EXPLORING CONTENT MANAGEMENT ISSUES IN

AIR FORCE ON-LINE COMMUNITIES OF PRACTICE:

A MULTIPLE CASE STUDY APPROACH

THESIS

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AFIT/GIR/ENV/04M-18

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Abstract

Content management is defined as all business practices and technical processes that are performed for the purpose of capturing, maintaining, sharing and preserving recorded meaning. It is a growing concern in the areas of web site management, portal development/management and collaborative workspace management. The ever-increasing volume of existing and daily-created knowledge and information impedes the ability of community members to navigate successfully through the collaborative workspace. The practice of content management attempts, regardless of platform, to ensure that pertinent information is current, relevant, and presented in a usable manner. The Air Force Communities of Practice (CoPs) hosted by AFMC/DRW can be defined collaborative workspaces. The purpose of these CoPs is to facilitate and promote an environment of capturing and sharing knowledge among members of a particular field, task, or common practice. As the host for these CoPs, AFMC/DRW desires to increase CoP participation, efficiency, and effectiveness. Addressing existing or potential content management issues will help do so.

This descriptive case-study research observed and interviewed managers and members of eight active CoPs hosted by AFMC/DRW. This research suggested that the interviewed CoPs currently use no formal content management processes. Some CoP members indicated developing formal content management processes and procedures, establishing a good taxonomy, and better defining roles and responsibilities of content owners may help solve future content management issues.

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Jaime A. Rodriguez

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EXPLORING CONTENT MANAGEMENT ISSUES IN AIR FORCE ON-LINE COMMUNITIES OF PRACTICE: A MULTIPLE CASE STUDY APPROACH

I. Introduction

The world is in a state of constant change. According to Drucker, we are entering the "knowledge society," where "the basic economic resource" is no longer capital, natural resources, or labor, but "is and will be knowledge" (Drucker, 1993). Given the argument that knowledge is a valuable resource to an organization, one line of reasoning follows that an organization's knowledge (to include all the knowledge that resides in the heads of the members of the organization) requires due attention and management. Malafsky describes knowledge management as a "field that seeks to exploit the combined knowledge, expertise, and experience of an organization's people to improve its productivity, efficiency, innovation, effectiveness, and value" (Malafsky, 2002). In order to adapt in a rapidly changing environment, organizations must constantly find means of achieving and realizing innovation. Communities of practice (CoPs) are a main component of many organizations knowledge management programs. In some instances, CoPs are facilitated through the implementation of (information system-based) knowledge management systems that support collaboration for fostering communication, networking people together, and learning while on the job (May, 2002). Web-based communities of practice can be viewed as a collaborative workspace and one type of knowledge management system (May, 2002).

A Community of Practice (CoP) is defined as a "group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge

and expertise by interacting on an ongoing basis" (Wenger et al., 2002). Community members interact to share information, accumulate knowledge, and solve problems (Wenger et al., 2002). They do so through social forums and with the use of a variety of collaborative technologies. One type of collaborative technology forum is a web-based CoP. A web-based CoP is essentially a virtual collaborative workspace, a common workspace shared by active subjects and supported by information technology (Heaton, 1998). Content management is an issue associated with the technology, policy, and procedures used to provide collaborative workspaces. It is a growing concern in the areas of web site management, portal development/management and collaborative workspace management (APQC, 2001). Content management is defined as "a practice to provide meaningful and timely information to end users by creating processes that identify, collect, categorize, and refresh content" (such as ensuring new information and knowledge is correctly categorized and outdated information is properly achieved) "using a common taxonomy across the organization" (APQC, 2001). Within the CoP workspace, the daily creation of new knowledge and information by community members adds to the abundance of existing community member knowledge and archived information. This ever-increasing volume of existing and daily-created knowledge and information impedes the ability of community members to navigate successfully through the collaborative workspace. Finding relevant knowledge becomes a key issue when content is not managed properly within the collaborative workspace. A search executed for a particular subject may result an over abundance of returns which have no relevance in the terms of the context of the topic. The practice of content management attempts, regardless of platform, to ensure that pertinent information and/or knowledge is current,

relevant, and presented in a usable manner for access by intended users. Applying content management practices to collaborative workspace technology is a central enabler in helping people get the information and knowledge they need to get their jobs done (APQC, 2001). Certain Air Force organizations are interested in encouraging the utilization of CoPs to supplement current knowledge management initiatives (May, 2002). These same organizations are looking for recommendations on how to improve the effectiveness and efficiency of existing CoPs so that they can better serve their members and organizations. Effective content management will provide an avenue that may be used to develop content that can enhance Air Force and specifically AFMC/DRW hosted CoPs.

Background

Knowledge Now is an Air Force knowledge management program of which web-based CoPs are one component. Air Force Materiel Command, Directorate of Requirements, Workforce Management Division (AFMC/DRW), the Air Force organization that manages and champions the Knowledge Now website, wants to identify ways web-based CoPs can evolve into more effective knowledge sharing environments. The motivation for this research is to assist AFMC/DRW in improving their hosted CoPs by exploring and identifying content management issues. Once the content management issues are identified, content management improvements may provide meaningful relevant knowledge sought by community members to accomplish their jobs in a timely manner and increase their individual knowledge bases. Next, the research questions of this thesis effort are presented.

Research Questions

This thesis research will attempt to answer the following research questions:

1. What are the content management issues associated with the AF CoPs hosted by AFMC/DRW?
2. What are the CoP content management issues critical to success as identified by AF CoPs knowledge owners/members?
3. What actions have AFMC/DRW or the AF CoPs themselves taken to address content management issues?
4. What suggestions or solutions do AF CoP knowledge owners/members propose to solve the content management problems that they are experiencing?

Research Approach

This research effort will use a case study method to identify issues of content management in the context of CoPs hosted by AFMC/DRW. The focus of this effort will be to identify the perceived existing content management issues that would provide for effective and efficient content management. The semi-structured interview method used in this research will consist of interviews with managers and key members of CoPs hosted by AFMC/DRW. In this endeavor, the research will identify and review existing content management practices within the commercial sector, with the intent of identifying the issues that are essential to successful CoPs. The results will be used as a basis for analyzing the current content management issues within the AFMC/DRW hosted CoPs, as perceived by CoP managers and members. It is anticipated that the identified results would be beneficial for AFMC/DRW to receive recommendations for improving existing

CoPs. The scope of this research is limited to identifying content management issues that enable effective content management for the AFMC/DRW hosted CoPs.

Benefits to the Air Force

Some organizations that have implemented CoPs have realized benefits such as reduced time and costs, improved quality of decisions, increased retention of talent, and the ability to take advantage of emerging opportunities (Wenger et al., 2002). Benefits to community members participating in CoPs include access to expertise, stronger sense of belonging, network for keeping current in an area, enhanced professional reputation, and increased marketability and employability (Wenger et al., 2002). By identifying content management issues that enable effective content management for AFMC/DRW hosted CoPs, this research can provide a foundation for future content management efforts directed at cultivating and improving these CoPs. The results of this research may help AFMC/DRW to better understand the current content management issues of existing CoPs and to determine potential content management strategies for cultivating CoPs to their greatest potential. It is also likely that this research may be extended to other Air Force organizations attempting to implement new CoPs on the site hosted by AFMC/DRW.

Summary

This chapter discussed the background of CoPs, introduced the concept of content management, stated the research problem, and presented the research questions. Additionally, this chapter discussed benefits of using content management within the

context of CoPs, described the scope of this thesis, presented the research methodology used, and discussed the benefits of the results.

Next, a literature review will be presented in Chapter 2. The scope of the literature review represents the key ideas of experts and academics from books, trade magazines, and peer-reviewed journal articles. Following the literature review, Chapter 3 will present the research methodology. Chapter 4 will state the research results and analysis. Finally, Chapter 5 will examine the implications of the research, as well as future research possibilities.

II. Literature Review

Introduction

This thesis research seeks to answer what content management issues exist in the Air Force CoPs hosted by AFMC/DRW. In addition, this research also attempts to find what Air Force CoP knowledge owners/members perceive as the critical content management issues. The scope of this literature review represents the ideas of experts and academics from books, trade magazines, and peer-reviewed journal articles discussing content management and CoPs. The information in this literature review provides the background of how CoPs relate to knowledge management, defines content management, describes the importance of content management in CoPs, and provides general information about other military services and AFMC/DRW CoP challenges and research. Next a definition of knowledge and knowledge management are given for the purpose of this research effort.

Knowledge and Knowledge Management

A key foundation of this research is the building block of knowledge. Since there exists an entire study on the theory of knowledge (Epistemology), this literature review provides a limited background and working definition of knowledge. Leonard and Sensiper define knowledge in the business context as "information that is relevant, actionable and at least partially based on experience" (Leonard and Sensiper, 1998). Knowledge includes "what people know about how to make things work better, best practices, and lessons learned about any process" (O'Dell et al, 2002). Michael Polanyi argues "we can know more than we can tell" (Polanyi, 1967). Polanyi describes a

distinction between tacit and explicit knowledge (Polanyi, 1967). Following on Polanyi's distinction of tacit and explicit knowledge, Nonaka and Takeuchi (1995) base their theory of organizational knowledge creation on the dynamic interaction of tacit and explicit knowledge. According to Nonaka and Takeuchi, tacit knowledge is "personal, context-specific, and therefore hard to formalize and communicate". In contrast, explicit knowledge is "transmittable in formal, systematic language" (Nonaka and Takeuchi, 1995). For the purpose of this research, Davenport and Prusak's working definition of knowledge is adopted. Davenport and Prusak (1998) define knowledge:

> 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 the documents or repositories but also in organizational routines, processes, practices, and norms.

This research is built on the premise that knowledge is regarded as valuable resource. According to Drucker, we are entering the "knowledge society," where "the basic economic resource" is no longer capital, natural resources, or labor, but "is and will be knowledge" (Drucker, 1993). Similarly, Toffler states knowledge is the ultimate replacement of other resources (Toffler, 1990). Nonaka and Takeuchi contend knowledge creation leads to continuous innovation, which in turn leads to competitive advantage (Nonaka and Takeuchi, 1995). In gaining and sustaining a competitive advantage, knowledge is a valuable resource (Davenport and Prusak, 1998). Wenger argues "[knowledge] is simply too valuable a resource to be left for chance" (Wenger et al, 2002). Given the argument that knowledge is a valuable resource to an organization, one line of reasoning follows that an organization's knowledge (to include all the knowledge residing in the heads of the members of the organization) requires due

attention and management. Hansen argues since the foundation of industrialized economies shifted from natural resources to knowledge assets, senior leaders are "forced to examine the knowledge underlying their businesses and how that knowledge is used" (Hasen et al, 1999). According to Swap et al (2001), scholars studying knowledge management (KM) often point out management accrues through experience. Malafsky describes knowledge management as a "field that seeks to exploit the combined knowledge, expertise, and experience of an organization's people to improve its productivity, efficiency, innovation, effectiveness, and value" (Malafsky, 2002). Fulmer describes knowledge management as "a process for identifying what knowledge is needed within an organization what gaps exist, and what skills are required to solve a problem or complete a project" (Fulmer et al, 2002). The American Productivity and Quality Center (APQC) defines knowledge management as "the systematic process of identifying, capturing, and transferring information and knowledge people can use to improve" (O'Dell et al, 2002). In a quick look at industry, Chevron defines knowledge management as "processes, tools, and behaviors that deliver the right content to the right people at the right time and the right context so that they can make the best decisions, exploit business opportunities, and innovate" (O'Dell et al, 2002). O'Dell and other researchers at the APQC state:

> Knowledge management has evolved into a systematic process to: identify important knowledge, create a space and system for people to share what they know and create new knowledge, capture best practices and useful information in a form that other people can use in the future, and transfer that information and knowledge to others who can use it. (O'Dell et al, 2002)

Organizations often pursue technology in search of KM solutions. Knowledge management initiatives generally "use some form of information technology to connect

people to people and people to information and knowledge" (Hasanali & Leavitt, 2003). Research at APQC shows consistent recognition of IT as "an essential enabler to effective knowledge sharing" (Hasanali & Leavitt, 2003). Information technology based knowledge management systems are a class of information systems designed to "focus on creating, gathering, organizing, and disseminating an organization's knowledge" (Alavi and Leidner, 1999). Knowledge management systems reduce the tedious work of searching for specialized knowledge resources, making it more likely that groups of individuals will include a variety of knowledge (Gray, 2000). Malafsky states "KM is not a technology solution, but rather is primarily about people-oriented processes…with technology playing a supporting, albeit critical, role" (Malafsky, 2002). This insightful statement by Malafsky leads to the next topic of a Community of Practice (CoP). In search of a solution for knowledge management needs, some organizations have turned to CoPs to meet the organizational knowledge management needs. Next, a definition of communities of practice is given along with the relationship linking CoPs to knowledge management.

Defining Communities of Practice

In order to accomplish work objectives, people collaborate and share ideas and views on problems or topics of concern. Technology, specifically information technology, facilitates collaboration and sharing by providing workers with virtual workspaces. People are no longer limited to the physical location of their desk, cubicle, or file cabinet, but now have a virtual expanse in which to store and share knowledge. Collaborative workspaces are common workspaces shared by active subjects and

supported by information technology (Heaton, 1998). A specific form of a collaborative workspace is a web-hosted Community of Practice.

People share insights and views on problems or topics of concern daily. This sharing occurs in both social and work environments. Sharing often occurs within groups of people with a common interest. The common thread within this group of people may be the desire to solve a problem, a shared practice or concern (like parenting), or an instilled passion for a topic. The APQC defines communities as "networks of people who come together to share ideas with and learn from one another in physical and virtual space" (Hasanali & Leavitt, 2003). More concisely, a CoP is "a group of people that shares an expertise and is bound by a common mission or purpose" (Hasanali & Leavitt, 2003). These communities are "held together by a common purpose or mission" and "are sustained by a desire to share experiences, insights, and best practices" (Hasanali & Leavitt, 2003). CoPs gather the shared collective knowledge, skills, and experiences of members to achieve a mutual goal. For this research endeavor, the following definition of a CoP is adopted: communities of practice are "groups of people who share a concern, set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (Wenger et al, 2002).

Researchers at APQC believe "it has become conventional wisdom that organizations must capitalize on knowledge to be fast, innovative, and successful" (Hasanali & Leavitt, 2003). More decentralized forms are replacing the traditional hierarchal organizational forms (Hasanali & Leavitt, 2003). Communities of practice have emerged as "a new organizational form for creating knowledge sharing relationships, organizational learning, and implementing change" (O'Dell et al, 2002).

Wenger and Snyder state “Not so long ago, companies were reinvented by teams. Communities of practice may invent them yet again – if managers learn to cultivate these fertile organizational forms without destroying them” (Wenger and Snyder, 2000). CoPs are used “as an effective way of creating, sharing, validating, and transferring tacit knowledge” (O’Dell et al, 2002). CoPs are “forums for the exchange of tacit knowledge and for determining the quality and usefulness of explicit knowledge” (Hasanali & Leavitt, 2003). CoPs are responsible for finding and sharing best practices, stewarding knowledge, and helping community members work better (Hasanali & Leavitt, 2003). Researchers at APQC found CoPs “may exist within organizations or stretch across organizational boundaries” (Hasanali & Leavitt, 2003). A distinctive characteristic of communities is the crossing of boundaries created by workflow, functions, location and time. The distinction and formality of communities of practice as boundary-crossing units is emerging in organizations and knowledge management initiatives (Hasanali & Leavitt, 2003). In a knowledge-based organization, communities provide a medium for the flow of knowledge across organizational boundaries (Hasanali & Leavitt, 2003). Another characteristic of CoPs is the movement of local “know-how” to collective knowledge available to the organization at large (Hasanali & Leavitt, 2003). In organizations, CoPs form around “certain professional needs and experiences, like finance, marketing, information technology, sales, and customer care” (Hasanali & Leavitt, 2003). CoP members offer insight through experience, solutions to problems, cutting-edge practices, and tricks of the trade. An intangible characteristic of CoPs is the strengthening of the social fabric of the organization (Hasanali & Leavitt, 2003). Members turn to other members to tackle challenging problems. Even non-members turn

to the community in search of help with difficult problems. Researchers at APQC found ongoing evidence in best-practice organizations revealing CoP "efforts enhance the implementation of knowledge management and reduce the cycle time to institutionalizing a knowledge sharing environment" (Hasanali & Leavitt, 2003). CoPs are warmly accepted by knowledge-based organizations since the communities "enable knowledge sharing relationships, accelerate learning, and enhance successful implementation" (Hasanali & Leavitt, 2003). These organizations want to take full advantage of the opportunities made available by knowledge management and are utilizing CoPs to reach this goal. Next, a definition of content management is provided followed by reasoning why content management is important in communities of practice.

Defining Content Management

Content management involves the identification, collection, and management of content within an organization (Hasanali & Leavitt, 2003). Content includes databases, documents, briefing presentations, records of dialogue transactions, and just about any creative work. According to the APQC, "Content is more than just data or information; it is codified knowledge" (APQC, 2001). Content management is defined as "a practice to provide meaningful and timely information to end users by creating processes that identify, collect, categorize, and refresh content using a common taxonomy across the organization" (APQC, 2001). Content management should provide a standard approach for content ownership, use, storage, and classification (Hasanali & Leavitt, 2003).

Content Management Issues.

Participation by community members in providing new content and assisting in maintaining content are identified content management issues. A common mistake is building knowledge repositories based on existing content and without active community members contributing to the endeavor. Research by APQC found completely supply-driven efforts are rarely successful in getting members to refresh or use the content provided. Community members need to contribute and maintain their content, not have it supplied for them. HP Consulting addresses the issue of participation through "finding and capitalizing on members' passions, providing the appropriate training, and using various channels for communication and participation" (O'Dell et al, 2002).

Another content management issue arises when users want to know if they are using the most accurate and up-to-date content. This issue is addressed by the validation of the knowledge provided by community members. Having a validation process in place allows subject matter experts to scrutinize the knowledge and information provided by community members. A critical success factor for the validation process is selecting recognized experts in a certain field or area to evaluate their respective community knowledge. Organizations also learned establishing a period for the validation process keeps content from becoming obsolete or stale. Establishing a validation process period also helps in preventing members from becoming discouraged contributors (O'Dell et al, 2002).

Communities of practice create and organize their documents and content in an idiosyncratic way that may be understandable to their members, but are not easily

accessible to others within the organization. During its eighth research consortium on knowledge management, *Managing Content and Knowledge 2001*, APQC researched several examples of working content management systems. APQC found one best-practice organization provides centrally funded content managers. These content managers are former practitioners from a community of practice and are extremely familiar with the nature of community knowledge. These individuals teach community members how to use metadata or keywords on a document so it can be retrieved from a search easily. The content managers also give training to content providers on writing abstracts so community members can quickly review the abstracts and see if the document is applicable. These practices allow community members to create documents and more effectively share these documents with the whole community. According to research on best-practice organizations by APQC, a key lesson learned is content management must be addressed early in the community life cycle since content becomes the limiting factor for most communities (Hasanali & Leavitt, 2003). Next, reasons of the importance of content management in communities of practice are explored.

Importance of Content Management in Communities of Practice

There is a growing awareness of the importance of content management in knowledge management initiatives (APQC, 2001). Content management enables people to find the knowledge they need to do their jobs. "Communities are positioned to exchange tacit knowledge and determine the usefulness and validity of explicit knowledge by allowing the bearers and creators of knowledge to share, cooperatively create, and use enterprise knowledge" (Hasanali & Leavitt, 2003). Additionally, the content created by communities can be used to provide substantial value to the

organization (Hasanali & Leavitt, 2003). "KM leaders faced with defining the life cycle of content, gathering an inventory of existing content, selecting a taxonomy, and creating a content validation system can address such issues through" the use of effective content management (Hasanali & Leavitt, 2003). Within CoPs, content management is important since resources are limited, content must be located, and limits are reached. Organizations supply substantial support resources to communities in the form of "content managers and systems, community coordinators, and information technology applications" and although support varies with community type "all depend on some central resources for training and content management" (Hasanali & Leavitt, 2003). Content management provides effective use of limited human resources by allowing the knowledge worker to access (in a timely manner) updated and pertinent knowledge and information as required. Finding relevant and accurate knowledge becomes easier with effective content management. Research at APQC shows "every best-practice organization has unlocked the power of its people's knowledge by enabling employees with IT tools that make finding, sharing, and using information easier and more effective" (Hasanali & Leavitt, 2003). The cost of finding the right knowledge emerges when "highly paid knowledge workers are spending time searching for, and recreating, content that they strongly suspect already exists in the organization, but they cannot find" (APQC, 2001). In organizations requiring employees to do more with less, reducing the time it takes for employees to find accurate and relevant answers is becoming more critical as more emphasis is being placed on speed. The volume of content has dramatically increased, but the time to find and truly comprehend the content being sought has not increased. (APQC, 2001). Finally, APQC's research and experience

shows content management quickly becomes a limiting factor in any knowledge management effort (Hasanali & Leavitt, 2003). A lack proper content management practices within a knowledge management effort reduces the value of gathering an organization's knowledge and information into a searchable repository when users unknowingly retrieve and use outdated or irrelevant information.

US Army Community of Practice Efforts

The US Army has addressed knowledge management through an enterprise network approach with the Army Knowledge Online (AKO) portal. AKO provides Army personnel, both authorized civilian (to include dependents, retirees, and sponsored users) and active-duty, access to Army resources required to get work done and to share knowledge in a collaborative workspace. The AKO portal hosts the Army CoP efforts. The Army CoPs can only be accessed through the AKO portal and only registered AKO users can access the Army CoPs (Fong, 2003).

The Army knowledge management strategy consists of five distinct goals. The second goal is to "Integrate knowledge management concepts and best practices to promote the knowledge-based force." This goal is reached by building knowledge sharing and collaboration into Army processes. One method for generating knowledge sharing and collaboration is the development of CoPs (Maliszewski, 2003).

At the 2003 Army Knowledge Management Symposium's Community Page Administrators Workshop, one briefer shared details relating to Army CoPs on the AKO portal. AKO will support multiple, nested Communities of Practice (CoPs). These CoPs will have the ability to have different templates and branding layouts. This differentiation ability allows the traditions (through colors and designs) of different units

to permeate into the CoP design layout. Content administration and additions will all be handled on the web without interaction with developers. Community page administrators are responsible for the content on their community pages and are provided training on the tools used to manage the content on their pages. CoPs will come with an automated content management system. The default setting on the content management system for content review on the community pages is to send an automated e-mail message to the content administrator notifying the administrator to review the content on an annual basis. The reasons given for moving communities onto AKO included: good business sense, provides an avenue for knowledge management and collaboration, allows for more effective information dissemination, enables internal targeting marketing, and meets the needs for accessibility and organization (Fong, 2003).

The Army has chosen to focus resources against formal communities known as knowledge networks. These knowledge networks cover a wide range of topic areas from field artillery to purchasing items issued to soldiers going to combat zones. Most of these formal communities are hosted by the schools that teach the related area. For example, the Fires Knowledge Network is hosted by the Artillery school at Fort Sill, Oklahoma. Unlike the Center for Army Lessons Learned, these schools are formally recognized as the authoritative source for knowledge and information in their subject areas. The goal in structuring these knowledge networks is for the soldier to be able to find current, relevant information within three clicks (in other words only follow three links from the community page). In order to realize this search goal, the Army has assigned experts in taxonomy (usually former librarians) to work closely with the community page administrators to design the right classification structure for these formal communities

(Knihnicki, 2003). Building a proper taxonomy provides the foundation for effective content management practices. The Army has the procedure in place to have experts in taxonomy work with content administrators to support in the development of effective classification structures for community pages within a well-defined subject area.

US Navy Communities of Practice Efforts

Similarly, the Department of the Navy (DON) has an enterprise knowledge management effort with the Navy Knowledge Online (NKO) portal. NKO provides Navy and Marine Corps personnel, both authorized civilian (to include dependents, retirees, and sponsored users) and active-duty, access to Navy resources required to get work done and to share knowledge in a collaborative workspace. The NKO portal hosts the Navy CoP efforts. The Navy CoPs can only be accessed through the NKO portal and only registered NKO users can access the Navy CoPs.

The Navy's journey in "becoming a knowledge centric organization began with development of the Information Management (IM)/Information Technology (IT) Strategic Plan" (Bennet, 2002, p. 468). A component of the vision of the future presented in this plan was "A Knowledge-Centric culture where trust and respect facilitate information sharing and organizational learning" (Bennet, 2002, p. 469). Nine strategic goals paved the path for achieving the vision. One goal was to "implement strategies that facilitate the creation and sharing of knowledge" (Bennet, 2002, p. 469). In the Navy, KM is "viewed as a process for optimizing the effective application of intellectual capital to achieve organizational objectives (Bennet, 2002, p. 476). In relating knowledge needs and sharing, Bennet states:

> KM, implemented by and at the organizational level, and supporting empowerment and responsibility at the individual level, focuses on understanding the knowledge needs of an organization and the sharing and creation of knowledge through communities and Web-enabled collaboration – connecting people. (Bennet, 2002, p. 476)

CoPs are a vital portion of the knowledge sharing and collaboration efforts used by the Navy. An important knowledge strategy is "the use of teams and communities help facilitate the flow of information and knowledge across the organization" (Bennet, 2002, p. 478). A resource provided by the Department of the Navy Chief Information Officer is the resource CD entitled *Cport: Building Communities of Practice*. The Cport resource is a practitioner's guide developed by the Navy to provide the groundwork for building and sustaining CoPs. It also provides sections on quickly starting a CoP, facilitating information/knowledge flows, and other tools and resources. Bennet states, "As the DON recognized the value and opportunity offered by this new approach to communicating, sharing, and innovation, communities have emerged across the DON enterprise" (Bennet, 2002, p. 478).

Getting down to the working level, the Navy developed a template to emphasize critical concepts that needed to be addressed in their KM strategy (Bennet, 2002, p. 474). The developed model template frames "a balanced KM system focusing on the five core areas: technology, content, process, culture, and learning" (Bennet, 2002, p. 475). When using this template to look at potential processes, the core concept areas highlight the questions to investigate. The questions under the content core area include: How does the system ensure content value? In what ways will it ensure currency and credibility of the data and information it provides? How will the system address the relevancy of content? How will context be added? Will links to people who have needed expertise be

available? (Bennet, 2002, p. 475). These questions bring to light issues addressed by sound content management practices.

AFMC/DRW Communities of Practice Efforts

The background of the origin and evolution of the Air Force Knowledge Now (AFKN) program aids in the understanding of the CoP efforts put forth by AFMC/DRW. The current Knowledge Now website consists of the integration of several knowledge management efforts. These efforts include the Air Force Knowledge Management website, the AFMC Helpdesk, and the AF Deskbook. The Air Force Knowledge Management web site endeavor began in 1998. It started as a "Lessons Learned" effort and covered a wide range of Air Force topics, and provided access to Communities of Practice (CoPs). Although there were benefits to the original site, room for improvement existed. Searching for subject area content was difficult due to a complex taxonomy, which was not user-friendly or intuitive. Additionally, the explosive growth rate of CoPs was difficult to manage. The AFMC Help Center site was deployed in 2000, in support of Air Force efforts in Kosovo. During the Kosovo crisis, a staff was initially assigned to answer questions on a wide variety of AFMC topics. After this mission-essential need was fulfilled, there was an expressed desire to continue this approach for providing timely access to AFMC information. The AFMC Knowledge Now team responded to this initiative by installing a search engine to expand former search capabilities. The Verity search engine is still used to retrieve knowledge content on AFMC web pages. In May 2002, the Deskbook Joint Program Office moved from Wright-Patterson AFB to Ft. Belvoir. Each service was directed to take control of their content, with DAU maintaining mandatory OSD documents. That same month, in response to a memo from

AFMC Commander General Lyles, the AFMC Knowledge Now Support Team captured both mandatory and discretionary content and placed it into a Community of Practice (CoP), thus creating the AF Deskbook. Since the establishment of the AF Deskbook, the Knowledge Now team has maintained the content of the Air Force portion of the resource. Many obstacles and events have been addressed through the integrated AFKN environment.

The current AFMC/DRW CoP efforts consists of well-over 300 CoPs. These CoPs are accessible only to the .mil community. The resources currently available now include: a searchable document posting/sharing repository, a searchable threaded-discussion area, CoP points of contact email directory, a search feature of CoP documents and selected web sites, knowledge owner control/update of web links on CoP pages, a calendar with daily/monthly/yearly views, a News Ticker to bring new or important information to the attention of community members, an editable member mailing list, a change alert feature associated to content stored in the CoP, and a selective access option to enable restrictive access as needed. The assigned knowledge owner manages the content existing on the Knowledge Now CoPs. Initial training on administering the content on the CoP is provided (when requested) by the Knowledge Now team. The Knowledge Now team also provides support for developing an initial taxonomy. Since the knowledge owner develops the processes and procedures for content management on their CoP, this focus of this research effort is to explore the content management issues/concerns that community members encounter with the CoPs hosted on Knowledge Now.

Summary

This chapter presented a literature review of the ideas of experts and academics discussing content management and CoPs. The information in this literature review provided the background of how CoPs relate to knowledge management, defined content management, described the importance of content management in CoPs, and provided general information about the Army and Navy CoP efforts, and covered the background and current activity of the AFMC/DRW CoP efforts. In the next chapter, the methodology used for this research effort is presented.

III. Methodology

Overview

This chapter presents the research methodology selected for conducting this thesis effort. The case study design is described and an explanation is given why it best fits this research project. This chapter includes the methods for data collection and analysis. The chapter also describes the design quality of this study. Finally, the limitations of this research effort are addressed.

Case Study Strategy

The case study is the methodology chosen for this research project. When deciding on research strategy, there are three conditions that must be considered: "the type of research question posed, the extent of control an investigator has over actual behavioral events, and the degree of focus on contemporary as opposed to historical events" (Yin, 2003, p. 5). This research meets all the criteria for choosing the case study approach for the research strategy. This research effort consists of an exploratory question asked about a contemporary event of which the researcher has no control.

The first and foremost condition to consider when choosing a research strategy is to identify the type of research question under investigation (Yin, 2003, p.7). The purpose of this study to find out what content management issues exist within the AFMC/DRW hosted CoPs. The research questions follow the exploratory nature of the stated purpose. These questions are exploratory and meet the criteria for a case study's form of research question.

The use of CoPs and the content management practices associated with the CoPs are events that are beyond the investigator's control. The investigator has no control over behavioral events in this research effort. The criterion for a case study's extent of control is met since the investigator has no control over participants' behavioral events.

The case study is the preferred method when studying contemporary events where the relevant behaviors are not able to be manipulated (Yin, 2003, p.7). The focus of this study is on a contemporary ongoing event rather than a historical event. The criterion for the case study's degree of focus is met since the research focuses on a contemporary event.

Multiple-Case Study Design

The multiple-case study is the type chosen as the design of the case study strategy for this research effort. The decision to use a multiple-case study design was arrived at after weighing several factors and the motivation to add more rigor to this research effort. When using a multiple-case study design, the evidence discovered is considered more compelling and the overall study is more robust (Herriott and Firestone, 1983; Yin, 2003, p.46). This multiple-case study design allows investigation of different types of existing CoPs to support the replication logic addressed in the research design quality. The holistic design is chosen for the individual cases within the multiple-case study design. A holistic design consists of a single unit of analysis for each individual case. The specific unit of analysis is discussed further in the research design.

Research Design

A research design is "the logic that links the data to be collected to the initial questions of study" (Yin, 2003, p.19). According to Yin (2003, p. 21), five components of research design are especially important for case studies:

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

Research Questions.

The first of the five components consists of the research questions of the study. This thesis research will attempt to answer the following research questions:

1. What are the content management issues associated with the AF CoPs hosted by AFMC/DRW?
2. What are the CoP content management issues critical to success as identified by AF CoPs knowledge owners/members?
3. What actions have AFMC/DRW or the AF CoPs themselves taken to address content management issues?
4. What suggestions or solutions do AF CoP knowledge owners/members propose to solve the content management problems that they are experiencing?

Proposition.

This research effort proposes the multiple-case study research design will identify the content management issues associated with web-based CoP workspaces. Yin comments that exploratory research has a legitimate reason for having no propositions (Yin, 2003, p. 22). However, Yin states that instead of propositions, the design should state the purpose of the exploration, as well as the criteria by which the exploration will be judged successful (Yin, 2003, p. 22). The purpose of this effort will be to identify the perceived existing content management issues that would provide for effective and efficient content management. The motivation behind this purpose is in aiding the knowledge management efforts currently pursued by the Air Force by improving content management within the Knowledge Now CoPs. Knowledge is a valuable resource for competitive advantage and innovation. AFMC/DRW is hosting web-based CoPs on Knowledge Now as part of an approach for knowledge management. Finding ways for CoP members to efficiently and effectively find and use information and knowledge will allow members to locate the relevant information and knowledge needed to complete their work, innovate, and improve their individual knowledge bases.

Unit of analysis.

The chosen unit of analysis for the purpose of this research is the individual CoP. Selecting the individual CoP as the unit of analysis allows for a holistic multi-case design. Eight Knowledge Now CoPs will be investigated. Table 1 lists the eight CoPs selected for the research design. The reasoning behind selecting these particular eight CoPs is discussed in the data collection section. The right mix of functional area CoPs to support replication logic is addressed by the research design quality.

Table 1. Selected Communities of Practice

Community of Practice (Cases)	**Functional Area**
Acquisition Costing	Financial
FMS Tech Order Pricing IPT	Financial
Serial Number Tracking	Logistics
Packaging	Logistics
Policy Integration (AFMC)	Policy
Financial Management Policy	Policy
IT Transformation for AFMC	Information Technology
AFMC/ITC e-Battlelab	Information Technology

Logic linking the data to the proposition.

Research data will come from documentation, archival records, interviews, and direct observations. Content management issues will be identified from the literature. Perceived content management issues, current practices, and suggested solutions from individual community members will be discovered from the interview data.

Criteria for interpreting the findings.

The interview data and their interpretations will be scrutinized for underlying themes and other patterns. Data analysis will primarily involve content analysis and pattern matching of the collected interview data. Further details follow in the data analysis section.

Data Collection

This research will use semi-structured interviews to gather data from individuals involved directly with the Knowledge Now CoPs. In accordance with AFI 40-402, Air Force Human Subjects Review Board, the research protocol was reviewed and approved by the Wright Site Institutional Review Board (WSIRB) on 7 July 2003 and the AFRL Chief of Aerospace Medicine on 11 July 2003. The approval number given was F-WR-2003-0069-E. A copy of the approval letter is in Appendix A. Sixteen volunteer community members (two members apiece from the eight selected CoPs) will be interviewed. The interviews will be conducted on a voluntary basis and individuals chosen to participate will be active members or managers from CoPs selected in the research design. In keeping the anonymity of the individual participants, this research will not disclose any of the identities of those interviewed.

CoP selection.

Eight active CoPs were selected for this research endeavor. Active CoPs were defined by the generation of content, actual use of CoP workspace, and the experience and insight provided by the Knowledge Now team. Four different pairs of functionally similar CoPs were selected. Members within the CoPs serve in different capacities (civilian, military, or contractor) and have varying work experience and expertise. A snapshot of the backgrounds of the sixteen CoP members interviewed is captured in Figure 1. The majority of those interviewed were government civilians, followed by government contractors, and finally military members.

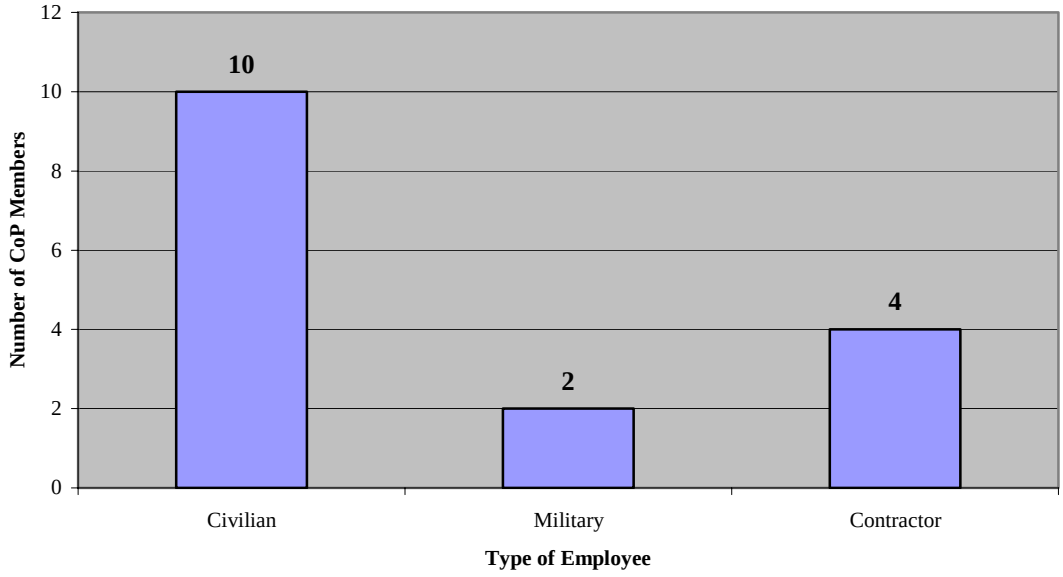

Figure 1. Communities of Practice Members Interviewed

Question development.

The questions for the interview are divided into four topic areas that follow with the research questions of this study: current content management issues, perceived issues critical to successful CoP content management, actions taken to address the current content management issues, and future suggested problem solutions for issues currently existing. The questions in the current issues section will identify the existing content management issues within the individuals' CoP. The critical content management issues topic area will identify the perceived issues, according to the subject's point of view, critical to content management success. The actions taken to address the current content management issues topic area will identify how an individual's CoP content management issues were handled and the actions taken to meet those issues. Finally, questions in the last topic area will identify suggested enhancements to the current and future practice of

content management within the Knowledge Now CoPs. Thesis committee members will review the questions prior to the actual interviews to ensure the clarity of the questions.

Interview procedures.

The interview scheduling takes place at a time and location convenient to each participant. Each participant is given an information sheet, an outline of the interview, and an informed consent letter before any interview takes place. Each participant is asked to sign the informed consent letter. At the beginning of every interview, the participant is asked whether they consent to the interview being audio taped which aids in the creation of transcripts. The recording device is only to be used if the participant signs the informed consent letter. At the beginning of the interview the recording device is started, an outline of the interview questions is used to take notes in order to "keep account of has already been talked about and what remains to be talked about" (Brenner, 1985, p. 154).

Data Analysis

The focus of the data analysis will be on the interview transcripts. Three techniques are used to analyze the interview transcripts: key informants review of the transcripts, content analysis, and pattern matching.

Key informant review.

After the interview transcript is completed, the transcript is made available to each subject for approval and release prior to the analysis of any data. When the transcript is returned to the participant, the participant is asked for a reply granting or

denying release. If a release is not granted or a reply is not received, the interview does not become a part of the research.

After the participants offer their release, the interview transcripts are used in the composition of the case study report. When the case study report is completed, a request is issued to key informants to review the report for accuracy. This evaluation of the study results by key informants increases the validity and reliability of the research.

Content analysis.

Content analysis begins with a review of the transcript created from the interview recording. Each transcript is uniquely marked for each instance that an action, issue, suggestion, or solution is observed. A spreadsheet is maintained for the ease of tallying participant responses and to record each instance a certain response is encountered.

Pattern matching.

For case study analysis, Dr Yin states that pattern matching is one of the most desirable techniques (Yin, 2003, p. 116). The patterns discovered from the analysis of the transcripts are then described and compared to data found both between and within the multiple cases in this research design. Patterns are matched within similar CoPs. Patterns are also noted between the different types of CoPs. The patterns found are summarized and presented.

Design Quality

According to Dr. Yin, the four tests commonly used to establish the quality of a case study are (Yin, 2003, p. 34):

- Construct Validity: establishing correct operational measures for the concepts being studied.
- Internal Validity (for explanatory or casual studies only, not for descriptive or exploratory studies): establishing a casual relationship, whereby certain conditions shown to lead to other conditions, as distinguished from spurious relationships.
- External Validity: establishing the domain to which the study's finding can be generalized.
- Reliability: demonstrating that the operations of the study - such as the data collection procedures can be repeated with the same results.

In order to address the tests for design quality, several case study tactics are used. Table 2 lists the tests, the tactics used in this research to address the test, and which phase of the research the tactics are used.

Table 2. Case Study Tactics for Design Tests.

Tests	**Case Study Tactic**	**Phase of the research the tactic is used**
Construct Validity	• Use multiple sources of evidence • Establish chain of evidence • Have key informants review draft of case study report	Data collection Data collection Composition
Internal Validity	• Pattern matching • Cross check findings with key informants	Data analysis Data analysis
External Validity	• Use both literal and theoretical replication logic	Data analysis
Reliability	• Full documentation of processes and procedures	Composition

Construct validity.

The case study tactics suggested by Yin (2003, p. 34) to establish construct validity include: multiple sources of evidence, in a manner encouraging convergent lines of inquiry, and is relevant during data collection; a chain of evidence must be established and is also relevant during data collection; and to have key informants review the draft of the case study report.

The researcher uses interviews as the primary source of collecting evidence. Direct observations and technical documents are used in this research effort. This research uses multiple sources of evidence to help establish construct validity.
The chain of evidence is established by the case study data. The data for this study is recorded in the form of interviews conducted by the researcher. The reader of this research can check this chain of evidence to establish construct validity.
Key informants review the draft case study report for accuracy. Comments and clarifications gathered from key informants are considered in finalizing the case study report. This evaluation of the study results by key informants increases both the validity and reliability of the research.

Internal validity.

According to Yin (2003, p. 34), the concern for internal validity in a case study approach may be extended to the problem of making inferences. A case study involves making an inference when an even is not directly observed. The analytic approach of pattern matching is one method of addressing internal validity (Yin, 2003, p. 34).

External validity.

The case-study tactic for establishing the external validity in multiple case studies (Yin, 2003, p. 34) is the use of replication logic. This test deals with the problem of knowing whether a study's findings are generalized beyond the immediate case study (Yin 2003, p. 37). The research design allowed for the selection of a collection of CoPs to support both literal and theoretical replication logic. Table 3 illustrates the research design selection used to achieve the replication logic.

Table 3. Research Design to Support Replication Logic.

CoP	**Functional Area**	**Size**
Acquisition Costing	Financial	Large
FMS Tech Order Pricing IPT	Financial	Large
Serial Number Tracking	Logistics	Small
Packaging	Logistics	Medium
Policy Integration (AFMC)	Policy	Medium
Financial Management Policy	Policy	Medium
IT Transformation for AFMC	Information Technology	Medium
AFMC/ITC e-Battlelab	Information Technology	Small

Literal replication is achieved by using all military CoPs, using four groupings of functional similar types of CoPs, and using similar sized CoPs. Theoretical replication is achieved between the four different types of CoPs and the different sized CoPs. The research design generated by the researcher is highly replicable. However, further study is warranted to establish generalization of the research beyond the immediate case study.

Reliability

The goal of reliability is to minimize the number of errors and biases within a study (Yin, 2003, p. 37). If the procedures conducted by an earlier investigator are exactly followed by a later investigator, the later investigator should arrive at the same findings and conclusions. A prerequisite for reliability is to document the procedures followed. The research procedures, interview questions, the analysis performed on the interview results and all the other procedures used in this research are documented for future reference.

Limitations

The research effort is limited by the scope of the CoPs investigated. A wider selection and number of CoPs may present a more complete picture of the content management issues related to the CoPs hosted on Knowledge Now. Determining the level of maturity of the participating CoPs was not included in the scope of this research. Knowing the varying levels of maturity would assist in matching patterns or discovering trends in the interview data. Also, the differing views based on whether the CoP member was a civilian, military, or contractor was not distinguished. Finally, the generalizability of this research extends to the Air Force CoPs hosted on the Knowledge Now website.

Summary

This chapter presented a description of the methodology selected for this research effort. The chapter covered the reasoning behind the selection of the case study method, the multi-case study research design, data collection procedures, data analysis techniques, the actions taken to ensure the quality of the research design, and the limitations of this research effort.

IV. Analysis

As discussed in previous chapters, the data consists of interviews of CoP members. In this chapter, the results of the interviews are summarized and presented. The results are presented by each CoP followed by patterns found within and between the CoPs.

Acquisition Costing CoP

The purpose of the Acquisition Costing CoP is to bring people together to share information in a collaborative environment about estimating the acquisition costs of various systems. This workspace provides links to acquisition costing related information and communities. The Acquisition Costing CoP members interviewed identified the responses to the research questions listed below in Table 4.

Table 4. Issues Identified by Acquisition Costing CoP

Research Question	CoP Member 1	CoP Member 2
Current issues	• Recruiting knowledge owners • Training knowledge owners	• Recruiting knowledge owners • Training knowledge owners
Identified critical issues	• No documented content management processes in place, in terms of best practices or lessons learned • Categorization and classification based on experience and initial major subject areas • Time to perform sound content management and experience to maintain the content	• No formally documented content management processes in place • Categorization and classification based on experience • Define active roles and responsibilities of knowledge owners
Actions taken	• Verity key word search return comparison to known locations • Identifying knowledge owners • Getting knowledge owners trained • Using CBT for site maintenance training • Devoting time to maintain content and check for dead links	• Identifying knowledge owners • Knowledge owners trained • Devoting time to maintain the content on the site
Future suggested actions	• Hire support contractors to do it • Use junior members under tutelage of more senior people • Sustaining the fire when senior management is not paying attention • Appoint a community coordinator	• Bake content management processes into the everyday job

The two members both indicated that recruiting and training knowledge owners was a content management issue currently experienced. They both identified that no formally documented content management processes are in place for this CoP. The taxonomy used on the site is based on the experience of the CoP administrator. Identifying a knowledge owner and getting them trained was identified as an action to solve the content management issue identified. The idea of hiring support contractors or getting junior members involved with carrying out content management activities was one suggestion to meet future content management issues. Another suggestion was to "bake" content management actions into the daily work of CoP members.

FMS Tech Order IPT CoP

The FMS Tech Order IPT CoP provides an environment for associated organizations across AFMC to submit the language of technical order statements to the headquarters organization for validation. The FMS Tech Order IPT CoP members interviewed identified the responses listed below in Table 5. The members of this CoP had different views of their content management issues. One member indicated getting

Table 5. Issues Identified by FMS Tech Order IPT CoP

Research Question	**CoP Member 1**	**CoP Member 2**
Current issues	• Integrating business culture into CoP	• Expressed no content management issues were being currently experienced
Identified critical issues	• Having taxonomy in place • Critical information must be updated to support decisions made	• Content owner must make sure the content is timely and updated
Actions taken	• Taxonomy based on experience • Knowledge owner is responsible for content	• Metrics to monitor inactive CoPs • Notifications to update possibly stagnant content
Future suggested actions	• Share what is being done to benefit others • Advertise new system capabilities and innovative processes • Web-based forms linked to database in lieu of standard documents	• Develop process to send automated notification to review inactive documents within 6 or 9 months of creation

member participation and contributions of content was inhibited since CoPs are not integrated in the business culture. Using CoPs as the avenue to get work done has not become an integral part of the business culture. The other member expressed that no content management issues were currently being experienced. One member indicated that having a good taxonomy in place is critical for successful content management. An identified action taken by the Knowledge Now team to address outdated content is to use metrics to monitor for inactive CoPs. A suggestion to meet future content management issues was to share what is being done by other CoPs to possibly benefit others. Another suggestion was to use web-based forms linked to a data store instead of using document objects.

Serial Number Tracking CoP

The Serial Number Tracking CoP is a closed CoP (accessed by membership only) designed to provide access to logistical resources related to serial number tracking of material assets and to facilitate the sharing of knowledge and ideas. The CoP members

Table 6. Issues Identified by Serial Number Tracking CoP

Research Question	CoP Member 1	CoP Member 2
Current issues	• Keeping information up-to-date • Keeping information organized in a useful manner • Content owners not volunteers	• No single content manager to provide consistency so need good taxonomy • Must upload a new version • .mil access only, security of FOUO • No content limit, so no driving force to purge outdated content
Identified critical issues	• Time to perform sound content management and experience to maintain the content	• Having a good taxonomy in place • Training on content and site maintenance
Actions taken	• Identifying knowledge owners • Getting knowledge owners trained • Devoting time to maintain content	• Timely set-up of CoP • Support & training by Knowledge Now team • Metrics to monitor inactive CoPs • Consistent organization of categorization based on guidelines provided
Future suggested actions	• Hire someone dedicated to content management	• Need dedicated manager to maintain content on larger CoPs • Develop process to send automated notification to review inactive documents

interviewed identified the following responses to the investigated research questions listed in Table 6. One identified issue was that there is currently no content storage limit for the CoPs hosted by AFMC/DRW, so there is no driving force to purge outdated content in the collaborative workspaces. The importance of taxonomy was again indicated as an issue critical to content management. Both members indicated that having someone dedicated to carrying out content management as a potential future solution for keeping the content up-to-date in a consistent manner.

Packaging CoP

The Packaging CoP is designed to provide access to packaging resources and to facilitate the sharing of knowledge and ideas. The goal is to provide a one-stop resource, offering access to a greater depth and breadth of information and understanding of packaging. The Packaging CoP members interviewed identified the responses listed in

Table 7. Issues Identified by Packaging CoP

Research Question	CoP Member 1	CoP Member 2
Current issues	• No formal content management process, updates occur as observed • .mil access only, security of FOUO • No content limit, so no driving force to purge outdated content • No formal archive process for outdated content, stays on the site	• No single content manager to provide consistency so need good taxonomy • Keeping content current and up to date • No content limit, so no driving force to purge outdated content
Identified critical issues	• Good working knowledge of maintaining content • Training on content management practices • Provide pertinent information to get job done based on experience of manager	• Taxonomy must be in place • Good working knowledge of maintaining content • Training on content management practices
Actions taken	• Support and training from Knowledge Now team • Metrics to monitor inactive CoPs • Consistent organization of categorization based on template guidelines provided • Email alerts for community members on updated content	• Teleconferencing while viewing CoP content • Support and training from Knowledge Now team • Demonstrations to new users • Metrics to monitor inactive CoPs • Consistent organization of categorization based on guidelines provided
Future suggested actions	• Include restrictive Non .mil domain access • Not linked to Outlook	• .mil only access provides security of FOUO

Table 7. Both members indicated no purging occurs since there is no limit for storage on the CoP. Having a good taxonomy was again mentioned as a critical content management issue. Both indicated the support and training provided by the Knowledge Now team and the guidelines provided for categorization were current solutions to address the content management issues they are facing. They disagreed on having access extended to other domains other than the .mil domain as a future solution of increasing the membership and thereby increase the participation and contribution of fresh content to the CoP. One member indicated that restricting access to the .mil domain ensures the security of FOUO posted on the site.

Policy Integration (AFMC) CoP

This AFMC Policy Integration CoP workspace provides a web-based collaborative environment designed to implement the new AFMC process for developing, reviewing, and coordinating new or modified policy. This new policy integration process is designed to ensure AFMC policy is integrated, consistent with HQ AFMC Command Policy, and aligned with HQ USAF policy guidance. The Policy Integration (AFMC) CoP members interviewed identified the responses listed in Table 8. In response to the first investigative question, both initially indicated that no content management issues were being experienced. The currency of information on the CoP was indicated as a critical content management issue. Building a taxonomy based on the experience of the content owner was expressed as an action that had been taken to address content management. The suggestion of providing a restrictive non .mil domain access was again

expressed as a potential solution of increasing the membership and thereby increase the participation and contribution of fresh content to the CoP.

Table 8. Issues Identified by Policy Integration (AFMC) CoP

Research Question	CoP Member 1	CoP Member 2
Current issues	• No content management issues identified	• No content management issues • Finding desired CoP based on the current categorization of CoPs is not always apparent to community members
Identified critical issues	• Currency of information on site • Communicating updates to content	• Accessibility to CoP • Initial problem of finding right CoP due to current categorization of CoPs • Training for senior managers and distant locations
Actions taken	• Taxonomy based on experience • Update date and owner information for existing content • Email alert for new content • Establish business rule for single entry point for certain information	• Support and training from Knowledge Now team
Future suggested actions	• Provide restricted non .mil access • Security: location for classified information	• Advertising of CoPs and more publicity • Get in concert with computer support personnel to resolve configuration issues

FM Policy CoP

The FM Policy CoP is designed to share AF financial policy and other relevant information to members of the FM community. The FM Policy CoP members interviewed identified the responses listed below in Table 9. One member indicated no

Table 9. Issues Indicated by FM Policy CoP

Research Question	CoP Member 1	CoP Member 2
Current issues	• No content management issues initially identified	• Spending time looking for information • Redundant information • Outdated information
Identified critical issues	• Currency of information • Communicating updates to time critical content	• Currency of information • Ease of finding relevant information
Actions taken	• Taxonomy based on experience • Update date and owner information for existing content • Email alert for new and updated content	• Taxonomy based on experience • Support and training from Knowledge Now team
Future suggested actions	• Develop content management processes based on industry best practices	• No identified future solutions

content management issues are currently experienced and the other indicated that finding the right resource in a timely manner was an issue in the CoP. Both expressed currency of information as a content management issue critical success. They both shared building a taxonomy based on their experience working with the content on the CoP was an action taken to address content management issues. One suggestion offered to address the content management issues was to develop content management processes based on industry best practices.

AFMC IT Transformation CoP

The AFMC IT Transformation CoP is designed to provide a single focal point for sharing all information related to AFMC/IT's transformation efforts and to provide a collaboration forum for those transformation activities. The AFMC IT Transformation

Table 10. Issues Indicated by AFMC IT Transformation CoP

Research Question	CoP Member 1	CoP Member 2
Current issues	• No formal knowledge owner for this CoP • Content owner is responsible for viability of the content • Less archival type of information more immediate • No constraints on storage, so no driving force to archive documents • Content set-up in hierarchical file system, so difficult to relate to a process model	• Keeping a systematic and consistent taxonomy
Identified critical issues	• Keeping a consistent taxonomy • Making it as easy as possible to find items • Ease of getting information submitted • Visibility of changes to information when it comes in • Show capabilities/functionalities that are available	• Keeping a consistent taxonomy • Making it as easy as possible to find items
Actions taken	• Content capture process for description document • Getting knowledge owners trained • Ease of use in maintaining content	• Keep content on CoPs at a manageable size by breaking down current general CoPs into smaller more focused ones • Getting knowledge owners trained • Extensive help menu available
Future suggested actions	• Assigning someone to consistently add new content while removing outdated content • Give users more input into look and feel, allowing graphical representations of processes in lieu of a file folder depiction	• Be aware of knowing when content has grown to an unmanageable level • Give users more input into look and feel of the site

CoP members interviewed identified the responses listed in Table 10. Not being able to relate and organize around a process (due to being set-up in hierarchical file system) was expressed as a current content management issue being experienced. The point of this comment was that processes do not translate well into hierarchical file folder system, but a picture allows for a better model of the process. Both indicated building a consistent taxonomy as a content management issue critical to success. Giving the CoP members more input into the look and feel (allowing a graphical representation of processes) of the CoP was expressed as a potential suggestion of increasing the membership and thereby increase the participation and contribution of fresh content to the CoP.

AFMC/ITC e-BattleLab CoP

The AFMC/ITC e-BattleLab CoP is designed to share information captured from investigating business processes suitable for on-line applications. The AFMC/ITC e-BattleLab CoP members interviewed identified the responses listed in Table 11. Both members indicated no formal content management processes and procedures are in place for the CoP. Developing a good taxonomy was referred to again as a content

Table 11. Issues Identified by AFMC/ITC e-BattleLab CoP

Research Question	CoP Member 1	CoP Member 2
Current issues	• No constraints on storage, so no driving force to archive documents • No formal archive procedure	• No formally documented content management processes in place
Identified critical issues	• Categorization and classification based on experience on knowledge owner • Currency of information on site	• Categorization and classification based on experience of knowledge owner
Actions taken	• Getting knowledge owners trained • Support and training from Knowledge Now team	• Devoting time to maintain available content
Future suggested actions	• Documented processes and procedures based on industry best practices	• Documented processes and procedures based on industry best practices

management issue critical to success. The members both propose to solve the issue of no formal content management processes by developing documented processes based on industry best practices. This CoP has one of the smaller memberships of the CoPs investigated. The issues associated with content management for the AFMC/ITC e-BattleLab CoP may differ from the other larger membership CoPs based on the volume of content available on the e-BattleLab CoP.

Patterns Between CoPs

This section attempts to highlight patterns found between the various CoPs. Patterns are described between and across functional CoPs and CoPs of varying sizes. The patterns are presented within the framework of the research questions.

1. What are the content management issues associated with the AF CoPs hosted by AFMC/DRW?

A common issue discovered from analyzing the research data is the lack of documented content management processes and procedures by the CoPs. Each CoP manages content as time allows and when they get new or updated information to share with the community. The way each community uses its CoP affects the content management of the CoP. The logistical CoPs, Serial Number Tracking and Packaging CoPs, contain a greater amount of archival type data than the CoPs that focus on current policy. The AFMC/ITC e-BattleLab CoP is relatively small and new CoP so it has not experienced the content management issues of a larger CoP like the AFMC IT Transformation CoP (identified as the CoP with the second greatest volume of content for CoPs on Knowledge Now). The AFMC IT Transformation CoP reorganized into smaller

more focused CoPs to deal with specific processes, which also helped alleviate the problem related to the volume of content associated with each process. The CoPs have had no driving need to purge outdated content since there is no pressure on limiting the amount of content stored on the CoPs. CoP administrators placed little emphasis on purging or formally archiving outdated content since no limitation exists on the amount of content stored by a CoP and these content management processes are not an immediate priority. At least one CoP in each functional type of CoP identified a lack of time and resources to execute the practice of content management as an issue. Not all CoP administrators are volunteers or have CoP administration as their primary duty.

2. What are the CoP content management issues critical to success as identified by AF CoPs knowledge owners/members?

The issues described as critical to success discovered from analyzing the research data include having a consistent taxonomy for the CoP. The responsibility for the file structure of the CoPs is left to the CoP administrators. Each CoP mentioned issues related to having a good taxonomy in place. These related issues included being able to find the correct information with ease and in a timely manner and locating the most relevant and up-to-date knowledge or information available. Identifying these issues as critical to success places an emphasis on having a good taxonomy in place for each CoP. Whether a common taxonomy is relevant for these CoPs is left for future study and further discussion. Those interviewed expressed an awareness that better content management practices exist (from either getting training or having to develop experience to maintain content on the CoP). Each CoP either identified getting knowledge owners trained as a critical issue or mentioned it as an action taken to meet their content

management issues. Training will be an reoccurring issue as people move jobs and new knowledge owners are found for the CoPs.

3. What actions have AFMC/DRW or the AF CoPs themselves taken to address content management issues?

The common issues discovered from analyzing the research data include the CoP members taking it upon themselves to build a taxonomy based on the experience of the knowledge owner with the content on the site. Having a good taxonomy in place on the CoP was previously identified as a critical issue; the knowledge owners have addressed this issue by applying their tacit knowledge to organizing a file plan in which to house the content of their CoP. The Knowledge Now team provides basic guidelines for the establishment of an initial taxonomy for a CoP. Additional help for creating an initial taxonomy has been made available in training workshops. In addition, the Knowledge Now team has provided a tool to give alerts (based on documents a user selects) on changing documents. This alert addresses the issue of knowing when content of interest to a user is updated. One interesting approach taken to address finding information on the CoP involved a knowledge owner comparing the returned hits of a Verity key word search to known locations on the CoP. This comparison allowed the knowledge owner to increase the relevancy of searches on the involved CoP.

4. What suggestions or solutions do AF CoP knowledge owners/members propose to solve the content management problems that they are experiencing?

The common issues discovered from analyzing the research data included the documentation of content management processes and procedures based on industry best

practices. Knowing which content management best practices or lessons learned to apply to a particular CoP requires an understanding on the part of the CoP's knowledge owner. This understanding pertains to the business processes of the CoP and how members utilize the CoP (and the content on it) to accomplish objectives. Documenting the content management processes and procedures for a CoP gives the administrator a plan to follow rather than no guidance at all. Three of the four functional CoPs identified not having the time or resources to execute good content management efforts as an issue. Suggested solutions included assigning an individual to add new content in a consistent manner while removing outdated content. Although it would be unlikely that an individual would be exclusively devoted to maintaining the content of a single CoP, the individual would be in a position to maintain the content on the site in an effective manner. Other alternatives involved hiring a support contractor to execute the actions required for good content management or having junior members maintain the site with the help of more senior members. Several CoP members suggested providing a restrictive non-.mil access to extend the CoP membership to those not on the .mil domain allowing for fresh contributions to the content managed on the CoP. This suggestion would allow contractors not working on locations with .mil access to enter the CoPs and participate in knowledge sharing. Other members disagreed and preferred to have the CoPs restricted in order to allow protection for posting FOUO information when necessary.

Summary

In this chapter, an analysis of the interview data collected was presented. Similarities and differences were described and common issues were highlighted.

Patterns were matched within and between CoPs. The follow chapter provides the conclusion and recommendations derived from this research effort.

V. Discussion and Recommendations

The conclusions, recommendations, and suggestions for future research based on this thesis effort are provided in this chapter. Content management is an issue of concern in the areas of web site management, portal development/management and collaborative workspace management (APQC, 2001). This study attempts to identify the content management issues associated with Air Force CoPs hosted by AFMC/DRW.

Discussion

Sharing knowledge and information is essential in collaborative workspaces. The rapid deployment of a CoP on the Knowledge Now site allows a virtual collaborative workspace to be established in a relatively short time. Since the CoPs can be set up rather quickly, not all knowledge owners can fully grasp all the issues surrounding the use and development of their CoP. The quick deployment of the Knowledge Now CoPs allows members to start using the tool, share information, and collaborate. The Knowledge Now team is aware that although the rapid set up time for a CoP (vs. a traditional website) is a desired feature, at times additional support is necessary for the new CoP members to successfully utilize the tool.

Having a well-developed taxonomy in place is essential for good content management. Taxonomy provides organization to digital content chaos. In addition, having a well-developed taxonomy in place improves the speed of relevant content location and retrieval. Not all CoP members expressed that they were experiencing content management issues. Several members did not have an understanding of what a

taxonomy is. Knowledge owners may not fully grasp all the issues involved with maintaining the content on their sites.

In the content management process, the knowledge owners are critical to success. The knowledge owner validates existing content for relevancy and currency, manages the existing content available, and has the understanding of the functional business area processes that may affect content on the CoP. Having enthusiastic and dedicated knowledge owners is critical to successful content management and to the overall success of the CoP.

Content management needs to be integrated into the business culture. CoPs are a new way of doing business and getting work done through online collaboration. Content management practices need to become a part of business processes. As Knowledge Now becomes more utilized at the Air Force level, more people will become familiar with the use of CoPs and the content management issues that are associated with the CoPs.

Recommendations

The following recommendations are provided based on this research effort.

Utilize taxonomy experts.

The foundation of good content management practices is a consistent taxonomy on which the CoP is built on and around. Taxonomies and methods of classification depict the way people work and are primarily developed by those knowledge owners close to the work being done, not by automated methods. Allowing the CoP administrator to work with an individual with knowledge of taxonomy may provide the structure on which to build the taxonomy for the CoP.

Develop content management guidelines.

The CoPs hosted by Knowledge Now have no documented formal content management processes or procedures. Developing a guideline to be followed (in lieu of a policy to be directed) for content management may facilitate better content management practices. Using guidelines is like balancing a double-edged sword. On one end, it allows for flexibility and does not stifle creativity and sharing. One CoP member indicated that having a dictated policy for content management might hamper the ongoing knowledge sharing efforts. The other side is taking the chance that some individuals will not comply with the guidance. Forming a steering committee composed of knowledge owners from various functional areas to shape the guidelines for content management would give more ownership of the content to knowledge owners. These knowledge owners working with their CoP members can determine what guidelines make sense based upon the information use and workflows in their functional areas.

Conduct reoccurring content audits.

Carrying out a content audit should be a reoccurring event during the lifetime of a CoP depending on the amount of activity on the CoP. In addition, persuading the knowledge owners perform a content audit prior to developing any guidelines would help them form a better picture of the types of content that current exist on the site. During the planning and design phase of a content management system, the APQC found "conducting a content audit was strongly correlated with every category of improved performance in content management: process improvement, service levels, cost savings, quality of content and customer satisfaction" (APQC, 2001).

Focus on the users.

It is essential to keep the user as the central focus of content delivery. The value of content is realized when individuals utilize it to make better decisions for an organization. Providing personalized content delivery to individuals based on their CoP memberships could facilitate locating the most current and relevant content during a search for knowledge and information.

Do not focus on the technological solution.

Performing content management is necessary to make sense of all the knowledge and information available and to provide users with the most relevant and up-to-date content necessary to make the best-informed decisions. In the near future, there might be a need to look for a commercially available content management technology solution. There is currently no single technology solution to performing content management. The key is to "understand all the components of the content management process and then look for the technologies that will best fit those needs" (APQC, 2001).

This section shared the recommendations derived from this research effort. Next, the limitations of this research effort are identified and presented.

Study Limitations

The research effort is limited by the scope of the CoPs investigated. A wider selection and number of CoPs may present a more complete picture of the content management issues related to the CoPs hosted on Knowledge Now. Assistance from the Knowledge Now team was used in the selection of CoPs to be investigated and may have introduced some bias into the research. Determining the level of maturity of the

participating CoPs was not included in the scope of this research. Knowing the varying levels of maturity would assist in matching patterns or discovering trends in the interview data. During data analysis, the triangulation of interview data was accomplished with a sparse volume of additional documentation. In addition, the types of people (military, civilian, or contractor) interviewed was not taken into account. Finally, the generalizability of this research extends to the Air Force CoPs hosted on the Knowledge Now website.

Suggestions for Further Study

This study addressed identifying the content management issues associated with the CoPs hosted by AFMC/DRW. An expansion of the study to include the levels of maturity of the participating CoPs may explain some pattern existing between the various CoPs. The differences in issues between CoPs in the evolutionary stage could then be distinguished from CoPs in more mature stages. In addition, enlarging the selection of other types of CoPs may provide a more complete picture of the content management issues currently existing in the Knowledge Now hosted CoPs. Further study may include identifying factors that impede the practice of sound content management. These factors could be identified in the subject areas of people (their roles), processes and technology involved with the CoPs. Finally, a researcher could perform a more in-depth study to determine if a commercially available content management system would be appropriate for use by the Knowledge Now CoPs in their current stage of evolution. The research could involve investigating how Fortune 500 companies are applying content management systems to their CoPs.

Summary

In this chapter, a discussion was presented of the big picture issues derived from this research effort. The recommendations shared were arrived at through the analysis of the interview data, additional documentation, and the literature reviewed. Future suggestions for further research were offered to help better understand the content management issues related to the Knowledge Now CoPs.

Appendix A. Human Subjects Review Board Approval

DEPARTMENT OF THE AIR FORCE
AIR FORCE RESEARCH LABORATORY (AFMC)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

14 July 2003

MEMORANDUM FOR: AFIT/ENV
ATTN: Jaime Rodriguez

FROM: AFRL/HEH

SUBJECT: Approval for the Use of Volunteers in Research

Human experimentation as described Protocol 03-69, "Content Management Issues in Air Force Communities of Practice", may begin.

2. In accordance with AFI 40-402, this protocol was reviewed and approved by the Wright Site Institutional Review Board (WSIRB) on 7 July 2003, the AFRL Chief of Aerospace Medicine on 11 July 2003. A copy of the meeting minutes showing final approval will be forwarded.

3. Please notify the undersigned of any changes in procedures prior to their implementation. A judgment will be made at that time whether or not a complete WSIRB review is necessary.

Signed 14 July 2003
HELEN JENNINGS
Human Use Administrator

Attachment:
WSIRB Minutes

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Vita

Captain Jaime A. Rodriguez graduated from Duncanville High School in Duncanville, Texas. He entered undergraduate studies at the University of Texas at Arlington, Texas where he graduated with a Bachelor of Science degree in Information Systems in May 1997. He was commissioned through the Detachment 845 AFROTC at Texas Christian University. Shortly thereafter, he entered active duty.

His first assignment was at the Space Warfare Center, Falcon AFB as a communications and information project officer in June 1997. In December 1999, he was assigned to the Cryptologic Systems Group, Kelly AFB, Texas where he served as an information assurance analyst. While stationed at Kelly, he was selected as the group's executive officer. In May 2002, he entered the Graduate School of Engineering and Management, Air Force Institute of Technology. Upon graduation, he will be assigned to the 99th Communications Squadron, Nellis AFB, Nevada.

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14. ABSTRACT

The practice of content management attempts, regardless of platform, to ensure that pertinent information is current, relevant, and presented in a usable manner. The Air Force Communities of Practice (CoPs) are hosted by AFMC/DRW. The purpose of these CoPs is to facilitate and promote an environment of capturing and sharing knowledge among members of a particular field, task, or common practice. As the host for these CoPs, AFMC/DRW desires to increase CoP participation, efficiency, and effectiveness. Addressing existing or potential content management issues will help do so.

This multiple-case study research observed and interviewed managers and members of eight active CoPs hosted by AFMC/DRW. This research suggested that the interviewed CoPs currently use no formally documented content management processes. Some CoP members indicated developing formal content management processes and procedures, establishing a good taxonomy, and better defining roles and responsibilities of content owners may help solve future content management issues.

15. SUBJECT TERMS

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