Communities of Practice stovepipes. As of July 2006, AFKN had over 4,500 CoPs. It would stand to reason that there are users working separately on similar problems within different CoPs. AFKN has no way of connecting users of similar interests together based on the nature of the CoPs they belong to, the types of documents they have posted, or the discussion threads that they are participating in. As one employee stated, "We're not leveraging our social networking data to tie [users] together. People need to find each other quickly." This lack of connectivity results in duplication of effort and on a larger scale, a loss of valuable resources. As one technician stated, "One of the leading customer complaints is that they are unable to find the CoP that they want."

Lack of information quality controls within CoPs. The Air Force Center of Excellence for Knowledge Management is often questioned over its information quality

control policy. Currently, the CoPs within AFKN perform quality control through a policy of self-policing. By self-policing, the CoP owner and the COP members take responsible for identifying information that may not be correct and subsequent action required to correct that information. Some people challenge this approach because they feel that each statement or document entered into a COP should be approved by an authoritative source if it going to be used for decision making. The nature of this discussion is rooted in the balance between utility and validity. As was stated earlier, there were approximately 4,500 CoPs in July 2006. The amount of information contained within these CoPs makes this an impossible task for those in the Air Force Center of Excellence for Knowledge Management to moderate. The breadth of information creates a similar problem of identifying adequate authoritative moderators.

Limited information access to and within AFKN. The issue of access to information within AFKN is another barrier that the Air Force Center of Excellence for Knowledge Management faces. In an ideal KM environment, one would like to have unbound knowledge sharing occur. Unfortunately, the benefits of open knowledge sharing have to be weighed against security risks. As one employee stated

> Because we are in the DOD and we are in the AF, we are always going to have this conundrum of breaking down barriers at the same time protecting need-to-know and avoiding aggregation of knowledge resources into higher levels of security. Those issues will not go away.

Within AFKN information access is limited at two levels. The first level of control is initial access to the system. Originally, AFKN was limited to access only from a .mil domain. This limitation was overcome by allowing access to AFKN through the Air

Force portal. Now, the only requirement needed for connection to AFKN is an Air Force Portal account, which allows anyone with a valid need and sponsorship access. The second level of information access is controlled within the CoPs. The CoPs levels of security are: open CoPs that are open to anyone in AFKN; entry CoPs that can only be accessed by password, but have an description that can be read; and closed CoPs that require a password for access and do not list a description of the CoP. Both of these access restrictions serve to limit the amount of knowledge sharing and potential innovative solutions that could come from open knowledge sharing.

Measurement

Lack of financial-based metrics. The lack of financial-based metrics are an issue when the Air Force Center of Excellence for Knowledge Management has to defend its funding position with leadership. Currently, the Air Force Center of Excellence for Knowledge Management relies heavily on quantitative metrics based on AFKN usage and a great number of anecdotal examples of success. One way that the Air Force Center of Excellence for Knowledge Management does receive some anecdotal, financial examples of cost savings is through its quarterly and annual CoP award program. However, when faced with funding battles, leadership is often looking for the total return on investment provided by the Air Force Center of Excellence for Knowledge Management, not isolated instances like those provided in the CoP award submissions. Tying KM to quantitative returns can prove rather elusive as it is difficult to accurately attribute direct monetary savings exclusively to KM. Regardless, the inability to tie KM directly to the bottom line creates issues for the Air Force Center of Excellence for Knowledge Management when it is attempting to justify both its funding and existence.

Conflicting leadership styles. In accordance with IRB guidelines, steps were taken to ensure the anonymity of all persons interviewed. However, this section attributes a direct quote from one of the interviewees. Due to the nature of the quote and the value it provides to the research, it was determined that the quote should be included in this report. However, using this quote compromised the interviewee's anonymity; therefore, this quote was used only with approval from the interviewee.

Mr. Randy Adkins has been in charge of the Air Force Center of Excellence for Knowledge Management since its inception. Mr. Adkins, an entrepreneur by nature, has begun to question whether the time has come to relinquish his leadership over the Air Force Center of Excellence for Knowledge Management and allow someone with a more bureaucratic mindset to take over. As stated by Mr. Adkins:

> Have I done everything I can do and is it time to move on? I've been doing this for a long time and maybe I've added all the value that I can add and it's gotten to the point where someone else would be better at this than me. You know, I'm kind of an entrepreneur in a bureaucratic organization and its gone beyond the entrepreneur thing. It's just like when people start companies. There're really good at starting a company, but not very good at running it. And so, I spend some of my time wondering if it is time for me to move on and let someone else do this. So, that and not becoming jaded in terms of I just keep dealing with the same stuff over and over again. Keeping up that energy and enthusiasm level is becoming more and more difficult. Mr. Gilligan is a great example, it took a lot of effort to get him where we got him. And we just got positioned in a great place and then the AF changed things and he decided to move on. And we've moved so

far backwards in that regard. It's like climbing up this grease pole and you get so far up and all of a sudden you lose your grip and slide down and you wonder if you can do this again.

Summary of Managerial Influence

Within the Air Force Center of Excellence for Knowledge Management there are a variety of managerial influences that act as barriers to KM efforts. Table 7 summarizes these influences.

Table 7. Summary of Managerial Influence Barriers

Influence	Finding
Leadership	• Lack of leadership commitment • Lack of reinforcing behaviors • Lack of a KM champion • Conflicting leadership styles
Coordination	• Lack of an Air Force KM strategy • Attempting to provide an enterprise solution while assigned to AFMC • Confusion as to the Air Force Center of Excellence for Knowledge Management's place within AFMC • Communities of Practice stovepipes
Control	• Lack of information quality controls within CoPs • Limited information access to and within AFKN
Measurement	• Lack of financial based metrics

Resource Barriers

The purpose of the second research question was to identify which resource influences act as barriers to knowledge management (KM) in the Air Force Center of Excellence for Knowledge Management. Using Holsapple and Joshi's (2000) "influences on the management of knowledge" framework as a guide, the following influences will be discussed: financial, human, material, and knowledge.

Financial Resources

Lack of adequate funding. Funding is a significant barrier to the Air Force Center of Excellence for Knowledge Management. Funding is critical because it directly impacts the Air Force Center of Excellence for Knowledge Management's other resources such as manpower and material resources. The Air Force Center of Excellence for Knowledge Management's funding issues begin with that fact that they are attempting to provide an enterprise solution with only the funding they receive through AFMC. Because the Air Force Center of Excellence for Knowledge Management's annual budget is based on sustainment of AFKN and TDYs to various tradeshows, it must use a hybrid funding model where customers pay for services such as CoP enhancement modules and KM workshops. This hybrid funding strategy plays an important role because without sufficient amounts of customer funds, the Air Force Center of Excellence for Knowledge Management would not be able to maintain its staff of contractors. In addition to threatening contractor job security, the lack of adequate funding creates several other problems for the Air Force Center of Excellence for Knowledge Management.

The next area impacted by a lack of adequate funding is the number of KM workshops that can be conducted. This is important because it is through the workshops that the Air Force Center of Excellence for Knowledge Management provides organizations with a deeper understanding of KM. Unfortunately, the Air Force Center of Excellence for Knowledge Management is limited to conducting only as many workshops as customers are willing to pay for.

Another problem that a lack of adequate funding creates is the situation where the Air Force Center of Excellence for Knowledge Management must balance the system

enhancement jobs it accepts with its KM goals because it relies on customer funds to pay for all of its contractors. Often, the Air Force Center of Excellence for Knowledge Management receives requests for CoP module enhancements that it feels are not in-line with its KM goals. It is then faced with the dilemma of accepting "non-KM" jobs or potentially not receiving enough money to pay for all of the Air Force Center of Excellence for Knowledge Management's contractors.

Unresponsive budgeting process. The U.S. government's budgeting process is a slow, unresponsive one. The Air Force Center of Excellence for Knowledge Management has found that the budgeting process has not kept pace with the rapid growth of AFKN. According to one Air Force Center of Excellence for Knowledge Management employee, "Three years ago, we'd never guess that we would get this big. And we never would have guessed that it would have happened so quickly." The rapid growth of AFKN coupled with quickly changing technologies has left the Air Force Center of Excellence for Knowledge Management's budget woefully inadequate to achieve all of its KM goals.

Contract ceiling limitations. Within the Air Force Center of Excellence for Knowledge Management there is delicate financial balancing act that occurs. On one hand, there is the ever-looming threat of not receiving enough customer funds to support the staff of contractors. On the other hand, funds may have to be turned away because the Air Force Center of Excellence for Knowledge Management has a contract ceiling that limits the maximum amount of funds that can be received from its customers. In an effort to ensure that there are enough funds for the staff of contractors, the Air Force Center of Excellence for Knowledge Management may have taken on system

enhancement jobs that it feels are not in-line with its KM goals. However, as the amount of funds then approach the contract ceiling, the Air Force Center of Excellence for Knowledge Management may have to turn away system enhancement jobs that it would like to implement because those jobs might make the Air Force Center of Excellence for Knowledge Management exceed its contract ceiling.

Human Resources

Limited manpower. As with most work centers, the Air Force Center of Excellence for Knowledge Management could use additional manning. They feel that their manpower is lacking in two areas. First, is the technical side of AFKN, namely the programmers. According to one technician, "The technical side gets more work than it can keep up with." Because of the huge amount of work and limited number of technical experts, there is a multiple month backlog on work to be done. This backlog creates problems for both the customers and the technicians. For the customers, it impacts the Air Force Center of Excellence for Knowledge Management's ability to quickly turnaround system enhancement modules. Therefore, customers have to be willing to wait for their upgrades. The constant backlog of modules to be programmed also creates problems for the technicians. One significant issue for the programmers is that they are always busy, leaving them no time to pursue either creative endeavors or to learn new programming techniques which may ultimately serve to better the system.

The second area where the Air Force Center of Excellence for Knowledge Management is lacking manpower is on the consulting side that provides services like KM workshops. The consultants feel that because of the limited manpower resources, they are pulled in too many directions by leadership. As one member said, "It feels as if

we are getting pulled in a thousand directions at once." They feel that over tasking along with minimal direction makes it difficult for them to be as productive as they would like.

Contractor restrictions. The Air Force Center of Excellence for Knowledge Management is a mix of military, civil service employees, and contractors. However, nearly three-fourths of the workforce are contractors. The current government rules on contractors has proven to be a barrier. Overall, the Air Force Center of Excellence for Knowledge Management thinks of itself as one team where everyone is focused on the same goal. However, problems arise because contractors face different restrictions than the military and civil service employees do. One such restriction involves the contractors' inability to allocate government resources. When issues relating to time or money arise, the contractors must refer customers to an authorized government employee. This slows down the overall consulting process and disrupts the relationship developed between the customer and the contractor.

Another contractor restriction involves the government's policy for rewarding contractors. For instance, when General Carlson, the AFMC commander, presented the Air Force Center of Excellence for Knowledge Management team with coins after winning an award, only the government employees were allowed to receive the coins. Situations like this serve to create rifts within the workforce.

Competing contract companies. The Air Force Center of Excellence for Knowledge Management employs contractors from five different companies. This arrangement creates some conflict amongst the different contractors. While everyone must work together to achieve the goals of the Air Force Center of Excellence for Knowledge Management, the contractors still express concern over the potential loss or

theft of their intellectual property. This type of thinking can erode open communication and the free flow of ideas.

Divide between technicians and consultants. There appears to be a disconnect between the technicians and the consultants in the Air Force Center of Excellence for Knowledge Management. The technicians, who are focused on AFKN and its associated programming needs, seem to have a narrower view of KM, where the consultants, who offer the KM workshops, seem to have a broader view of KM. As one employee stated, "The technicians joke around calling the consultants 'code talkers' because they say that they do not understand what [the consultants] are saying." This kind of separation effects unit cohesiveness, but also prevents the programmers from understanding what effect their position plays in the bigger picture of KM.

Material Resources

Slow connection speeds through the Air Force Portal. Once AFKN became available through the Air Force Portal, it became more easily accessible to users. Unfortunately, accessing AFKN via the Air Force Portal has demonstrated problems with connection speeds resulting in slow webpage loads and searches. Today's culture is an impatient one and issues like this can draw customers away from AFKN and towards other competing solutions.

Competing technical solutions. To date, AFKN hosts the majority of knowledge sharing participants in the Air Force, but some of its competing solutions present potential barriers. One prominent contender is Enterprise Information Management (EIM) applications. EIM is the Air Force's attempt at finding a single solution for all of its information management needs. While some tout EIM as a KM solution, most at the

Air Force Center of Excellence for Knowledge Management feel that it is only a document management system. As one manager stated, "They look at us and then say EIM does that. Then we have to say no, we're this and EIM is that. I say that EIM is not a KM program." So, while EIM is an IM solution, the threat exists that an uninformed leader may make a decision the will negatively impact the Air Force Center of Excellence for Knowledge Management. Another competitive technical solution is Microsoft's SharePoint. SharePoint, another document management system, is marketed as a KM solution, but, as with EIM, it lacks the "people" element needed for KM. What these solutions present are threats that can take resources away from the Air Force Center of Excellence for Knowledge Management. While the Air Force Center of Excellence for Knowledge Management considers itself "technology agnostic," there is still uncertainty as to its future if AFKN were to go away.

The evolution of technology. Another effect of inadequate funding is the Air Force Center of Excellence for Knowledge Management's ability to keep current with technology. One area where the Air Force Center of Excellence for Knowledge Management would like to pursue new technologies is with search engines. According to an employee, "Search has evolved significantly." Instead of just returning documents or COPS, newer search engines can return people as results based on their previous posts, CoP memberships, documents explored, and personnel interests. These types of capabilities would greatly improve bringing people together. Unfortunately, because of limited funds, the Air Force Center of Excellence for Knowledge Management has not been able to pursue these newer technologies.

Knowledge Resources

Lack of tools or processes for sharing tacit knowledge. As a tool, AFKN does a good job of sharing explicit knowledge, but it lacks the tools and processes to share tacit knowledge resources. As one employee offered, "Not enough is being done for tacit knowledge capture. We want to focus more on the people to people piece. We're too explicit heavy." Additionally, "We do not have an active tacit knowledge capture methodology." The important part of sharing tacit knowledge is to bring people together. Currently, AFKN's people connecting services are limited to the contact information of its members. As was stated earlier, AFKN does not work well for identifying users of like interests or experiences in order to put them in contact with each other. The nearest thing to that now is the Wisdom Exchange, which allows a user to ask a self-identified subject matter expert for help with a particular problem.

Lack of an internal training program. The Air Force Center of Excellence for Knowledge Management does not do a good job of ensuring that its employees are adequately educated on KM principles. Upon arrival, new hires are given a copy of Davenport and Prusak's *Working Knowledge*. Aside from the book, training is largely left to the individual. After varying amounts of time spent in the office, employees are sent to trade shows and to the workshop training offered by the consultants. Many of the members wished that there was a more structured path for their KM education; especially as many did not have KM experience when they arrived. This self-paced, unstructured method of training slows employee development time and results in differing levels of KM understanding and differing levels of KM solution quality provided to the customers.

Summary of Resource Influence

Within the Air Force Center of Excellence for Knowledge Management there are a variety of resource influences that act as barriers to KM efforts. Table 8 summarizes these influences.

Table 8. Summary of Resource Influence Barriers

Influence	Finding
Financial	• Lack of adequate funding • Unresponsive budgeting process • Contract ceiling limitations
Human	• Limited manpower • Contractor restrictions • Competing contractor companies • Divide between technicians and consultants
Material	• Slow connection speeds through the Air Force Portal • Competing technical solutions • The evolution of technology
Knowledge	• Lack of tools or processes for sharing tacit knowledge • Lack of an internal training program

Environmental Barriers

The purpose of the third research question was to identify which environmental influences act as barriers to knowledge management (KM) in the Air Force Center of Excellence for Knowledge Management. Using Holsapple and Joshi's (2000) "influences on the management of knowledge" framework as a guide, the following influences will be discussed: markets; technology; time; and Government, Economic, Political, Social, and Educational (GEPSE) climate.

Markets.

Slow to enact industry trends. The Air Force Center of Excellence for Knowledge Management works closely with industry in an effort to identify new techniques and best practices. One employee offered, "We've been to companies like Caterpillar, State Farm,

and others." While on these knowledge sharing ventures with industry, the Air Force Center of Excellence for Knowledge Management often returns with ideas that they would like to implement for use. Unfortunately, limited resources often slow the Air Force Center of Excellence for Knowledge Management's implementation of those changes. As one manager stated, "We picked something up from Caterpillar when we met with them, but it took us nearly a year to get it implemented." Despite having close ties with industry, this slow responsiveness prevents the Air Force Center of Excellence for Knowledge from being able to quickly capitalize on what they have learned.

Technology.

Inconsistent network configurations. Currently, the Air Force does not practice enterprise-wide execution of network configurations. Each MAJCOM, and often each base, operates their network independently, creating configuration inconsistencies across the Air Force. There are two areas in particular that pose as problems for the Air Force Center of Excellence for Knowledge Management. One is in the area of firewalls and the other is the Air Force's execution of Active Directory (AD).

The Air Force has no standard firewall configuration. As one member of the Air Force Center of Excellence for Knowledge Management stated, "Each MAJCOM implementing their own firewall strategy differently is the single biggest technical barrier to information sharing in the AF." Units open or close different network ports and have different procedures for opening network ports for use. Some bases may have a fairly lax method of granting network port access, while others may severely restrict network port access. This problem makes real-time collaborative tools like switched video conferencing nearly impossible to achieve. As described by on technician, "Leadership

wants synchronous collaborative capabilities, but our hands are tied." These challenges to synchronous collaboration severely impact the Air Force Center of Excellence for Knowledge Management's ability to share and capture tacit knowledge.

Another area creating barriers for the Air Force Center of Excellence for Knowledge Management is the Air Force's execution of AD. The Air Force has implemented a decentralized execution plan, which means that instead of having a single Air Force AD, there are multiple ADs throughout the Air Force. According to one employee, "If we were to go to SharePoint in our current [AD] state, we would have no collaboration, only SharePoint stovepipes around the Air Force. In the event that SharePoint is mandated, the Air Force will not be able to operate it collaboratively." Because SharePoint relies on AD for users to be able to share documents, it cannot operate as an enterprise solution until the AF's AD problems are resolved.

Time.

Lack of time. What the Air Force Center of Excellence for Knowledge Management has found is that their customers' ability to commit to KM is limited by the amount of time that they have. This is tied directly to leadership support because the customers' leaders often fail to give them the time necessary to either learn more about KM or to try KM efforts. Due to a lack of time to engage in KM activities, users often limit their KM activities to only using AFKN. While this may help them accomplish their immediate requirement, it does not allow them to address any larger KM needs. As one employee stated, "Most customers don't understand the full potential of what KM can do. A lot of that is driven by the amount of time that they have."

GEPSE.

The generation gap. A cultural issue that is acting as barrier to KM efforts guided by the Air Force Center of Excellence for Knowledge Management is the generation gap. According to an employee, "We are really beginning to see the difference because of the generation gap." The Air Force Center of Excellence for Knowledge Management is finding that the younger generation is more accepting of KM ideals and the use of AFKN, where the older generation is slower to react. "Today's youth is comfortable with the Internet. They don't think twice about sharing knowledge, just go take a look at MySpace or some of their blogs." While it is promising to see today's youth willing to accept KM, the challenge still lies in convincing the older generation, who happens to be the Air Force's leadership.

Lack of KM understanding. The largest challenge that the Air Force Center of Excellence for Knowledge Management faces is an overall lack of understanding of KM across the Air Force. One of the most common misunderstandings that the Air Force Center of Excellence for Knowledge Management sees is a confusion between KM and IM. This confusion is the foundation of many of the barriers that the Air Force Center of Excellence for Knowledge Management faces.

Because of the lack of KM understanding amongst Air Force leaders, KM efforts receive little support in the form of financial resources, employee time, and promotion of a supportive KM culture. What the Air Force Center of Excellence for Knowledge Management has found is that the majority of people can understand the operational benefits of KM better than they can understand the concepts of KM. While Mr. Gilligan was championing KM, he would brief KM to the Air Force's senior leader sessions such

as Corona. However, since his departure, no one has continued to deliver those briefings, which has limited senior leader KM education opportunities.

Another area where this lack of KM understanding is felt is in the Air Force's IT community. The Air Force's IT community tends to seek technical solutions for KM problems because they do not understand KM principles. As one member offered, "The [IT] community will implement a solution and then wonder why no one uses it. They leave the people part out.." The Air Force's IT community's understanding of KM is important because of the role leaders are asking them to play in providing KM solutions. This is described by an Air Force Center of Excellence for Knowledge Management employee, "We are finding that leaders are recognizing a need [for KM], but they are not necessarily sure what it is. What they do, is then task their [IT] officers to provide a solution." Because of the lack of KM understanding, the proposed solution is usually technical.

Summary of Environmental Influences

Within the Air Force Center of Excellence for Knowledge Management there are a variety of environmental influences that act as barriers to KM efforts. Table 9 summarizes these influences.

Table 9. Summary of Environmental Influence Barriers

Influence	Finding
Markets	• Slow to enact industry trends
Technology	• Inconsistent network configurations
Time	• Lack of time
GEPSE climate	• The generation gap • Lack of KM understanding

Chapter IV presented the results of the data that was collected. Those influences acting as barriers to KM efforts guided by the Air Force Center of Excellence for

Knowledge Management were identified. Chapter V will provide the researcher's conclusions and recommendations for future research.

V. Conclusions and Recommendations

This thesis has focused on the identification of influences that act as barriers to KM efforts guided by the Air Force Center of Excellence for Knowledge Management. Based on Holsapple and Joshi's (2000) "influences on the management of knowledge" framework, a variety of managerial, resource, and environmental influences have been identified as barriers to Air Force Center of Excellence for Knowledge Management.

This research was conducted using a case study methodology. Data was collected through organization documentation, archival records, and interviews. The interviewees were selected based on three different categories: upper-level management, mid-level management, and technicians. Three interviewees were selected for each category, for a total of nine interviewees.

Conclusions

This research shows that the Air Force Center of Excellence for Knowledge Management is indeed facing barriers to its KM efforts. Throughout this research, the reoccurring and overarching theme of a general lack of KM understanding at all levels of the Air Force was identified. This general lack of understanding about KM had cascading effects throughout the Air Force Center of Excellence for Knowledge Management.

An example of this problem can easily be demonstrated by starting with a lack of senior leader KM understanding. The lack of senior leader KM understanding directly results in a lack of leadership support for KM. The lack of leadership support then results in a reduction of financial resources, which results in the reduction of financial resources

such as reduced human and material resources such as manpower, time, and information technology (IT) resources. Figure 25 offers a representation of the cascading effect that a lack of KM understanding can have on KM efforts in an organization.

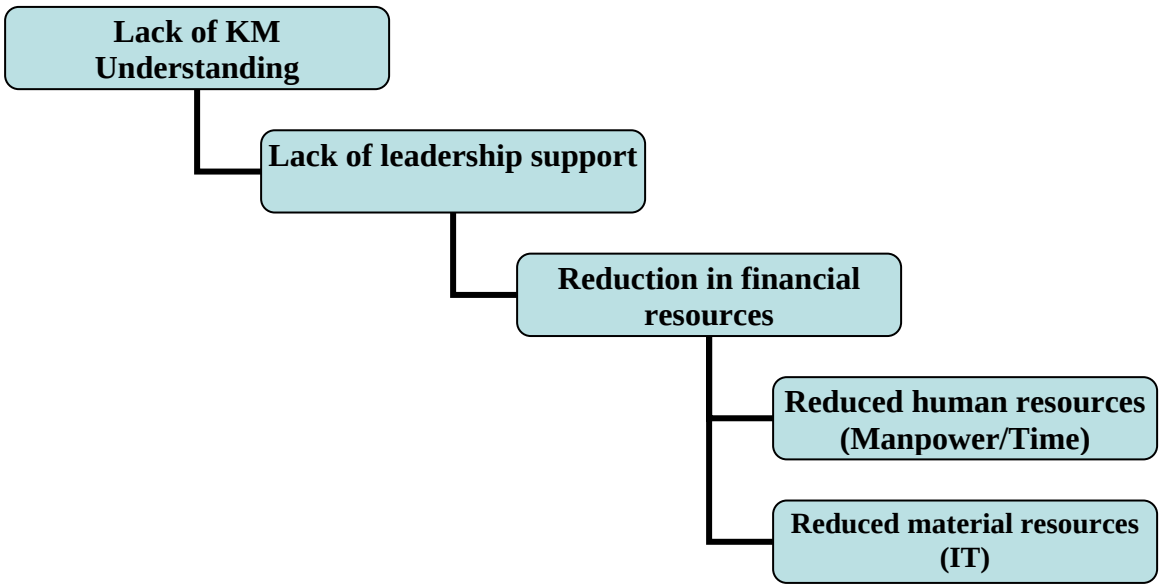

Figure 25. Cascading Effects of KM Understanding

Overcoming the overall lack of KM understanding will likely prove a complicated undertaking. First, the Air Force will need to focus on wide-spread education efforts at all levels of the Air Force. Education opportunities must exist at entry-level schools and throughout continued military education. Second, the Air Force is in dire need of a senior-level KM champion, someone who can promote KM and has the authority to enact change. A high-level KM champion can use their position to brief senior Air Force leaders at senior-level conferences.

Propositions.

The first proposition of this research was to determine if Holsapple and Joshi's (2000) "influences on the management of knowledge" framework was appropriate for

identifying barriers to KM efforts guided by the Air Force Center of Excellence for Knowledge Management. Overall, the framework still holds as a reliable means of identifying barriers to KM efforts. However, there were several areas where the researchers feels that the framework could use improvement. First, there needs to be more detail when describing the influences. While some of the influences receive a paragraph or two of explanation, all six of the environmental influences are only listed in a single paragraph (Holsapple & Joshi, 2000). This lack of influence clarity makes it difficult for the researcher to be precise when identifying the barriers. Many of the conclusions are based on assumptions of the definitions made by the researcher. Second, the framework fails to adequately address organizational culture. Throughout the literature review, this was a common complaint made by those whose research built upon this framework.

The second proposition of this research was that there would be changes in the barriers identified in the Bartczak (2000) study and this study. This proposition was based on the assumption that changing events such as the appointment as the Air Force Center of Excellence for Knowledge Management, the 2005 Air Force KM conference, and heightened AFKN usage would alter some of the barriers previously identified. While there appeared to have been some changes during the period of Mr. Gilligan's term as the Air Force CIO, many, if not all, of those changes seem to have been disappeared. Because of a lack of senior-leader KM support and the loss of their KM champion, Mr. Gilligan, the Air Force Center of Excellence for Knowledge Management seems to be faced with the same barriers as in 2002.

Implications of Research.

This results of this research offers several benefits for both practitioners and academics. First, it gives the Air Force Center of Excellence for Knowledge Management insights as to which influences are acting as barriers to its KM efforts. This will allow the Air Force Center of Excellence for Knowledge Management to focus their efforts towards those actions that can help overcome those barriers. Furthermore, the results of this research offer the Air Force a look into those influences acting as barriers to its organizations. Second, this research adds to the KM body of knowledge by augmenting the work done by Bartczak (2002). This is particularly important when it comes to KM in the military because of the limited amount of research that has been done in that area. And third, this research offers researchers the opportunity to see if Holsapple and Joshi's (2000) "influences on the management of knowledge" framework still holds as an accurate means of identifying barriers to KM. While this research did point out several areas where the framework is lacking, influence definition clarity and accounting for organizational culture, overall, the framework is still a useful guide in identifying barriers to KM.

Recommendations for Future Research

The first recommendation for future research would be to investigate other Air Force organizations that say they are practicing KM. That investigation could be extended to examine organizations of varying size at varying organizational levels such as a squadron or at the Air Staff level. Furthermore, it would be beneficial to investigate organizations at deployed locations.

Second, future research should try to capitalize on the wealth of social networking data that the Air Force Center of Excellence for Knowledge Management possesses. Examining this data would present an excellent opportunity to examine the social networking characteristics of knowledge sharing, allowing the Air Force Center of Excellence for Knowledge Management to focus it AFKN efforts where they would be the most beneficial.

Third, future research should investigate some of successful organizations that the Air Force Center of Excellence for Knowledge Management has worked with. For example, SAF/FM has been extremely successful with their KM efforts and they would serve as a good organization to investigate. Identifying which factors led to the success of these organizations would greatly benefit the Air Force Center of Excellence for Knowledge Management and it's consulting efforts.

Summary

The focus of this research was to investigate the influences that act as barriers to knowledge management efforts guided by the Air Force Center of Excellence for Knowledge Management. The research questions of this research was based on Holsapple and Joshi's (2000) "influences on the management of knowledge" framework. A case study methodology was used to investigate the Air Force Center of Excellence for Knowledge Management. The influences acting as barriers to KM efforts guided by the Air Force Center of Excellence for Knowledge Management identified in this research include: a lack of KM understanding, a lack of leadership commitment and reinforcing behaviors, a lack of financial, human, material, and knowledge resources, and a variety of

environmental influences. It is important that the Air Force Center of Excellence for Knowledge Management recognize these barriers and take efforts towards overcoming them if it is going to maintain its success.

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From – To)*
14-09-2006	Master's Thesis	Aug 2005 – Sep 2006

4. TITLE AND SUBTITLE

Investigating Barriers to Knowledge Management: A Case Study of the Air Force Center of Excellence for Knowledge Management

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Myers, Edgar L. IV, Captain, USAF

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S)
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AFIT/GIR/ENV/06-01S

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10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

13. SUPPLEMENTARY NOTES

14. ABSTRACT
Knowledge is becoming recognized as an organization's most valuable and powerful resource. As a resource, knowledge is used to improve an organization's efficiency and effectiveness, to create innovative solutions, and to enhance decision making capabilities. Being such an important resource, it stands to reason that an organization's knowledge resources must be effectively managed. However, while an organization attempts to manage its knowledge, its efforts are constrained by a variety of influences acting as barriers. Using Holsapple and Joshi's (2000) "influences on the management of knowledge" framework, the purpose of this research is to identify those barriers which are acting as barriers to knowledge management (KM) efforts guided by the Air Force Center of Excellence for Knowledge Management. Based on the results of this research, a variety of managerial, resource, and environmental influences acting as barriers were found. It was also determined that the overarching problem of a lack of KM understanding throughout the Air Force serves as the greatest barrier to KM efforts guided by the Air Force Center of Excellence for Knowledge Management.

15. SUBJECT TERMS
Knowledge mangement, Holsapple, Joshi, barriers, influences

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
REPORT	**ABSTRACT**	**c. THIS PAGE**			Summer E. Bartczak, Lt Col, USAF
U	**U**	**U**	**UU**	124	**19b. TELEPHONE NUMBER** *(Include area code)* (937) 255-6565, ext 4826 e-mail: summer.bartczak@afit.edu

Standard Form 298 (Rev: 8-98)
Prescribed by ANSI Std. Z39-18