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An Exploratory Analysis of Factors Affecting Participation in Air Force Knowledge Now Communities of Practice

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PARTICIPATION IN AIR FORCE KNOWLEDGE NOW COMMUNITIES OF

PRACTICE

THESIS

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COMMUNITIES OF PRACTICE

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Abstract

As the Air Force continues to lose its knowledge base through retirements and downsizing, the need to get maximum use from the remaining knowledge base becomes increasingly important. In their efforts to help the Department of Defense and the Air Force Chief Information Officer (AFCIO) meet their knowledge management goals, Air Force Material Command (AFMC) has been working to implement the use of communities of practice. A primary goal of AFMC/DRW, the Air Force Knowledge Now (AFKN) program office, and the office of the AFCIO is to increase effectiveness and participation within communities of practice (CoPs).

The goal of this research is to identify factors from the literature that may affect knowledge transfer, information sharing, and technology acceptance, and compare those factors with AFKN hosted CoPs exhibiting high and low levels of participation. Additionally, factors of interest identified in interviews with AFKN personnel were researched. This research used a cross-sectional research instrument to survey CoP members within all AFKN hosted CoPs containing 20 or more members. This research suggests these factors positively correlate with high use CoPs: *Trust*, W*illingness to Share*, *Security Constraints*, and *Facilitator*. Additionally, factor analysis confirmed the *Security Constraints* factor and produced a *Job Performance* factor that also positively correlated with high use CoPs. The results of these findings may allow AFKN to focus on these factors when the goal is to improve participation in future CoPs.

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I. Introduction

Overview

The term "Community of Practice" (CoP), is defined as a group of people who both share an interest in a domain of human endeavor and engage in a process of collective learning that creates bonds amongst them. This collective of people come together to collaborate, share, innovate new ideas, and solve problems (Wenger, 1998).

Knowledge in the Air Force (AF), in large part, resides within the minds of its people. As the AF continues to downsize its personnel and lose its knowledge base, more and more organizations are challenged to seek news ways of harnessing the available knowledge. For example, AF Material Command (AFMC) employs the lion's share of AF scientists and engineers. A decade of downsizing and hiring freezes has made up to 70 percent of its civilian workforce, including scientists and engineers, retirement eligible in the next five to seven years (Norman, 2002). When appropriate, the use of CoPs affords AF organizations the chance to utilize and distribute the knowledge they have in place. The ability to make use of knowledge is key to current learning/knowledge management initiatives. In addition to adding CoPs to their knowledge management arsenals, organizations are also looking for recommendations on how to improve the effectiveness of the CoPs currently in use to serve better the participants and organizations they were created to help. In order to identify and develop ways to

improve the use of CoPs as a knowledge sharing tool, identification of potential barriers

to their implementation is important. By doing so, a stronger foundation may enable the

AF and AFMC CoPs to work around or alleviate the impact of barriers to CoP use by

improving the design and strategy that go into creating CoPs. By identifying factors

affecting participation in CoPs and working to remove them, the AF and AFMC may

realize gains in usage by the CoP members and the organizations to which they belong.

Background

The Department of Defense (DoD), the AF Chief Information Officer (AFCIO),

and even the President of the United States recognize the need for improvement in the

way knowledge management is implemented. One of the DOD's objectives in the 2001

Quadrennial Defense Review Report is the modernization of DoD business processes.

> Boundaries must be broken to accelerate change across the entire
> organization, *promote cooperation, share information and best practices*,
> and institutionalize change throughout the Department (2001 QDR).

One way to achieve this objective is to improve the way knowledge management is

employed. In the 2002 Air Force Information Strategy (AFIS), the AFCIO put forth nine

goals for information management; goal seven is clear, "Implement knowledge

management practices and technologies to assure knowledge is identified, captured, and

shared" (AFIS, 2002). The AFIS elaborates on goal seven by calling for the use of

collaborative work tools to link "people who know" to those needing their knowledge

(AFIS, 2002). The strategic management of human capital is addressed in the President's

Management Agenda (PMA) for Fiscal Year 2002. In the PMA, the President points out

the need to "retain the knowledge and skills of retiring employees" and how "knowledge

management systems are just one part of an effective strategy that will help generate,

capture, and disseminate knowledge and information that is relevant to the organization's mission" (OMB, 2002:13). In addition to making the most of the knowledge in place, it is also important to continually find ways to augment and improve the training of an organization's personnel. In order to survive and adapt in these new environments, organizations must strive for continuous learning. Electronic-based CoPs (referred to as CoPs from this point forward) are one type of organizational information-system based knowledge management system that can help the DoD to meet its training and knowledge sharing goals.

Communities of Practice in AFMC and the Air Force

As the AF continues to lose its knowledge base through retirements and downsizing, it becomes increasingly important to maximize the knowledge that remains. In its efforts to help the DoD and AFCIO meet their knowledge management goals, AFMC has been working to implement the use of communities of practice (CoPs). Headquarters AFMC/DRW is the organization that manages and administers CoPs for both the AFMC and AF as part of the AF Knowledge Management (AFKM) Program. AFKM's AF and AFMC CoP labors are motivated by the desire to "increase the efficiency and effectiveness of the warfighter workforce by creating and supporting a continuous learning environment using knowledge management tools and processes" (Nguyen, 2002). The AFKM efforts include the AF Knowledge Now program which is lead by the AFMC eLearning Knowledge Management Integrated Project Team (IPT). The eLearning Knowledge Management IPT is tasked to investigate ways to apply private-sector technologies and management theories to AFMC's information distribution problems. Additionally, the eLearning Knowledge Management IPT investigates current

technologies and processes that can provide learning and collaborative tools to improve the warfighter's abilities to perform their mission (Nguyen, 2002).

Background on AF/AFMC CoP Efforts

In January 1998, AFMC/DRW created the AFMC *Lessons Learned Database*. This database provided AFMC personnel on-line access to documented, first-hand experiences focusing on acquisition and logistics subject matter. The AFMC Lessons Learned Database was originally deployed to support the Air Force efforts in Kosovo and was continued even after the Kosovo mission ended. AFMC/DRW wanted to expand the AFMC Lessons Learned Database into a more robust program (Lipka, 2003).

AFMC/DRW began expanding the AFKM program by developing the AFMC Help Center. The AFMC Help Center was made available in February of 2000 to help AFMC and other personnel locate information primarily dealing with acquisitions and logistics. The Help Center presently provides a search capability of over 482,000 non-classified AFMC web pages and averages 32,000 hits each month from AF personnel (Lipka, 2003).

With the success of the AFMC Help Center in November of 2001, AFMC/DRW decided to advance their efforts even further by making a Community of Practice Tool available as an ideal way of organizing proceedings of a team or organization effort where members in various localities are unable to see each other face to face (Nguyen, 2002). The Community of Practice "electronic" workspace that AFMC/DRW built offered customers an electronic collaborative environment where multiple personnel with a particular interest or goal could work together and carry out business through web-based communication (Nguyen, 2002). The electronic CoP workspaces made available

Air Force Instructions, key documents, tools, handbooks, guides, and expert contacts in specific fields to community members. Having these documents and tools available provided an excellent way of coordinating the efforts of people who work in different physical locations (Nguyen, 2002). As of May 2003, over four hundred community of practice workspaces had been developed for use by AF personnel, civilians, and contractors (Lipka, 2003).

The focus of the AFMC/DRW knowledge management program has evolved to the development and sustainment of electronic-based CoPs over the past four years from its initial knowledge management efforts. The AFCIO Office recognized that AFMC already had an impressive foundation for CoPs and as a result, AFMC became the focal point for some AF CoPs as well as AFMC CoPs (Nguyen, 2002). In early 2004 the AFCIO proposed leveraging the expertise and success of the AF Knowledge Now (AFKN) team, currently managed by AFMC/DRW, by designating the AFKN office as the Air Force Center of Excellence for Knowledge Management (AFCIO, 2004).

In September of 2002, a new Knowledge Now website was deployed to integrate the Help Center, Lessons Learned Database, Air Force Deskbook, and entry points to CoPs, into one complete resource. AFMC/DRW developed a training curriculum for CoPs on the existing program to better educate and inform CoP users and managers and is also modifying the CoP workspaces to allow access to updated Air Force content via the Knowledge Now website. This website makes all AFMC and DoD acquisition and logistical information even more available and easy to find (Lipka, 2003).

The efforts of AFMC/DRW are aimed towards the objectives set forth in the AFMC eLearning Knowledge Management IPT Project Charter. The AFMC eLearning

Knowledge Management IPT was tasked to enhance knowledge management opportunities to support a learning culture in AFMC through these three specific objectives (AFMC, 2002).

- Enhance the application of knowledge management opportunities to the warfighter support community (military, civilian, and contractor).
- Increase collaboration opportunities.
- Increase the quantity of pertinent knowledge management opportunities.

As these objectives are implemented, access to the Air Force Deskbook subject matter should improve and supply the information base necessary to foster the CoP concept.

Problem Statement

The AF has a growing number of communities of practice (CoPs) being created. Some are utilized by their members regularly and endure over long periods of time while others fail to ever get on track, thereby fading away from a lack of participation. Before making recommendations for improving participation, identifying which factors affecting participation are present within AFMC/DRW hosted CoPs would be great benefit.

The motivation behind this research is to bring the factors affecting CoP participation to the attention of AFMC and AFMC/DRW (from here on referred to as Air Force Knowledge Now) in order to improve their efforts to reach their goal of continued participation. As such, the purpose of this thesis is to survey Air Force Knowledge Now (AFKN) CoP members to determine the presence of factors affecting participation within their respective CoPs. Additionally, if respondent perception of factors in CoPs experiencing substantial participation can be shown to have a lower respondent perception in the less active AFKN CoPs, the results could help in substantiating the effect identified factors have on CoP participation. The results could then be used by

AFMC and AFMC/DRW to provide guidelines in future CoP building strategies and the barriers to avoid in achieving continued use, development, and improvement within their CoPs.

Scope

This research effort will explore the factors affecting participation computer-mediated communication and their applicability in affecting participation within AFKN CoPs. Identification of barriers within AFKN CoPs will be the focus of this effort. To do this, the research will review existing literature to identify factors affecting participation in other forms of computer-mediated communication (ex. group support systems), with the goal of identifying the essential attributes to successful participation within collaborative knowledge management systems such as CoPs. The results will potentially be used to aid in the modification of existing AF and AFMC CoPs, as well as in the design and implementation of future AF and AFMC CoPs.

The scope of this research is limited to identifying factors affecting participation, in AFKN CoPs, identified in the literature as being common within other forms of computer-mediated communications.   This research can then provide a guideline for future efforts towards improved and consistent participation in knowledge sharing and collaboration via CoPs.

Benefits to the Air Force

Some organizations that have instituted CoPs have experienced benefits such as reduced costs, improved quality, enhanced innovation, better transfer of knowledge, and increased value to their customers (Wenger, 1998). Individuals participating in CoPs can experience faster learning, collaborative innovation, better networking, less time looking

for information, a wider information base available for consideration, and a greater sense of connection with peers (Wenger, 1998). Without successful implementation of CoPs and sustained participation by their members, the potential benefits to knowledge sharing to the individuals within an organization outlined by Wenger would be negated. The results of this research may enable the AFCIO and AFMC to have a better understanding of the barriers affecting participation within existing CoPs and act as a guide in avoiding the identified barriers in future development of new CoPs. In addition to assisting the AF and AFMC CoP developers in determining what factors are affecting participation within their CoPs, it is possible the research will apply as well to other military services and DoD organizations, providing a tool for them to use as well in the improvement and development of both current and future CoPs.

Summary

This chapter reviewed the knowledge management objectives of the DoD, the AFCIO, and AFMC. This chapter also discussed the problem statement and the background of AF and AFMC/DRW CoP efforts. Furthermore, this chapter discussed advantages this research may provide for the Air Force.

Next, a literature review will be presented in Chapter 2. The scope of the literature review includes the thinking of experts and academics from peer-reviewed journal articles and books as it applies to this research. After the literature review, Chapter 3 will discuss the research methodology. Chapter 4 will provide the results of the research and analysis. Lastly, Chapter 5 will discuss the implications of the research, as well as future research possibilities.

II. Literature Review

Introduction

Since the AFMC Electronic Learning (eLearning) Knowledge Management Integrated Project Team, which resides in AFMC/DRW (primarily referred to as Air Force Knowledge Now from this point), began building communities of practice (CoPs) for AF organizations in 2001, there has been tremendous growth in the number of CoPs brought into use. As of February 2004, Air Force Knowledge Now (AFKN) had created 648 CoPs. Along with this rapid growth of the AF CoP community, there has been a significant number of CoPs that have become inactive and subsequently closed or terminated. Over 17% of the CoPs created by AFKN have been terminated; and of the remaining CoPs still maintained by AFKN an additional 22% have become inactive and not had a single user log-in over a 3 month timeframe (Dec 2003 - Feb 2004).

This thesis research attempts to identify factors affecting the usage, and therefore the sustainment of CoPs. Potential factors affecting participation will be sought within the literature on more established Computer Mediated Communication (CMC) systems such as Group Support Systems (GSS), Group Decision Support Systems (GDSS), and virtual teams in general. Factors affecting knowledge and information sharing, as well as areas of interest to AFKN personnel will also be studied for their effects on CoP usage. The scope of this literature review represents the thinking of experts and academics from numerous journal articles and books pertaining to knowledge transfer and factors affecting knowledge transfer within the various CMC systems mentioned above, in addition to CoPs. The information in this literature review defines what CoPs are and describes some of the factors that affect knowledge transfer---in general and within

CMCs. The specific AFKN areas of interest were the roles that anonymity and security constraints play in CoP usage.

Communities of Practice Defined

Communities of Practice (CoPs) are defined by Etienne Wenger and William Snyder as groups of people who share an interest in a domain of human endeavor and engage in a process of collective learning that creates bonds between them. These people come together to collaborate, share, and innovate new ideas (Wenger et al, 2002). Communities of practice are made up of volunteers who are similar to each other with common interests that bring them together. A certain subject that involves all of them links these participants. Furthermore, the goals of any CoP can be broad and may often fluctuate (Wenger and Snyder, 2000). "In the past few years e-mail, electronic discussion groups, and electronic chat rooms have facilitated the development of communities of practice whose members are not all co-located" (Lesser and Storck, 2001:4). The ability to bring together people from around the globe with similar interests makes the CoP a valuable tool for AFKN to use in its quest to improve knowledge management in the AF and AFMC. The CoPs hosted by AFKN are of course web based; however, CoPs are not dependent upon computers and the internet to function. Communities of practice have been around for as long as there have been groups of people sharing information on a common interest. While CoPs may have been around for thousands of years, the term "communities of practice" only just began to enter into the business and learning vernacular in the early 1990's, and CoPs hosted by AFKN have only been in use since November 2001.

Communities of practice (CoPs) are valuable to AF knowledge management initiatives because they allow for the knowledge within organizations, and career fields, to be shared and retained. With the downsizing of AF personnel comes a loss of valuable knowledge and experience. As experts become fewer in number throughout the different AF career fields, it is important to optimize the use of the knowledge that remains. Knowledge can be broken down into two general categories---explicit knowledge and tacit knowledge. Explicit knowledge is made up of tangible information that can be written down, such as a set of procedures or instructions on how to perform a specific task. Tacit knowledge is practical knowledge, such as riding a unicycle, learned through example or experience; it is not written down, but rather known. Providing a way for knowledgeable people to share tacit knowledge through their insights, opinions, and experiences makes CoPs a powerful tool to help solve the loss of knowledge from downsizing. Communities of practice are able to facilitate the transfer of both explicit and tacit knowledge among users; therein lays the value of CoPs to knowledge management initiatives aimed at making the most of people, knowledge, and information within organizations.

Potential Factors Affecting Participation in AFKN Communities of Practice

The proposed factors affecting participation that are being emphasized in this research are not so much obstructions or impediments as they are a lack of, or absence of, enablers to participation. Since the main goal of communities of practice (CoPs) is the sharing of knowledge and information, factors that have been shown to enable or facilitate knowledge and information sharing are also viewed as factors that enable or facilitate participation in CoPs. This research attempts to determine where AFKN

personnel should apply their efforts in sustaining and increasing participation in the CoPs

they host. By highlighting the factors affecting participation (i.e. the sharing of

knowledge or information) that exist, it is hoped that AFKN personnel will have the

information they need to apply their focus in regards to maintaining and improving CoP

use. Throughout the course of this literature review, numerous factors were identified

within the various CMCs. The factors identified throughout the literature review, and

discussions with AFKN personnel, focused on in this research are:

- trust
- willingness to share
- job fit
- outcome expectations
- social factors

- facilitating conditions
- anonymity
- security constraints
- knowledge champion
- facilitator

Trust

The American Heritage Dictionary of the English Language, Fourth Edition,

defines "trust" as the firm reliance on the integrity, ability, or character of a person or

thing. This is consistent with the definition of trust found in academic literature

pertaining to information sharing and knowledge management (Jarvenpaa et al, 1998;

Fjermestad and Hiltz, 2000; McDermott and O'Dell, 2001; Gongla and Rizzuto, 2001).

This definition is especially important when dealing with AFKN communities of practice

(CoPs) as many of the CoP members are geographically dispersed around the world.

Trust is an important factor that appears throughout the literature reviewed for this

research. Virtual teams require trust to be successful (Jarvenpaa et al); trust is a

characteristic of successful group support system implementations (Fjermestad and

Hiltz); trust is a key enabler to usage in CoPs (McDermott and O'Dell; Gongla and

Rizzuto). "The level of trust that exists between the organization, its subunits, and its

employees has been reported to have a great deal of influence on the amount of

knowledge that flows from individuals into the firm" (Delong and Fahey, 2000:119). In

most cases, trust in a virtual environment is handicapped by the lack of visual cues that

are present in face-to-face encounters. "Trust is important in virtual communities where

the absence of workable rules makes a reliance on the socially acceptable behavior of

others, i.e. trust, essential to the continuity of the community" (Ridings et al, 2002:275).

While the lack of face-to-face interactions in CoPs can work against the development of

trust, the presence of a common interest that is the foundation for CoPs can also work as

a means of developing trust. Most CoPs are built from existing informal human networks

whose members "trust each other and feel obliged to share information and insights with

each other" (McDermott and O'Dell, 2001:82). While there may be several different

factors that affect whether trust is present, this research does not try to ascertain whether

trust exists; the object of this research in regards to trust is to determine whether an

absence of trust corresponds to participation within AFKN CoPs.

> H1: There will be a positive relationship between perceived trust and participation within
> AFKN communities of practice.

Willingness to Share

While knowledge is often thought to be the property of individuals, a great deal of

knowledge is both produced and held collectively and it is this collective knowledge that

is readily generated when people work together in the tightly knit groups such as

communities of practice (CoPs) (Brown and Duguid, 1998). The ability to share explicit

knowledge is a valuable tool CoPs provide to their members; however, the ability to

share tacit knowledge is where the AFKN CoPs prove their worth. By providing the

capability for knowledge owners around the world to share their insights and experiences

to those who need the knowledge in the different fields or areas of interest that each CoP

revolves around, the impact of expertise lost that downsizing has on the Air Force's

knowledge base can be mitigated. "However, today's knowledge workers, faced with

waves of reorganization and downsizing, may also feel that their job security is

dependent on their level of knowledge and be very reluctant to share that knowledge,

perceiving it as a loss of 'competitive advantage' over other organizational members"

(Davenport & Prusak, 1998). Therefore, it is important that knowledge owners within

AFKN CoPs are willing and able to provide their tacit knowledge to the other members

of their respective CoPs. Brown and Duguid (1998:92) suggest that while explicit

knowledge "know-what" circulates with relative ease within organizations, the tacit

knowledge "know-how" that is "embedded in work practice (usually collective work

practice) is *sui generis* and thus relatively easy to protect", but also making it hard to

spread, coordinate, baseline, or change. Four factors have been shown to influence the

difficulty of knowledge transfer: "characteristics of the knowledge transferred, of the

source, of the recipient, and of the context in which the transfer takes place" (Szulanski,

1996:30). Of these four factors listed, this research focuses on characteristics of the

source, or owner. It is crucial to the success of CoPs that the knowledge owners are

willing to share their expertise and knowledge with the other members of the CoP. This

can pose a problem however when there is a lack of motivation or interest on the part of

the knowledge owner. "A knowledge source may be reluctant to share crucial knowledge

for fear of losing ownership, position of privilege, superiority; it may resent inadequate reward for sharing hard-won success; or they may be unwilling to devote time and resources to support the transfer" (Szulanski,1996:31). In a nutshell, if the knowledge owners, or sources, are not willing to share their knowledge with the other members of the CoP, the benefits of the CoP for the knowledge recipients may be reduced and therefore have an effect on their level of participation.

> H2: There will be a positive relationship between perceived willingness to share and participation within AFKN communities of practice.

User Acceptance of Information Technology

Four of the factors affecting participation that this research investigates come from the Unified Theory of Acceptance and Use of Technology (UTAUT) model developed by Venkatesh, Morris, Davis, and Davis in September 2003. The UTAUT is an empirical comparison of eight models that are currently in use to help explain an individual's inclination to use technology. The eight models that Venkatesh et al compared for their study were the theory of reasoned action, the technology acceptance model, the motivational model, the theory of planned behavior, a model combining the technology acceptance model and the theory of planned behavior, the model of PC utilization, the innovation diffusion theory, and the social cognitive theory. The UTAUT is a consolidation of similarities within the different constructs the eight models use to identify user acceptance. The end result of the UTAUT comparison was a unified model that "outperformed each of the eight individual models" it evolved from (Venkatesh et al, 2003:425).   Three of the determinants identified by the UTAUT that played a significant role in user acceptance and usage behavior were performance expectancy, social

influence, and facilitating conditions. The four factors affecting participation included in this thesis from the three UTAUT determinants were *job fit*, *outcome expectations*, *social factors*, and *facilitating conditions*.

Job Fit

Job fit is another of the acceptance constructs for information technology identified within the performance expectancy determinant of the Unified Theory of Acceptance and Use of Technology model (Venkatesh et al, 2003). Job fit is defined as "the extent to which an individual believes that using a PC can enhance the performance of his or her job" (Thompson et al, 1991:129). Whereas outcome expectations reflect the anticipated goals an individual may hope to achieve through a certain behavior, job fit does not focus on a specific goal or outcome but rather on an improvement in the way a job is performed. Performance expectancy factors have been shown to be a significant indicator of computer usage (Venkatesh et al; Thompson et al). This research will attempt to duplicate Thompson et al's findings on the effect of job fit on computer usage in relation to participation within AFKN communities of practice.

> H3: There will be a positive relationship between perceived job fit and participation within AFKN communities of practice.

Outcome Expectations

Outcome expectations are one of the constructs identified within the performance expectancy determinant of the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al, 2003). Outcome expectations are the degree to which a person believes that using a particular system would affect his or her performance or personal expectations (Venkatesh et al). Personal expectations might reflect individuals'

hopes of getting a promotion or raise, while performance expectations would indicate goals towards being more effective at work or doing a better job. According to Compeau and Higgins (1995), outcome expectations have a significant influence on an individuals' propensity to use a technology and are an important precursor to usage behavior. The research done by Compeau and Higgins relating to outcome expectations is based on the Social Cognitive Theory (SCT). One of the SCT's major cognitive forces guiding behavior is the expectation that individuals are more likely to undertake behaviors they believe will result in valued outcomes than those they do not see as having favorable consequences (Compeau and Higgins). Research by Compeau and Higgins determined that both performance and personal expectations have a significant positive effect on computer usage. This research attempts to find similar outcome expectation effects on participation within AFKN communities of practice.

> H4: There will be a positive relationship between perceived outcome expectations and participation within AFKN communities of practice.

Social Factors

Social factors are one of the acceptance constructs for information technology identified within the social influence determinant of the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al, 2003). Social factors reflect an individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations (Venkatesh et al). Thompson et al's (1991) study on utilization of personal computers determined social factors had a significant influence on personal computer utilization, and these findings were later confirmed in Venkatesh et al's development of

the UTAUT model. Social factors are being looked at within AFKN communities of practice (CoP) to see how the perceived support from supervisors and organization effects CoP members' participation.

> H5: There will be a positive relationship between perceived social factors and participation within AFKN communities of practice.

Facilitating Conditions

Facilitating conditions are one of the determinants for acceptance of information technology identified in the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al, 2003). The facilitating conditions focused on in this research pertain to the availability of community of practice (CoP) training and the level of the CoP members' belief in their knowledge to use CoPs. Thompson et al (1991:129) found that "by training users and assisting them when they encounter difficulties, some of the potential barriers to use are reduced or eliminated." A look into factors that affect implementation of innovations (Brown et al, 1994), such as CoPs, shows that improper user training can act as a barrier. Improper training could be an absence of training or, as pointed out by Brown et al, the lack of applicability of training to an employee's job and a lack of opportunity for building experience with the innovation.

In addition to looking at training as a facilitating condition that effects participation in AFKN communities of practice (CoPs), this research will also look at the facilitating condition of perceived behavioral control as it pertains to self-efficacy, i.e. the CoP member's belief that they have the knowledge necessary to use AFKN CoPs. Perceived behavioral control is identified within the UTAUT as a construct under facilitating conditions. In his work on the Theory of Planned Behavior, Ajzen (1991:183)

defines perceived behavioral control as "a person's perception of the ease or difficulty of performing a behavior of interest." Ajzen (1991:184) goes on to point out that "people's behavior is strongly influenced by their confidence in their ability to perform it (i.e., by perceived behavioral control)." This research will try to establish a link between CoP participation and facilitating conditions related to improper or insufficient training and CoP members perceived behavioral control.

> H6: There will be a positive relationship between perceived facilitating conditions and participation within AFKN communities of practice.

Anonymity

The effect anonymity plays in community of practice (CoPs) participation was an area of interest to the Knowledge Now program office (Adkins, 2003). Currently the AFKN hosted CoPs do not offer its members the ability to participate in CoP functions and activities anonymously. All types of text-based Computer-Mediated Communication (CMC), such as GDSSs, are often characterized as being relatively anonymous (Postmes et al, 1998); therefore, this research uses the anonymity studies on other forms of CMC in relation to CoP participation. Anonymity has been the subject of numerous studies, spanning the fields of computer-mediated communications (CMC) (Dennis and Valacich, 1994; Postmes et al, 1998), group support systems (GSS) (Jessup et al, 1990; Nunamaker et al, 1991; Fjermestad and Hiltz, 2000), and group decision support systems (GDSS) (Connolly et al, 1990; Postmes and Lea, 2000). While anonymity might provide opportunities for individuals to act outside of accepted group norms by using vulgar language or doing less work, most of the effects of anonymity tend to be looked at as positives. In a review of three GSS experiments that examined the use of anonymity and

its corresponding effects in terms of group process and outcome, Jessup et al found that anonymity promoted the generation of more critical and more probing comments from group members. The consensus of the studies reviewed indicated that anonymity provided a low threat environment that allowed junior, or introverted, individuals to participate in the various forms of CMC that they might otherwise avoid. Dennis and Valacich point out that anonymity might reduce participant apprehension and domination of knowledge flow by high status members because the source of ideas is unknown. Research by de Vreede et al (2003:4) studied three organizations that incorporated anonymous GSSs and found that anonymity was considered "instrumental to achieve a process that lacked intimidation," and people felt "less apprehensive to contribute ideas and discuss them openly." The benefits of anonymity are more likely to be present in larger groups, as smaller groups have more difficulty remaining anonymous.

Postmes et al did extensive research on anonymity in computer-mediated communication (CMC) under the framework of the Social Identity Model of Deindividuation Effects (SIDE), with surprising results. The SIDE model consists of two dimensions, relating to self-categorization (cognitive) and self-expression (strategic), and it analyzes the conditions that facilitate or impede these (Spears et al, 2002). The SIDE model determined that although the opportunity might exist for anonymity to foster socially unacceptable behaviors, the opposite effect occurs. Evidence in research by Spear et al suggests that the anonymity associated with CMC, far from undermining the social dimension to self and behavior can strengthen its very basis. Rather than encourage unacceptable behavior, anonymity in CMCs can strengthen the social influence the group has on individuals. In regards to this research pertaining to AFKN

CoPs, anonymity might be viewed as a means of bringing more individuals into active participation. This might be especially evident in regards to lower ranking CoP members.

> H7: There will be a negative relationship between perceived lack of anonymity and participation within AFKN communities of practice.

Security Constraints

Another area of interest the Knowledge Now program office is interested in exploring is the effect security constraints might have on participation of AFKN community of practice (CoP) members. The AFKN CoPs are not cleared to handle information at security levels of secret or above. Therefore, jobs that require utilization of information at secret and higher classifications are unable to use CoPs at the security levels their job requires. The Knowledge Now office is therefore interested in finding out how much of an effect security constraints have on the participation within AFKN CoPs. Information that is at the higher security classification levels, such as Secret or Top Secret, may prohibit members that use the information from sharing across CoPs. Literature on security and its effect on CoPs and other forms of computer-mediated communication was not abundant; in fact, the majority of the literature reviewed on security was found in e-commerce articles.

Establishing effective security measures is important for E-commerce companies seeking to gain the trust of consumers. It is important to ensure enough security to preserve business integrity, as "no business will prosper if users do not trust its website" (Mitchell, 2000:54). When a collaborative online median such as a community of practice (CoP) is being developed, careful consideration of the user needs is required

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when determining a security policy for the system security. In the face of computer theft, hackers, and increased virus activity over the internet, "management, especially financial executives, is being forced to reassess their methods of collaboration and information-sharing to ensure that critical information is protected when working with both internal and external audiences" (Price, 2003:51). Knowledge management cultures are based on trust (Damm and Schindler, 2002), so secure operating environments are necessary to establish successful collaboration between organizations. While research in the business world would indicate that perceived security may not be a direct indicator of a system's usage (Lim, 2003), security may indirectly effect perceived usefulness or trust.

> H8: There will be a negative relationship between perceived security constraints and participation within AFKN communities of practice.

Facilitators and Knowledge Champions

In addition to the eight factors previous discussed, this research will also examine the potential effects that a facilitator or knowledge champion of an AFKN community of practice (CoP) might have on the participation of other members. Wenger et al (2002) reports that many studies have discovered the most important factor in a community's success is the vitality of its leadership. This is supported by evidence that spontaneous leadership emerges in communities that are not planned or organizationally supported (McDermott, 2000). In the literature reviewed, the impact of leadership is evident in other forms of computer-mediated communication and information sharing. For the effective transfer of best practices, leaders need to consistently champion the message of knowledge sharing for the greater good of the organization (O'Dell & Grayson, 1998), and according to Fjermestad and Hiltz, two of the characteristics in successful

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implementations of group support systems is leadership and the presence of a facilitator. Facilitators are the knowledge brokers of CoPs, while knowledge champions are the practice leaders (Fontaine, 2001). Within CoPs, leadership often takes the form of the facilitator (also known as the coordinator), the knowledge champion (also known as knowledge leader or subject matter expert), or both. Most often, facilitators are well-respected members within a community, but not usually the world leading experts (McDermott). The role that facilitators play is important in keeping CoPs active, they keep the CoP informed of what other members are doing and create opportunities for the sharing of ideas.

> H9: There will be a positive relationship between perceived facilitator presence and participation within AFKN communities of practice.

Knowledge champions are important because they are "responsible for maintaining and advancing the body of knowledge in the CoP and for encouraging thought leaders' involvement in a CoP from its inception" (Smith and McKeen, 2003:12).

> H10: There will be a positive relationship between perceived knowledge champion presence and participation within AFKN communities of practice.

Research Model

A theoretical research model is developed and presented in Figure 1. This model draws together the research propositions identified in the literature review and in discussions with AFKN personnel. Table 1 provides an overview of the variables this research will assess along with their corresponding hypotheses. Table 2 will provide an overview of the variables along with their supporting literature.
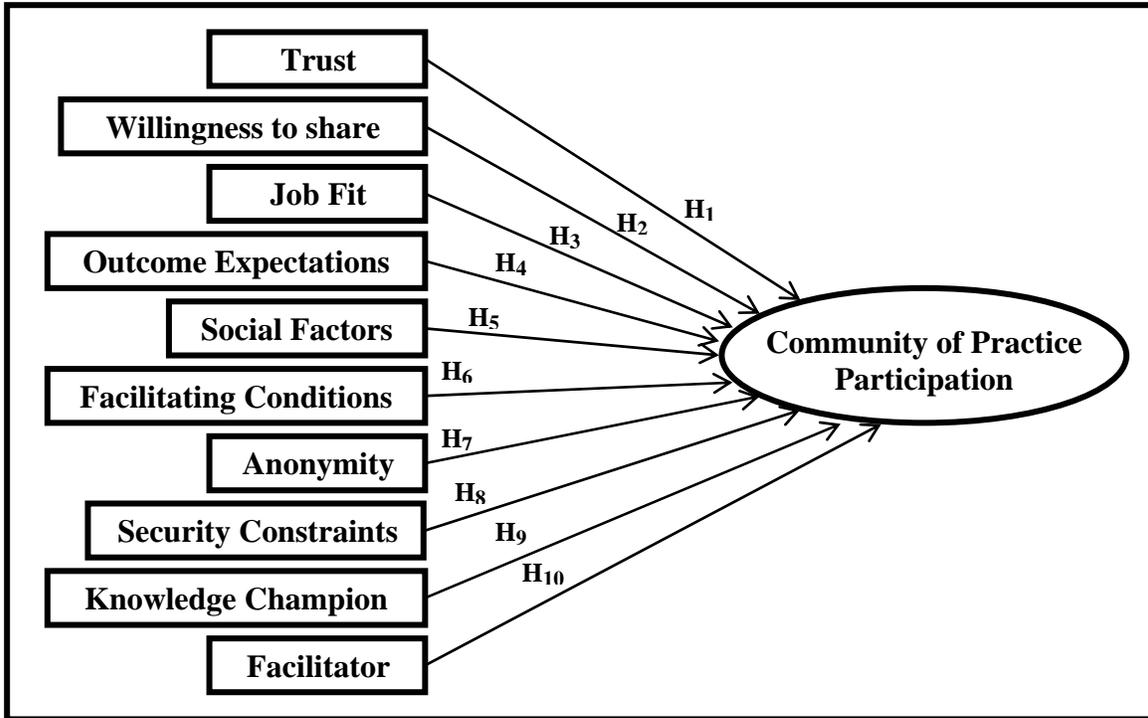
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Figure 1. Initial Research Model

Table 1. Variables with Hypotheses

Variables	Hypotheses
Trust	H1: There will be a positive relationship between perceived trust and participation within AFKN communities of practice.
Willingness to Share	H2: There will be a positive relationship between perceived willingness to share and participation within AFKN communities of practice.
Job Fit	H3: There will be a positive relationship between perceived job fit and participation within AFKN communities of practice.
Outcome Expectations	H4: There will be a positive relationship between perceived outcome expectations and participation within AFKN communities of practice.
Social Factors	H5: There will be a positive relationship between perceived social factors and participation within AFKN communities of practice.
Facilitating Conditions	H6: There will be a positive relationship between perceived facilitating conditions and participation within AFKN communities of practice.
Anonymity	H7: There will be a negative relationship between perceived lack of anonymity and participation within AFKN communities of practice.
Security Constraints	H8: There will be a negative relationship between perceived security constraints and participation within AFKN communities of practice
Facilitator	H9: There will be a positive relationship between perceived facilitator presence and participation within AFKN communities of practice.
Knowledge Champion	H10: There will be a positive relationship between perceived knowledge champion presence and participation within AFKN communities of practice.

Table 2. Variables with Supporting Literature

Variables	Supporting Literature
Trust	Jarvenpaa et al (1998), Fjermestad and Hiltz (2000), McDermott and O'Dell (2001), Gongla and Rizzuto (2001)
Willingness to Share	Davenport & Prusak (1998), Brown and Duguid (1998), Szulanski (1996)
Job Fit	Thompson et al (1991), Venkatesh et al (2003)
Outcome Expectations	Compeau and Higgins (1995), Venkatesh et al (2003)
Social Factors	Thompson et al (1991), Venkatesh et al (2003)
Facilitating Conditions	Ajzen (1991), Thompson et al (1991), Brown et al (1994), Venkatesh et al (2003)
Anonymity	Jessup et al (1990), Nunamaker et al (1991), Dennis and Valacich (1994), Connolly et al (1990), Postmes et al (1998), Postmes and Lea (2000), Fjermestad and Hiltz (2000), de Vreede et al (2003)
Security Constraints	Mitchell (2000), Damm and Schindler (2002), Lim (2003)
Knowledge Champion	Fjermestad and Hiltz (2000), McDermott (2000), Fontaine (2001), Wenger et al (2002)
Facilitator	O'Dell & Grayson (1998), McDermott (2000), Fontaine (2001), Wenger et al (2002), Smith and McKeen (2003)

Conclusion

This literature review provided a summary of information representing the major thinking regarding articles and books that focus on factors affecting participation in various forms of computer-mediated communications (CMC), and specifically communities of practice (CoPs). It has defined CoPs, provided background information on AFMC and AF CoPs efforts, and presented some general information on the proposed factors affecting participation within the different CMCs. The literature covered in this chapter will be used as the basis for the research methodology addressed in Chapter 3.

III. Methodology

Introduction

This chapter will discuss the methodology used to collect and analyze data. Included is a description of the research design, an explanation of the research questions, a discussion of the survey development, and details on the statistical techniques that will be used to analyze the data.

Research Questions

This research will attempt to answer three research questions. The research questions are:

1. Can we identify factors that affect participation between high and low use AFKN Communities of Practice?

2. What differentiates the successful and unsuccessful AFKN hosted Communities of Practice?

The intent and focus of each question in the context of this particular research is provided below.

Research Question #1

The purpose of the first research question (*Can we identify factors that affect participation between high and low use AFKN Communities of Practice?*) is to identify the presence, or absence, of factors resulting in a lack of participation within AFKN communities of practice (CoPs). The AFKN hosted CoPs that fall into the population criteria will be analyzed to determine whether the factors affecting participation identified in the literature review are present.

Research Question #2

The purpose of the second research question *(What differentiates the successful and unsuccessful AFKN hosted Communities of Practice?)* is to determine if the high and low usage CoPs have differing quantities of the factors affecting participation identified in the literature review.

Research Design

The research design of this study is a survey. The survey is cross-sectional in order to effectively gather information on a population at a single point in time, and consists of a combination of quantitative and qualitative questions. This methodology was chosen because it was deemed necessary to collect quantitative as well as qualitative data from respondents in order to address all of the research questions. The cross-sectional survey was selected due to time constraints and the need to poll survey recipients only once. Constructs in this research were measured using items assessed on a seven-point Likert scale, indicating one as "Strongly Disagree" and seven as "Strongly Agree." In addition, two open-ended questions were asked. With the exception of the anonymity and security constraint question, all quantitative questions were developed to infer increased participation as Likert scale responses increased. If a respondent answered a question with a seven, the corresponding inference should indicate positive affect on participation. The responses received for the anonymity and security constraint questions were reverse coded so their Likert responses would indicate the same positive emphasis on participation. Three demographic questions were also asked to determine the community each respondent was a member of, determine respondent's rank or grade, and respondent's length of time as a community of practice member.

Survey Development

Four variables used in this research were developed based on previous research by Venkatesh et al in regards to user acceptance constructs. The four variables were job fit, outcome expectations, social factors, and facilitating conditions. Two variables used in this research, anonymity and security constraints, were developed based on interviews with members of the AFKN team. The remaining four variables used in this research (trust, willingness to share, knowledge champion, and facilitator) were developed based on the literature review.

Development of Survey Questions

The majority of the survey questions are quantitative; however, there was one qualitative question included in the survey to provide the survey respondents the opportunity to give insights not covered in the quantitative questions. Eight of the survey questions, covering four of the constructs: job fit, outcome expectations, social factors, and facilitating conditions, were obtained from the Unified Theory of Acceptance and Use of Technology Model (UTAUT) (Venkatesh et al, 2003). The ten survey questions, covering six of the constructs, not obtained in the UTAUT model were developed based on their conceptual definitions in the literature.

Sample Population

Due to the availability of contact information on the members of AFKN hosted communities of practice (CoPs), the entire population, i.e. a census, of CoPs consisting of twenty or more members was solicited for participation in the survey. Six thousand-one hundred and sixty-five individuals were contacted to participate in the survey. Participation in the survey was anonymous and the respondents that completed the survey

made up the resulting convenience sample. Further information on the survey response

rates and results is provided in Chapter 4.

Human Subjects Review

Approval from the Air Systems Command Human Subjects Review Board was

required per Air Force Instruction 40-402, Air Force Human Subjects Review Program,

prior to surveying the AF personnel that make up the survey population. The approval

number given was USAF SCN 03-112. A copy of the Air Systems Command Human

Subjects Review Board approval letter is in Appendix A.

Data Collection

The survey was distributed to the entire populations of all AFKN hosted

communities of practice (CoPs) with at least 20 registered members created prior to

August 2003. The CoPs were then ranked based on web page hits per member for the

three month period from August 1st through September 30th, 2003. There were 120 CoPs

meeting the criteria to receive the survey. After the CoPs were ranked they were broken

up into six groups of 20 CoPs each. This was done to facilitate the survey respondents'

ability to select the CoP they belonged to in the survey without having to scroll through

all one-hundred and twenty CoPs. Survey respondents input their responses via the web

based survey and the data was collected through the AFIT website that hosted the survey.

Survey Validity

The survey was tested for face validity by using AFIT graduate students with little

or no knowledge of communities of practice (CoPs). Face validity tests readability, ease

of use, and how easy the survey is to complete. The AFIT graduate students who

reviewed the survey found it to be easy to read, easy to use, and no one found the survey to contain irrelevant items.

Next, several people at AFMC/DRW responsible for creating and maintaining AFMC CoPs were used to test the survey's content validity. Content validity is a biased evaluation of how suitable the survey items appear to knowledgeable reviewers (Litwin, 1995). The AFMC/DRW personnel that reviewed the survey found it to be suitable for the variables being researched.

Data Analysis

The survey data will be analyzed using descriptive and inferential statistical techniques. A descriptive analysis will be done on all variables based on the frequency distributions of each variable. Using JMP version 5.01, a comparison of each variable using the Student's t test at an alpha level of .05 will be made to reveal any significant differences between high and low use groupings of CoPs. The qualitative question will be reviewed for any themes or patterns in the responses in hopes they will help clarify and support the qualitative data.

Statistical analysis will be accomplished using the Statistical Package for Social Sciences v. 11.5. Reliability of scale items will be determined using Cronbach's Alpha. Scale items with a sufficient Cronbach's Alpha will be considered for further data reduction. The Cronbach's Alpha reliability coefficients are presented in chapter four in the factor analysis section. Along with Crobach's Alpha coefficients, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy will be used to identify the appropriate set of variables for data reduction. Data reduction will be accomplished through factor analysis to identify any underlying dimensions of the constructs.

Summary

This chapter explained the research approach and the methodology used to Assess proposed factors affecting participation within AFMC/DRW hosted communities of practice (CoPs). The research goal was to see if there were significant differences between groups of CoPs that exhibit high and low participation rates. As such, the chapter included an explanation of the research questions, a description of the research design, a discussion of the survey instrument development, and discussed techniques that will be used to analyze the data. The results of the research and analysis, along with a summary of demographic data, will be presented in Chapter 4. Chapter 5 will discuss the implications and limitations of the research and will propose future research possibilities.

IV. Results and Analysis

This chapter explores the results of the methodology put forth in Chapter 3. The Overview will provide response rate information followed by demographics of the survey participants. The Statistical Analysis will look at each variable investigated and provide results of Cronbach's Alpha tests and Student t tests. The Qualitative Results section will highlight any trends or themes that emerge in the qualitative question. The Hypothesis Testing section will apply the results of the analysis to the hypotheses to determine whether they are each accepted or rejected. The Factor Analysis section will provide the results of the exploratory factor analysis.

Overview

This research provided links to a web based survey via email to all the registered members of AFKN hosted communities of practice (CoPs) meeting the following criterion: containing 20 or more members and in existence since 01 August 2003. The survey was an aggregation of two separate AFIT student's surveys consisting of three shared demographic questions, 42 combined (not shared) quantitative questions, and one (not shared) qualitative question. The two separate surveys were combined into a single survey at the request of AFKN to protect its CoP members from being contacted by multiple research efforts. This research's survey consisted of the shared demographic and qualitative questions as well as 18 quantitative questions covering the 10 variables hypothesized to affect participation within CoPs. The survey in its entirety is provided in Appendix B, while questions specific to this research are provided below in Table 3.

Table 3. Survey Variables-Coding-Questions

Variable	Coding	Questions
Demographic	D1	D1. To which community of practice do you belong? (List only the community with which you are most involved?
Demographic	D2	D2. How many months have you been a member of your CoP?
Demographic	D3	D3. What is your rank?
Trust	T1	1. Information obtained from my CoP is reliable enough to use in my job.
Outcome Expectations	OE1	3. If I use my CoP I will increase my chances of obtaining a promotion.
Facilitating Conditions	FC1	5. Training in the use of my CoP was available to me.
Anonymity	A1	7. I would participate more often in my CoP if I could remain anonymous.
Social Factors	SF1	9. My supervisor is very supportive of my use of CoPs in my job.
Trust	T2	11. The members of my CoP are competent enough in their job knowledge to provide accurate information to others within the CoP.
Knowledge Champion	KC	13. A knowledge champion is responsible for invigorating a CoP, encouraging CoP members to participate and share knowledge, highlighting successes, recognizing the contributions of members, and so on: my CoP has a knowledge champion.
Outcome Expectations	OE2	15. If I use my CoP I will increase my effectiveness on the job.
Facilitating Conditions	FC2	17. I have the knowledge necessary to use my CoP.
Anonymity	A2	19. I would share my opinions and insights more often in my CoP if I could remain anonymous.
Security Constraints	S1	21. The level of security my job deals with limits my ability to use CoPs in my work.
Security Constraints	S2	23. I would participate more in my CoP if the sharing of classified and higher information was allowed.
Social Factors	SF2	25. In general, my organization has supported my use of CoPs.
Job Fit	JF1	27. Use of CoPs can significantly increase the quality of output on my job.
Job Fit	JF2	29. Use of CoPs will affect the performance of my job.
Willingness to Share	US1	31. I have no reservations about sharing my job knowledge with other members of my CoP.
Facilitator	F1	33. The efforts of my CoP's facilitator affect how much I participate within my CoP.
Willingness to Share	US2	35. Sharing my job knowledge with other members of my CoP will make me more valuable to my organization.
Qualitative	Q1	43. What factors, positive or negative, affect your participation in your CoP? Please use the block below to input your comments

Emails requesting participation in the survey were sent to all 6165 registered members of the 120 CoPs fitting the sample criterion. The survey was taken by 1042 people, for a response rate of 17%. Any individual survey response missing 30% or more answers was removed. The remaining missing data points within each survey response were addressed via mean replacement, as recommended by Hair et al. (1998). Of the 1042 survey responses, 915 were judged adequate for participation, for a usable response rate of 14.9%. The survey asked participants to rate each quantitative question on a 7-point Likert scale, with associated scores for each answer shown in Figure 2.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

Figure 2. Likert Scale

The communities of practice (CoPs) were rank ordered by usage (page hits per member over the last three months) and then divided into six equal groups. Each group contained twenty CoPs and the groups were numbered from 1 to 6, with Group 1 containing the CoPs with the highest usage rates, and so on, down to Group 6, which contained the twenty CoPs with the lowest usage rates. This also provided a quick visual method to assess how the group's response rates compared. The CoPs were divided into the six equal groups for the emails sent to each CoP group member to contain a survey link with a smaller amount of CoPs to scroll down to in order to find the CoP belonging to each participant (demographic question #1).   The response numbers for each group are shown in Figure 3.
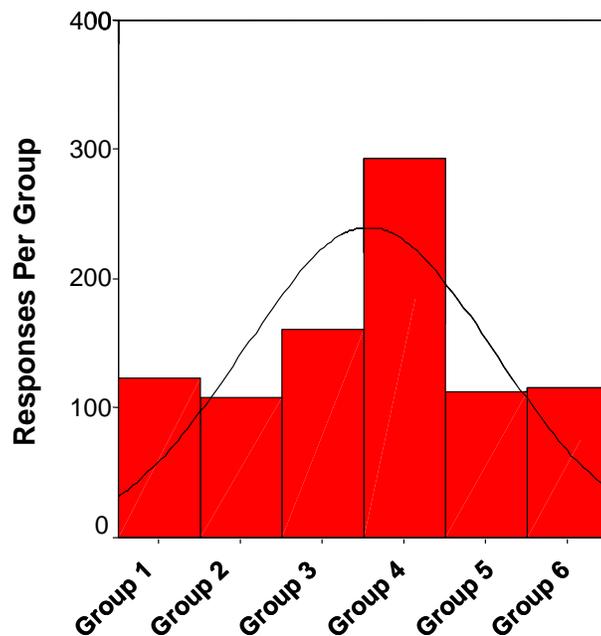

Figure 3. CoP Member Response Rates by Group

The length of time participants belonged to their respective CoP is provided in Table 4. An overwhelming number of participants (66.7 %) have belonged to their CoPs for 12 months or less, which corresponds to the increased interest throughout the military in using CoPs as a knowledge management tool.

Table 4. Length of CoP Membership

Months as CoP Member	Frequency	Percent
1_12	610	66.7
13_24	129	14.1
25_36	25	2.7
Less than 1	86	9.4
More than 36	65	7.1
Total	915	100.0

Lastly, the breakdown of rank and grade for participants is provided in Table 5. Almost half, 45.6%, the survey participants fell within the grades of GS-11 through 15. Next were senior non-commissioned officers at 11.7%, contractors at 11.6%, and field grade officers at 10.8%. While these numbers bode well for the level of experience present in AFKN CoPs, the lack of participation by lower ranks and grades could indicate a missed opportunity for the CoP members in need of the knowledge and insight possessed by the senior CoP members.

Table 5. Response Frequency by Rank and Grade

Rank or Grade	Frequency	Percent	Cumulative Percent
Contractor	106	11.6	11.6
E1_E4	4	0.4	12
E5_E6	62	6.8	18.8
E7_E9	107	11.7	30.5
GS1_GS5	4	0.4	30.9
GS11_GS15	417	45.6	76.5
GS6_GS10	47	5.1	81.6
O1_O3	54	5.9	87.5
O4_O6	99	10.8	98.4
O7_O10	4	0.4	98.8
Other	11	1.2	100
Total	915	100	

Statistical Analysis

This section will give the results from the statistical analysis of the ten proposed variables affecting participation within AFKN communities of practice (CoPs). Hypothesis testing will be determined in the following section based on the following analyses. Once again, the ten variables are:

- trust
- willingness to share
- job fit
- outcome expectations
- social factors

- facilitating conditions
- anonymity
- security constraints
- knowledge champion
- facilitator

With the exception of the one-item scales used to assess the knowledge champion and facilitator variables, all the variables were analyzed with two-item scales using the questions shown in Table 3. Even though increasing the number of items in a scale can improve its reliability (Nunnally, 1978), questions were kept at a minimum due to the combined survey effort to help maximize survey response rates. Cronbach's Alphas were determined for each of the two-item scales to determine their internal reliability, and Student t tests were accomplished on all ten variables to determine any significant differences for each variable between the high and low use CoPs. The Cronbach's Alpha results for the variable scales are provided in Table 6 below.

Table 6. Scale Cronbach's Alphas

Variables	Cronbach's Alpha
Outcome Expectations	0.475*
Willingness to Share	0.489*
Facilitating Conditions	0.660
Trust	0.737
Security Constraints	0.759
Social Factors	0.803
Job Fit	0.824
Anonymity	0.865

* Failed to exceed minimum Cronbach's Alpha level of .60

The recommended minimum Cronbach's Alpha level is 0.70 (Hair et al. 1998); however, in scales that have a smaller number of items, a lower alpha level is acceptable (Carmines and Zeller, 1979), and alphas may decrease to .60 (Hair et al. 1998) or even .50 (Nunnally 1978) in exploratory research. Six of the eight variable scales had acceptable alpha levels. 'Outcome expectations' and 'Willingness to Share' only produced alphas in the .4 range, so their ability to properly assess the variables they were meant to is in question. Since more than one item is necessary to determine Cronbach's Alpha, the one-item scale variables; 'Knowledge Champion' and 'Facilitator' were excluded from this portion of analysis..

Next, a Student t test was accomplished on each variable to determine if there were significant differences between groups of CoPs with high and low participation rates. The groups of CoPs being compared were the upper and lower quartiles of all surveyed CoPs based on their member participation rates. The upper quartile represented the high participation CoPs and was made up of individual responses from within those CoPs averaging more than 80 page hits per member (N = 232) over a three month timeframe. The lower quartile represented the low participation CoPs and was made up

of individual responses from within those CoPs averaging 21 or less page hits per

member (N = 231) over the same three month timeframe. Variables were compared

across the different groupings of CoPs using an alpha = 0.05. Therefore, any p-value less

than 0.05 will constitute a significant difference.

Of the ten variables analyzed using Student t tests, four demonstrated significant

differences between the CoPs with high and low participation rates. The four variables

with significant differences were 'Security Constraints,' 'Willingness to Share,' 'Trust,'

and 'Facilitator.' A summary of the Student's t test results and hypotheses status for all

the variables is provided in Table 7 below.

Table 7. P Value Results for all Ten Variables

Hypothesis	Variable	Lower Quartile Means	Upper Quartile Means	P value	Hypothesis Supported
H1	Trust	5.27	5.56	0.003 *	Yes
H8	Security Constraints	4.83	5.20	0.003 *	Yes
H9	Facilitator	4.47	4.91	0.000 *	Yes
H2	Willingness to Share	5.33	5.66	0.000 *	Yes
H6	Facilitating Conditions	4.45	4.55	0.470	No
H7	Anonymity	4.77	4.89	0.384	No
H4	Outcome Expectations	4.02	4.16	0.191	No
H10	Knowledge Champion	4.48	4.66	0.188	No
H5	Social Factors	4.83	5.03	0.085	No
H3	Job Fit	4.67	4.87	0.074	No

* P value < 0.01
N=463

Hypothesis Testing

Hypothesis H_1 examined the effects of trust on participation in AFKN

communities of practice. Specifically, the hypothesis suggested as perceived trust

towards other community of practice members, and the information they provide to the

CoP increases, the greater the amount of participation will be within the respondents

CoP. The analysis produced a p value = 0.003 at the .01 significance level, therefore, the results supported this hypothesis.

Hypothesis H_2 examined the effects of respondents' willingness to share information on participation in AFKN communities of practice. Specifically, the hypothesis suggested the higher a CoP members' willingness to share with other CoP members is, the greater the amount of participation will be within the CoP. The analysis produced a p value = 0.0002 at the .01 significance level, which strongly supported this hypothesis. The results from the 'Willingness to Share' scale's Cronbach's Alpha failed to produce an acceptable result (0.4889) causing hypothesis H_2 to be considered for removal from consideration. Hypothesis H_2 was accepted due to the individual items within its scale each having a significant p value at the .01 significance level, in addition to the scale itself, when comparing the low and high use CoPs (item US1 had p value = 0.0001, item US2 had p value = 0.0043).

Hypothesis H_8 examined the effects of security constraints on participation in AFKN communities of practice. Specifically, the hypothesis suggested as the perceived level of security needed to transfer information with a CoP increases, the lower the amount of participation will be within the respondent's CoP. The analysis produced a p value = 0.003 at the .01 significance level, therefore, the results supported this hypothesis.

Hypothesis H_9 examined the effects of the community of practice facilitator on participation in AFKN communities of practice. Specifically, the hypothesis suggested as CoP members' perception of the effort by a CoP facilitator increases, the greater the

amount of participation will be within the respondent's CoP. The analysis produced a p value = 0.0004 at the .01 significance level, therefore, the results strongly supported this hypothesis.

Factor Analysis

The survey's 18 Likert scale items were analyzed using exploratory factor analysis. Exploratory factor analysis does not specify any structure a priori but constructs a model that best fits the data (Hair et al., 1998). The Statistical Package for Social Sciences (SPSS) v.11.5 was used as the statistical analysis tool. Based on suggestions within Nunnally (1978), Hair et al. (1998), and Stevens (2002), the criteria used to determine the factorability of the survey items were:

- Assessing the pattern of correlation coefficients > 0.300 in the correlation matrix
- Kaiser-Meyer-Olkin Measure of Sampling Adequacy (MSA) > 0.700
- Bartlett's Test of Sphericity p < 0.05
- Communalities > 0.450
- Factor Loadings > 0.400
- No cross loadings > 0.350
- Eigenvalues > 1.0

The initial data quality check suggested the correlation matrix contained a substantial number of non-zero correlations (Appendix C), and therefore, was suitable to exploratory factor analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy yielded a value of .790, and Bartlett's test of sphericity yielded a p-value < .000. Both values fall within appropriate numerical ranges (Nunnally, 1978; Hair et al., 1998; Stevens, 2002).

Stevens (2002) suggests when N is greater than 250 and the mean communality is greater than or equal to .60, using either Eigenvalues greater than one or assessing the Skree plot will result in an accurate estimate of the number of true factors. In this analysis, the mean communality of the factors was 0.72, with an N of 915. Varimax rotation was used to rotate the solution. Six items were removed from consideration due to low communality scores and excessive cross loadings. The six items removed represented the two *Trust* items (T1 and T2), the first *Willingness to Share* item (US1), the first *Outcome Expectations* item (OE2), and the *Knowledge Champion* and *Facilitator* items (KC and F1). Four factors producing an Eigenvalue greater than 1.0 were extracted (Table 8).

Table 8. Summary of Factor Variance

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.189	34.909	34.909	4.189	34.909	34.909
2	2.176	18.130	53.039	2.176	18.130	53.039
3	1.211	10.093	63.132	1.211	10.093	63.132
4	1.078	8.984	72.116	1.078	8.984	72.116
5	.779	6.490	78.606			
6	.532	4.429	83.035			
7	.487	4.055	87.090			
8	.403	3.357	90.448			
9	.335	2.791	93.239			
10	.317	2.639	95.878			
11	.267	2.227	98.106			
12	.227	1.894	100.000			

Extraction Method: Principal Component Analysis.
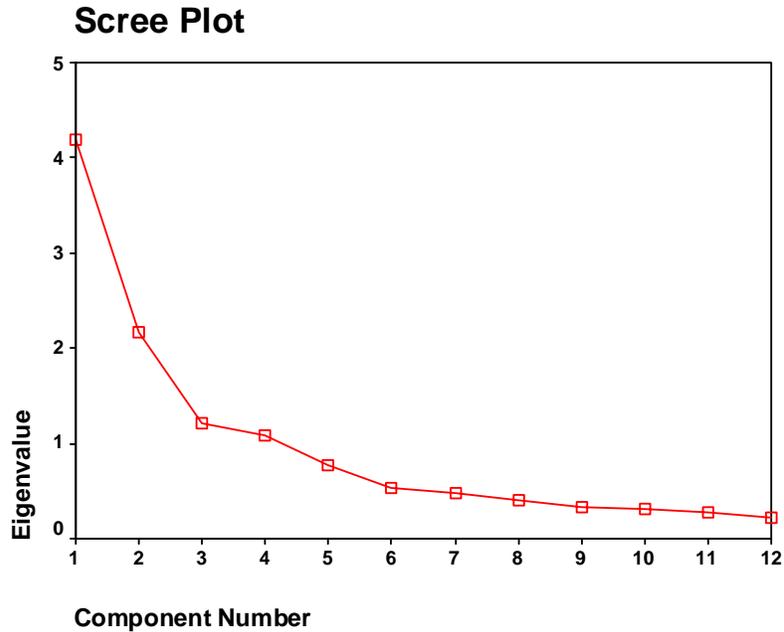
Scree Plot

Figure 4. Scree Plot of Recommended Factors

The Scree plot shown in Figure 4 also suggested four factors were appropriate for extraction. The four factors represented over 72% of the variability in the data. The factor loadings, after Varimax rotation, for the remaining 12 variables on the four factors are shown below in Table 9.

Table 9. Rotated Component Matrix

	Component			
	1	2	3	4
JF2	.839			
JF1	.817			
OE2	.787			
US2	.745			
SF2		.760		
FC1		.758		
SF1		.718		
FC2		.711		
A1			.926	
A2			.923	
S2				.890
S1				.885

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

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The first factor, which accounted for 34.9 percent of the observed variance, could be described as "Job Performance" based on scale characteristics. Factor 1 loaded heaviest for item JF1, "Use of CoPs can significantly increase the quality of output on my job." The next factor, which accounted for 18.1 percent of the observed variance, could be called the "Job Empowerment" factor. The highest loading for Factor 2 was on item SF2, "In general, my organization has supported my use of CoPs." Factor 3, accounting for 10.09 percent of the observed variance, measures the role of "Anonymity." Factor 3's highest loading was for A1, "I would participate more often in my CoP if I could remain anonymous." The fourth and final factor, "Security Constraints," accounted for 8.98 percent of the observed variance. The highest loading for Factor 4 was for item S2, "I would participate more in my CoP if the sharing of classified and higher information was allowed."

A split half analysis on the exploratory factor analysis data set resulted in the same four factors being produced, supporting the reliability of the initial reduction to four factors (Nunnally, 1978). All four factor scales were found to be reliable upon review of their Cronbach's Alpha numbers, shown in Table 10.

Table 10. Reduced Factors' Cronbach's Alphas

Factors	Cronbach's Alpha
1 - Job Performance	0.8562
2 - Job Empowerment	0.7729
3 - Anonymity	0.8647
4 - Security Constraints	0.7587

A further analysis of the factor analysis results by Student's t-tests was accomplished to determine if there were any statistically significant differences between

the CoPs with high and low participation rates. Factor 4, 'Security Constraints,' was the only factor to display significant differences between high and low use CoP groupings. Factor 1, "Job Performance," displayed borderline significant differences, and in a subsequent Student's t test on a reduced sample set using CoP groups one and six, Factor 1 in fact did display significant differences between CoP groups exhibiting high and low participation rates. A summary of all the factors' t test results is provided in Table 11.

Table 11. Summary of Reduced Factors Cronbach's Alphas

Factor	Lower Quartile Means	Upper Quartile Means	P value
Security Constraints	4.825	5.198	0.003 *
Job Performance	4.808	5.003	0.0551
Job Empowerment	4.637	4.791	0.1717
Anonymity	4.773	4.888	0.3838

 * P value < 0.01

Qualitative Question Analysis

The last survey item, question #43, asked respondents to provide any factors they felt affected their participation, either positively or negatively. Since this research attempts to focus on areas within Air Force Knowledge Now communities of practice (CoPs) needing improvement, only those factors perceived as negative were broken into categories. All positive responses were grouped together. Answers that were deemed to be ambiguous or that contained no positive or negative comments were deleted. Of the 915 survey respondents contributing to this research, 400 answered question #43 for a response rate of almost 44%. In answers that provided more than one factor to consider, each factor was accounted for, i.e. some of the 400 answers were counted more than once. In all, 440 comments were extracted, reviewed for any recurring themes, and then

categorized. Validity of the factors was obtained by having four Air Force Institute of Technology students familiar with CoPs review the answers. All four students' assessments were assigned numeric values for each answer based on the assigned category, and a Cronbach's Alpha analysis was performed on the entire set of assessments to determine reliability. The results produced an alpha of 0.88, which shows high internal reliability (Hair et al, 1998), i.e. the students agreed with each other to a significant degree as to the categories in which each answer belonged. When there was disagreement in the reviewers' categorization of a response, the category for each response that was selected most determined the final category. The 11 categories drawn from the analysis are:

Accessibility - this category pertained to issues concerning access of the CoPs, including numerous passwords complaints.

Familiarity - this category pertained to the lack of knowledge or awareness about CoPs. :

Leadership - this category pertained to any issues concerning the respondent's chain of command, to include lack of support or guidance in the CoPs.

Inactivity - this category pertained to the lack of participation from the other members of the respondent's CoP.

Information - this category pertained predominantly to outdated, inaccurate, insufficient, or useless information in the CoPs.

Job Fit - this category pertained to any issues concerning CoPs not being useful in the respondent's job.

Time - this category pertained to a lack of time to use the CoPs. This category was similar to Job Fit but was kept separate to highlight the number of responses it received.

Training - this category pertained to any perceived lack of CoP training the respondents had.

Usability - this category pertained to any issues concerning the respondent's perception of the CoP's ease of use.

Other - this category pertained to any category that did not fit in well with the others and was insignificant enough to stand alone. These comments were primarily made up of anonymity concerns and request for more or fewer reminders.

Positive - this category contained all respondents' comments that reflected positive opinions towards CoPs.

Some responses shared commonalities suggesting consolidation with more than one other category. The categories with similar interpretations were kept separate as much as possible to increase the overall definition of the analysis. Over 85% of the comments provided were negative. Of the categorized negative comments: *Familiarity* (18.6%), *Time* (13.4%), and *Accessibility* (10.5%) were the most frequent factors given as having a negative impact on the respondent's level of participation. Appendix D contains

examples of comments from each category. Table 12 provides a breakdown on all of the categories derived from the analysis.

Table 12. Percentage of Total Comments Received by Category

Comment Categories	% of total comments received
Familiarity	18.6%
Positive	14.1%
Time	13.4%
Accessibility	10.5%
Information	8.9%
Training	8.0%
Inactivity	7.3%
Job Fit	6.1%
Usability	6.1%
Leadership	5.0%
Other	2.0%

Ad Hoc Analysis

While demographics were not part of any of the proposed hypotheses or research questions, the possibility of differences in the way certain demographic categories answered the survey was too interesting to omit. None of the previous chapters provides any discussion on demographics as a factor, so this analysis was accomplished in the expressed hope of adding credence to potential future research efforts.

This ad hoc analysis looked at the size of the communities of practice (CoPs) involved in the survey and at the different rank and grade breakdown of the respondents. The upper and lower quartiles of membership numbers for the participating CoPs was used as the basis for determining what constituted a large and small CoP. Small CoPs were all those containing fewer than 40 members (N=246) and Large CoPs consisted of those with 155 members or greater (N=235). Comparisons of the small and large CoPs

did not take usage into account, instead the two levels of CoP size where compared for differences in the way they perceived the significant factors previously identified in the hypothesis testing and factor analysis (which did consider participation rates). The factors looked at were *Job Performance, Job Empowerment, Security Constraints, Anonymity, Willingness to Share, Trust, and Facilitator*. The results are summarized below in Table 13.

Table 13. CoP Size Mean Comparisons

Factor/Variable	Small CoP Means	Large CoP Means	P value
Facilitator	4.857	4.391	0.002**
Willingness to Share	5.587	5.38	0.015*
Job Empowerment	4.801	4.599	0.052
Trust	5.478	5.347	0.166
Security Constraints	5.020	4.855	0.190
Anonymity	4.900	4.760	0.275
Job Performance	4.946	4.967	0.833

* P value < 0.05 , ** P value < 0.01

Small CoPs had the greater mean value for all variables tested, except for Job Performance. The Small and Large CoP's mean scores in Job Performance were very close which would point to a similar value placed on that variable throughout both CoP sizes. *Facilitator* (p= 0.002) and *Willingness to Share* (p= 0.015) displayed significant differences, while *Job Empowerment* was borderline significant (p= 0.052). The trend among CoPs of different sizes indicates that the smaller the CoP, the higher the perception of the factors analyzed, and potentially---higher participation rates. A check of the average participation rates (page hits per member over the last three months minus any outliers) among Small and Large CoPs shows Small CoPs with an average usage rate of 232 hits per member compared to on 64 hits per member for Large CoPs.

The next ad hoc analysis was performed based on rank structure within all CoPs involved in the survey. As in the analysis done on CoP size, the factors looked at were *Job Performance, Job Empowerment, Security Constraints, Anonymity, Willingness to Share, Trust, and Facilitator*---participation rates were not taken into consideration. The objective was to identify any trends in the way different ranks and grades perceived the variables analyzed. Three levels of stratification were employed using the rank and grade breakdowns within CoPs: junior and senior level CoP members, military and non-military CoP members, and the individual category the CoP members belonged to (i.e. contractor, government service, enlisted, and officer).

The junior level CoP members (N=171) were made up of Technical Sergeants and below, Captains and below, and GS-10 grade government employees and below. The senior level CoP members (N=627) consisted of Master Sergeants and above, Majors and above, and GS-11 grade government employees and higher. Contractors were not considered for this analysis as they were not broken into junior or senior level categories.

Senior level CoP members had the greater mean value for all variables tested, except for *Facilitator*. The senior and junior level mean scores in *Facilitator* were very close which would point to a similar value placed on that variable throughout both rank and grade levels of CoP respondents. *Anonymity* was the only variable to display a significant difference (p= 0.011), and since this variable was reverse scored, it would seem to indicate a lesser inclination among senior level CoP members towards anonymous participation. Conversely, this would seem to indicate that the lower in rank

or grade a CoP member is, the more inclined they would be towards anonymous participation.

The next ad hoc demographic analysis compared military and non-military members. Military members consisted of enlisted and officer personnel (N=330), while non-military consisted of contractors and GS-level CoP members (N=574). The results are summarized below in Table 14.

Table 14. Military and Non-Military CoP Member Mean Comparisons

Variable	Military CoP Member Means	Non-Military CoP Member Means	P value
Security Constraints	4.748	5.011	0.006**
Job Empowerment	4.509	4.693	0.021*
Trust	5.298	5.408	0.126
Anonymity	4.773	4.906	0.159
Willingness to Share	5.390	5.478	0.180
Job Performance	4.852	4.912	0.418
Facilitator	4.570	4.617	0.612

* P value < 0.05, ** P value < 0.01

Non-Military CoP members displayed higher means in all of the variables tested. Significant differences were produced for *Job Empowerment* (p= 0.021) and *Security Constraints* (p= 0.006). These results showed a higher perceived value placed on all the variables by non-military CoP members. In the case of the reverse scored *Security Constraint* variable, this would indicate a higher value placed on security amongst military members.

The final ad hoc demographic analysis compared the different employment categories of CoP members. The categories tested were Contractors (N=106), GS-grade employees (N=468), enlisted personnel (N=173), and officers (N=157). Participation

rates were not considered. The results are summarized below in Table 15 and discussed

further in Chapter 5.

Table 15. Mean Comparisons by CoP Employment Category

Job Performance				Mean
Contractor	A			5.170
Enlisted	A	B		5.001
GS grade		B	C	4.854
Officer			C	4.688

Job Enhancement			Mean
Contractor	A		4.797
GS grade	A		4.670
Enlisted	A		4.636
Officer		B	4.369

Anonymity			Mean
Contractor	A		5.132
Officer	A		5.073
GS grade	A		4.855
Enlisted		B	4.500

Security Constraints			Mean
Contractor	A		5.038
GS grade	A		5.005
Officer	A	B	4.809
Enlisted		B	4.694

Trust			Mean
Contractor	A		5.585
Enlisted	A	B	5.373
GS grade		B	5.368
Officer		B	5.217

Facilitator			Mean
Enlisted	A		4.798
GS grade	A		4.639
Contractor	A	B	4.519
Officer		B	4.318

Willingness to Share			Mean
Contractor	A		5.632
Enlisted	A	B	5.448
GS grade	A	B	5.443
Officer		B	5.328

‐ Levels not connected by same letter are significantly different

Summary

The statistical and factor analyses on the community of practice (CoP) survey data

supported three of the hypotheses (H_1, H_8, and H_{10}), and reduced the survey items into

five distinct factors; *Job Empowerment, Job Performance, Willingness to Share, Security*

Constraints, and *Anonymity*. Descriptive analysis provided information on the survey

population such as rank, length of CoP membership, and from which groupings of CoPs

survey respondents belonged. A thematic analysis was performed on the qualitative

question to identify any trends or patterns in the open-ended question. Finally, an ad hoc

analysis was done on several different demographic characteristics of the survey CoPs

and respondents. Chapter 5 will discuss the research questions, provide a revised model

of participation factors, and provide conclusions and recommendations. The limitations

of this research and the possibilities for future research are also provided in Chapter 5.

V. Discussion, Conclusions, and Recommendations

Overview

The results of this study suggest the presence of five factors affecting participation within Air Force Knowledge Now (AFKN) communities of practice (CoPs). The factors found to have the greatest affect on participation through testing of the hypotheses and exploratory factor analysis on all the scale items were *Job Performance, Willingness to Share, Security Constraints, Trust,* and *Facilitator.* Based on the findings of the data analysis, a revised research model is proposed in Figure 5.
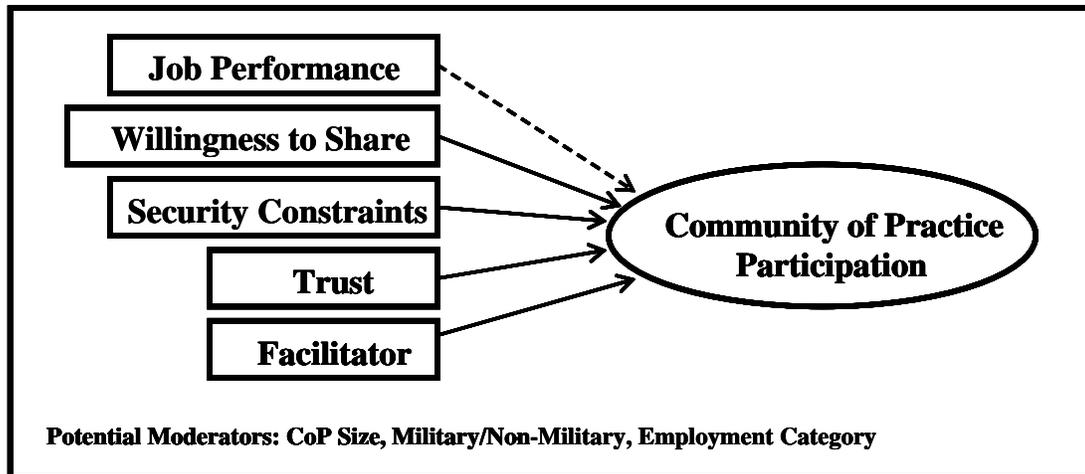
→ Indicates significant difference at p = 0.05 between high and low quartiles of CoP usage

------▸ Indicates significant difference at p = 0.05 between Group 1 and Group 6 of CoP usage

Figure 5. The Revised Model

Discussion

Security emerged in both the hypothesis testing and the factor analysis as a factor with significant differences in the perceptions of members from high and low

participation CoPs. All Air Force Knowledge Now (AFKN) communities of practice

(CoPs) are subject to the same Air Force security standards and practices. Each CoP

member is expected to follow proper security procedures when dealing with information

and having increased opportunity to disseminate information makes following security

procedures especially important. The AFKN CoPs with a lower level of perceived

security constraints were more likely to exhibit a greater level of participation. This

could be in part due to their members having less exposure to the higher classifications of

information, and therefore having less to be concerned about when considering

participating within CoPs.

Trust was another variable showing noticeable difference between the high and

low use CoPs. While the *Trust* mean scores for both the high and low participation CoPs

were among the highest in the survey, there was still a significant difference between the

two. This would seem to indicate that while for the most part, all CoP members have a

fairly positive perception of trust in regards to the information on the CoPs and towards

the other members within their respective CoPs, there is still significance in the

differences in way the high and low participation CoP members view trust.

The *Facilitator* factor represented the way AFKN CoP members perceived the

efforts of their facilitators and the influence that effort had on each respondent's

participation. The significance of the difference in *Facilitator* perception between the

high and low participation CoPs was the highest significance in the study (p=0.002).

These results provide support to the crucial role facilitators play in the success of the

CoPs to which they belong. Additionally, ad hoc analysis of small and large CoPs show

a significant difference in the way AFKN CoPs view the affect a facilitator has on the CoPs. The smaller CoPs had a higher mean score for their respondent's perception of facilitator efforts, suggesting that CoP members are more likely to be familiar with their CoP facilitator's role in supporting the CoP when the CoP is small.

Willingness to Share represented the way members of AFKN CoPs perceived sharing their knowledge with other members of their CoPs. Respondent's perceptions were in regards to how they perceived their value to their organizations if they shared their knowledge, and whether or not the respondents had any reservations about sharing their knowledge. These two questions focus on different aspects of sharing which explains the poor Cronbach's Alpha score for the *Willingness to Share* scale. Looked at individually, each item was significantly different when compared between the high and low use AFKN CoPs. This would suggest in the CoPs with a higher participation rate that CoP members are less likely to have reservations about sharing their knowledge and be more likely to perceive an increase in their value to their organizations when sharing knowledge.

Despite a lack of significant differences between high and low CoP perceptions, *Job Performance* was the last factor included in the revised model. *Job Performance* was included because it exhibited borderline significance in the tests that were performed. Another consideration for inclusion in the model was the significant difference that did appear when *Job Performance* was tested in a more defined separation of high and low participation CoPs, the twenty AFKN CoPs making up Group 1 and the twenty CoPs making up Group 2. The *Job Performance* factor was made up of scale items from *Job*

Fit, Outcome Expectations, and *Willingness to Share*. These items all pertained to how participation within CoPs improved the respondent's production at work or the way the respondent's value on the job was perceived. The perception of *Job Performance* would tend to support the idea that the more benefit a respondent feels they will obtain through the use of a knowledge management tool such as CoPs, the more inclined they will be to utilize that tool.

Research Question Discussion

The first research question posed in this study asked, "*Can we identify factors that affect participation between high and low use AFKN CoPs?*" This question was answered in the preceding Chapter 5 discussion and in the revised research model in Figure 11. *Job Performance, Security Constraints, Trust, Willingness to Share*, and *Facilitator* are all factors that appear to have an affect on participation in AFKN CoPs. The second research question asked, "*What differentiates the successful and unsuccessful AFKN hosted Communities of Practice?*" Based on the questions asked in the survey, question two does not have a clear answer. The survey questions are helpful in getting an idea of how CoP members perceive the different variables and factors investigated; however, the questions do not give much information about the individual AFKN CoPs whose members took part in this study. This study bases successful and unsuccessful CoPs strictly on the amount of participation a CoP exhibits. The analysis in this study indicates that the more successful CoPs display a greater positive perception on factors presented in the revised research model; security constraints are not as applicable to the information used in the respondent's job duties; and, the CoP is likely to be smaller in the number of members it has.

Limitations

The primarily limitation of this study in the estimation of the researcher is the fact that the survey respondents consisted of any Communities of Practice (CoP) member willing to take the time and effort to self-report their answers. When a survey is self reporting there is a chance for bias to be injected into the results. Another limitation is whether there were any differences between the CoP members who responded and those that did not. Were survey respondents providing a representative sample of the rest of their CoP, or were the respondents made up of the people who are more active? Another potential limitation of the survey is that the instrument was not validated. Since the survey was a combination of two separate research efforts, the number of questions used in each study was kept at a minimum to increase the response rates. Lastly, the make up of the work environment in which the surveys were distributed could also be a limitation in the results. All of the survey respondents were members of AFKN CoPs--- they each support the United States Department of Defense, the Air Force, and AF Knowledge Management. Therefore, the results may not be generalizable to CoPs outside of the military.

Recommendations for Future Study

To build on the results of this study, a study utilizing a broader range of questions and incorporating interviews could be considered to reduce reporting bias and increase the representative survey sample. This might help determine whether the responses in this study were actually representative of how members of high and low use CoPs feel, or whether the respondents self-reporting injected bias. Use of validated survey instruments

should be a goal of any future research in the areas addresses in this research. Lastly, the generalizability of this study could be improved by researching factors shown to have significant differences between high and low use AFKN CoPs in non-military CoPs.

The ad hoc analysis touched on several areas that could warrant further study. The role of organizational complexity, as evidenced by CoP size, appears to have a strong separation between degrees of participation in large and small CoPs. The breakdown of rank and grade shows differences that suggest a need for further study. The perceptions of the various employment categories (enlisted, officer, contractor, GS level) towards the variables affecting participation produced significant differences in many occasions. These differences could be further explored to determine the benefits that might be achieved in the implementation of future AFKN CoPs.

Conclusions

This study attempted to find relevant factors affecting participation within existing literature, and assess each factor's presence within Air Force Knowledge Now (AFKN) communities of practice (CoPs). Additionally, this research looked at factors of interest to AFKN personnel. This study confirmed that within the CoPs studied, factors affecting the participation rates among AFKN CoP members do exist. Hopefully, the results of this study will provide a useful glimpse into the way AFKN CoP members view different aspects of CoPs and the benefits those aspects provide, for use in refining the way AFKN CoPs are developed, maintained, and implemented.

Appendix A: Human Subjects Approval Letter

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

13 November 2003

MEMORANDUM FOR AFIT/ENV
                 ATTN: David Fitzgerald
FROM: AFRL/HEH

SUBJECT: Approval for the Use of Volunteers in Research

1. Human experimentation as described amendment to Protocol
04-09-E,"Factors Affecting Community of Practice Use Survey",
may begin.

2. In accordance with AFI 40-402, this protocol was reviewed
and approved by the Wright Site Institutional Review Board
(WSIRB) on 12 November 2003, the AFRL Chief of Aerospace
Medicine on 13 November 2003.

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 13 November 2003
                         HELEN JENNINGS
                         Human Use Administrator

Appendix B: The Survey

Factors Affecting Use of Communities of Practice

Survey Control Number: USAF SCN 03-112

PURPOSE:
Our research team is investigating the effects of various factors of use in communities of practice (CoPs) hosted at Air Force Knowledge Now. Our goal is to more fully understand factors that promote and discourage CoP usage. Results may be beneficial in the future development and management of CoPs.

PARTICIPATION:
Your participation is COMPLETELY VOLUNTARY however, your input is important for us to understand factors of use in Air Force CoPs.

CONFIDENTIALITY:
ALL ANSWERS ARE STRICTLY ANONYMOUS. We request demographic information in order to interpret results more accurately and to better understand the factors of CoP usage being researched.

By participating in this survey you acknowledge that you have read the above information and are willing to participate in the study.

Contact information:
If you have any questions or comments about the survey please contact Capt David Fitzgerald (david.fitzgerald@afit.edu) or 1Lt Peter Hinrichsen (peter.hinrichsen@afit.edu) .

Privacy Notice:
In accordance with AFI 37-132, paragraph 3.2, the information below is provided as required by the Privacy Act of 1974.

Authority: 10 U.S.C. 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFI 36-2601, USAF Survey Program.

Purpose: To evaluate factors affecting usage within Air Force communities of practice.

Routine Use: To increase understanding of factors affecting usage within Air Force communities of practice. No analyses of individual responses will be conducted. Reports summarizing factors in CoP usage may be published.

Disclosure: Participation is VOLUNTARY. No adverse action will be taken against any member who does not participate in this survey or who does not complete any part of this survey.

DEMOGRAPHIC QUESTIONS (3 Questions)

D1. To which community of practice do you belong? (List only the community with which you are most involved) [DROP DOWN]

D2. How many months have you been a member of your CoP? [DROP DOWN]
    Less than 1
    1-12
    13-24
    25-36
    more than 36

D3. What is your rank? [DROP DOWN]
    E-1 through E-4   GS-1 through GS-5
    E-5 and E-6   GS-6 through GS-10
    E-7 through E-9   GS-11 through GS-15
    O-1 through O-3   Contractor
    O-4 through O-6   Other
    O-7 through O-10

FACTORS AFFECTING USE OF COMMUNITIES OF PRACTICE SURVEY
(43 QUESTIONS)

1. Information obtained from my CoP is reliable enough to use in my job.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
□	□	□	□	□	□	□

2. Information is shared in my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
□	□	□	□	□	□	□

3. If I use my CoP I will increase my chances of obtaining a promotion.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
□	□	□	□	□	□	□

4. I trust my fellow CoP members.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
□	□	□	□	□	□	□

5. Training in the use of my CoP was available to me.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

6. My CoP recognizes or rewards its members for making contributions.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

7. I would participate more often in my CoP if I could remain anonymous.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

8. Members of my CoP explore new or unfamiliar areas of my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

9. My supervisor is very supportive of my use of CoPs in my job.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

10. There are different schools of thought regarding major issues in my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

11. The members of my CoP are competent enough in their job knowledge to provide accurate information to others within the CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

12. Members of my CoP work to accomplish common goals.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

13. A knowledge champion is responsible for invigorating a CoP, encouraging CoP members to participate and share knowledge, highlighting successes, recognizing the contributions of members, and so on: my CoP has a knowledge champion.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

14. My fellow CoP members try new tools or suggestions.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

15. If I use my CoP I will increase my effectiveness on the job.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

16. Members of my CoP believe that it is acceptable for people to make mistakes as long as everyone learns from the mistake and moves on.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

17. I have the knowledge necessary to use my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

18. My CoP ensures members know where to find resources.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

19. I would share my opinions and insights more often in my CoP if I could remain anonymous.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

20. Teamwork is valued in my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

21. The level of security my job deals with limits my ability to use CoPs in my work.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

22. My CoP encourages its members to use materials originating outside our CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

23. I would participate more in my CoP if the sharing of classified and higher information was allowed.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

24. Members of my CoP are technically competent enough to use our web-site.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

25. In general, my organization has supported my use of CoPs.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

26. My CoP should rely on "tried and tested" tools to get things done.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

27. Use of CoPs can significantly increase the quality of output on my job.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

28. My CoP should encourage its members to use resources posted on our web-site.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

29. Use of CoPs will affect the performance of my job.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

30. If material is not created by a member of my CoP, it should not be posted on our website.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

31. I have no reservations about sharing my job knowledge with other members of my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

32. It is important to be patient with people who make honest mistakes in my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

33. The efforts of my CoP's facilitator affect how much I participate within my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

34. Working in teams is not important in my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

35. Sharing my job knowledge with other members of my CoP will make me more valuable to my organization.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

36. Members of my CoP should be highly proficient in using our community web-site.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

37. It is not necessary that information be shared among members of my CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

38. Members who make contributions to my CoP should be given credit.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

39. It is not important for CoP members to agree on major issues.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

40. My fellow CoP members should be cautious about taking advice or using tools posted on our website.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

41. CoP members should explore new or unfamiliar areas of their CoP.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

42. Members of my CoP should make some concession to reach common goals.

Strongly Disagree	Disagree	Slightly Disagree	Don't know	Slightly Agree	Agree	Strongly Agree
☐	☐	☐	☐	☐	☐	☐

43. What factors, positive or negative, affect your participation in your CoP? Please use the block below to input your comments.
COMMENTS: (250 character maximum)

CONCLUSION

THANK YOU FOR TAKING TIME TO COMPLETE THE SURVEY.

IF YOU HAVE ADDITIONAL COMMENTS REGARDING EXPERIENCES OR OBSERVATIONS IN YOUR CoP OR IF YOU HAVE QUESTIONS REGARDING THIS STUDY, PLEASE USE THE SPACE BELOW. IF YOU WOULD LIKE A RESPONSE TO A COMMENT, ENTER YOUR CONTACT INFORMATION. PERSONAL INFORMATION YOU PROVIDE IS OPTIONAL AND WILL REMAIN CONFIDENTIAL.

COMMENTS: (250 character maximum) [RESPONDENT WRITE-IN]

Appendix C: Factor Analysis Correlation Matrix

Correlation Matrix(a)

Correlation		FC1	A1	SF1	FC2	A2	S1	S2	SF2	JF1	JF2	US2	OE2
	FC1	1.000	.025	.403	.497	.044	.046	-.004	.404	.338	.316	.227	.353
	A1	.025	1.000	.080	.180	.762	.243	.223	.146	.097	.042	.095	.107
	SF1	.403	.080	1.000	.399	.018	-.002	-.042	.671	.440	.410	.387	.451
	FC2	.497	.180	.399	1.000	.128	.092	.026	.459	.435	.352	.268	.426
	A2	.044	.762	.018	.128	1.000	.267	.227	.100	.076	.019	.087	.073
	S1	.046	.243	-.002	.092	.267	1.000	.611	.049	.020	-.018	.030	.019
	S2	-.004	.223	-.042	.026	.227	.611	1.000	.062	-.073	-.122	-.030	-.026
	SF2	.404	.146	.671	.459	.100	.049	.062	1.000	.441	.346	.380	.421
	JF1	.338	.097	.440	.435	.076	.020	-.073	.441	1.000	.702	.526	.688
	JF2	.316	.042	.410	.352	.019	-.018	-.122	.346	.702	1.000	.516	.649
	US2	.227	.095	.387	.268	.087	.030	-.030	.380	.526	.516	1.000	.517
	OE2	.353	.107	.451	.426	.073	.019	-.026	.421	.688	.649	.517	1.000

a Determinant = .006

Appendix D: Qualitative Question Comment Examples

Accessibility

- I work with NASA employees that don't have access to CoP - access should be extended to .gov addresses.
- I would get more benefit from it if I were able to access it from my home computer.
- Having to remember user IDs and passwords for each CoP.
- The use of passwords is frustrating and my biggest hindrance in using/accessing CoPs.

Familiarity

- Don't know---not sure what a CoP is!
- I've spent very little time in my CoP, but when there have found it difficult to figure out what's going on.
- I have never used the CoP.
- Lack of awareness of its' existence and advertisement of its' potential.

Leadership

- Actions of the team lead. The team lead directs activities which are worked using the CoP.
- It seems 80 percent of our community doesn't know the tool exists, because there is no leadership focus in our CoP.
- Management constraints normally affect my participation in my CoP.
- There has been very little guidance or information from MAJCOM supporting the use of CoPs, therefore nobody knows or cares about them.

Inactivity

- This group has a very low level of activity.
- Very few members of my organization use their CoP.
- Use of the site has been minimal - If no one knows the answers, there is not much to post.
- There are very few people contributing material to our site, with many members sitting around waiting for those few people to produce.

Information

- Good content maintenance and management is critical to my desire to participate.
- Not much there. What is there has been there a long time. What's new??
- Lack of new information and resources discourage me from checking the CoP frequently.
- It is, to me, another unregulated source of information that must be verified by a second source outside the CoP.

Job Fit

- My tasks currently do not warrant much use of the CoP.
- Sufficient time to devote to an area felt to be merely peripheral to my major responsibilities.
- My particular function does not require extensive use of CoPs.
- Have not seen the value or benefit of CoP.

Time

- I find little time to participate in the CoP enough to become proficient in its use.
- Really don't have the time to fully explore CoP and evaluate it against other information
- Time constraints, limited success with search results.
- There is so much going on, I don't have the time to search three CoPs for new news.

Training

- The "common users" need a formal training class. I have only received an overall briefing which lasted for approximately 30 minutes.
- TRAINING! What about it? At least tell me what's going on--don't leave it up to my computer to tell me.
- Training was more or less a "here is the web site play with it". There should be more training for this system.
- I haven't received any training on the website, I trained myself.

Usability

- The site is not user friendly. There are many steps you need to go through to do a simple posting.
- I frankly do not find that navigation in the CoP is either straightforward or easy.
- If it were a bit easier to load information into the CoP. Sometimes it is not user friendly.
- Most important: the ability to review and comment on documents. This is extremely cumbersome in all CoPs

Other

- There should be some "automatic" way of being notified when new information has been uploaded to the CoP, without me having to access the site over & over again to "look" for it.
- I have not received notifications of CoP activities or information. I was not aware that the CoP was active.
- As a user, I would probably use wisdom exchange more often if I could remain anonymous
- Some individuals don't want their name put on something in case there is a problem.

Positive

- I find the data most useful and the help I receive makes participation easy.
- Access to documents and links to other sites make my CoP valuable to me.
- CoP is an excellent tool that brings additional synergy to our community that would be difficult to capture in a stand-alone site.
- Extremely useful tool for distance collaboration.

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Vita

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14. ABSTRACT

As the AF continues to lose its knowledge base through retirements and downsizing, the need to get maximum use from the remaining knowledge base becomes increasingly important. In their efforts to help the Department of Defense and the Air Force Chief Information Officer (AFCIO) meet their knowledge management goals, Air Force Material Command (AFMC) has been working to implement the use of communities of practice. A primary goal of AFMC/DRW, the AF Knowledge Now program office, and the office of the AFCIO is to increase effectiveness and participation within communities of practice.

The goal of this research is to identify factors from the literature that may affect knowledge transfer, information sharing, and technology acceptance, and compare those factors with AFKN hosted communities of practice (CoPs) exhibiting high and low levels of participation. Additionally, factors of interest identified in interviews with AFKN personnel will be researched. This research used a cross-sectional research instrument to survey CoP members within all AFKN hosted CoPs containing 20 or more members. This research suggests there are differences in the way members within high and low use CoPs perceive these factors: trust, willingness to share information, job fit, outcome expectations, social factors, facilitating conditions, anonymity, security constraints, knowledge champion, facilitator. The results of these findings may allow AFKN to focus on these factors when the goal is to improve participation in future CoPs.

15. SUBJECT TERMS
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