KNOWLEDGE MANAGEMENT DETERMINANTS OF CONTINUANCE BEHAVIOR: EVALUATING THE AIR FORCE KNOWLEDGE NOW KNOWLEDGE MANAGEMENT SYSTEM

by

ERIC JAMAL TUCKER
B.S. USAF Academy, 1994
M.S. Oklahoma State University, 2002
M.A. Naval War College, 2006

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Major Professor: Tim Kotnour

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ABSTRACT

Knowledge management (KM) encompasses the set of capabilities, processes, tools, and techniques for the most effective use of knowledge by an organization. The goal of KM is to improve the organization's ability to create, transfer, retain, and apply knowledge.

Knowledge management is a goal that many organizations seek to achieve. Organizations apply their strategies, plans, and implementation to achieve KM. Organizations use technology to implement their KM strategy. For some, this approach has worked well; however, for others, the results have fallen short. KM shortcomings revolve around employees' infrequent use of the technology. This research seeks to understand what influences a user's behavior to use a KM system and why a user becomes a routine user.

This research provides a model of KM continuance behavior and post-acceptance usage behavior. Post-acceptance usage behavior is how an individual decides to use a system after its initial acceptance. The KM continuance model incorporates technology, community, individual, and organizational elements that influence a user's intentions and actual use of a KM system.

The specific context of this research is a KM system known as the Air Force Knowledge Now (AFKN) system. AFKN emphasizes KM through expertise-sharing activities in Communities of Practice (CoPs). The AFKN KM system facilitates and enhances the relationships in the community.

The data for this study were obtained by using an online questionnaire. The results are analyzed using Partial Least Squares structural equation modeling with a two-step data analysis approach. The first step assessed the properties of the measurement model. The second step

assessed the path model. Path coefficients and t-values are generated to evaluate the 14 proposed hypotheses.

The results of the investigation show that community and technology KM both positively influence a user's evaluation of the KM environment. The results produced a coefficient of determination of 60% for KM continued-use intention and 31% for KM continued-use behavior.

The outcome of this research is a model that allows organizations to tailor their KM systems efforts to the organizational environment in order to maximize their resources.

This investigation serves as a foundation for further research and development in areas of KM, KM systems, and post-acceptance usage.

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LIST OF ABBREVIATIONS

AA	Anecdotal Analysis
AFKN	Air Force Knowledge Now
CB	Continued Use Behavior
CI	Continued Use Intention
CoP, CoPs	Community of practice, Communities of practice
COS	Coefficient
EDT	Expectation Disconfirmation Therory
ES	Effect Size
FC	Facilitating Conditions
FF	Face-to-Face
IDT	Innovation Diffusion Theory
IS	Information Systems
IT	Information Technology
KBV	Knowledge-Based View
KM	Knowledge Management
NT	Network Ties Disconfirmation
PBC	Perceived Behavioral Control
PEU	Perceived Ease of Use
PM	Program Management
PU	Perceived Usefulness
PUU	Post-Usage Usefulness
RBV	Resource-Based View

SA	Statistical Analysis
SCT	Social Capital Theory
SE	Self-Efficacy
SEM	Structural Equation Modeling
SL	Share Language Disconfirmation
SPRT	Supported
SQC	System Quality Disconfirmation
ST	Satisfaction
T	Trust Disconfirmation
TAM	Technology Acceptance Model
TBP	Theory of Planned Behavior
TRA	Theory of Reasoned Action
USAF	United States Air Force

CHAPTER 1: INTRODUCTION

1.1 Introduction and Environment

Organizations are made up of numerous people who work individually and collectively to perform the mission of the organization. The members of the organization are placed in different positions to best transform inputs into outputs (Garvin, 1998). Organizations operate in ways that capitalize on previous successes and minimize failures (Lesser & Storck, 2001). A method used to accomplish this task is Knowledge Management (KM). KM is an array of approaches that allow organizations to harness the knowledge of their individual workers to capitalize on success and avoid failures. KM methods calculate the worth of knowledge, evaluate the best ways to create knowledge, and employ different ways to manage knowledge in an organizational context (Davenport, De Long, & Beers, 1998).

This research examines KM in the organizational context and examines how organizational conditions influence the performance of its members. The performance is appraised by evaluating an organizational member's intentions to use a KM system and measuring the actual usage of a KM system in a community of practice (CoP). A CoP is a KM strategy that emphasizes individual-to-individual and individual-to-group collaboration centered on an interest or practice (Lesser & Storck, 2001; Wenger, McDermott, & Snyder, 2002). The KM system examined contains personalized and codified capabilities. The personalized elements of the KM system enhance and facilitate the interaction within and between communities of practice (CoPs). The codified elements of the KM system use database technologies to allow the storage and retrieval of codified information.

KM systems can take on many forms. For this research, the United States Air Force (USAF) KM system is examined. The system is the Air Force Knowledge Now (AFKN) System. The USAF has more than 600,000 individuals working for multiple organizations around the globe. AFKN consists of 300,000 users structured in knowledge communities called CoPs. The users of AFKN may join multiple CoPs or solely peruse the knowledge database (codified elements). Users have the capability to schedule web-based meetings, form discussion groups, e-mail CoP members, and locate experts (personalized elements). Individual usage of AFKN access is tracked through performance metrics. CoP knowledge owners use this information to tailor the nature of the CoP to suit the needs of the users.

1.2 Problem Statement

Organizations recognize that leveraging and deliberately managing their knowledge is a critical asset (Alavi & Leidner, 2001; Begoña Lloria, 2008; Nonaka, 1994; Spender, 1996b). Organizations that manage their knowledge effectively can achieve a competitive advantage (Davenport & Prusak, 1998; Drucker, 1992; Lesser & Storck, 2001). To be successful, individuals must be willing to contribute their knowledge.

In recent years, scholars have assessed the contribution of KM by using different methods (Lesser & Storck, 2001; Maltz, Shenhar, & Reilly, 2003; Tseng, 2008). Assessment of knowledge activities is viewed at all organizational levels and from multiple perspectives (Huber, 1991). Because KM has become such a critical factor in guiding an organization's future performance, it is critical to leverage its knowledge resources.

Past KM research focused on describing the critical components of KM and the KM system (Alavi & Leidner, 2001; Hansen, Nohria, & Tierney, 1999). Scholars note that

organizations need the ability to evaluate whether invested resources are being used effectively and whether they lead to improved performance that results in an advantage over competitors (Krogh, Nonaka, & Aben, 2001; O'Dell & Grayson, 1998). Kalling (2003) proposed that organizational KM efforts may not link to performance. Kalling supposed that knowledge in an organization is not used again uniformly. Recent efforts highlight the importance of understanding how individual participation leads to repeated KM contributions. Addressing the nature of KM implementation in organizations, concentrating on the integration of information systems, is an area with great opportunity for study.

The successful implementation of KM is a multifaceted endeavor. Methods are employed to leverage the knowledge capabilities of the organization. Organizations choose to use information systems (IS) to leverage their knowledge capabilities (Alavi & Leidner, 2001). Using IS to accomplish KM involves technologies that can store, retrieve, and transfer information. Additionally, IS enable users to communicate with others inside and outside the organization (Gold, Malhotra, & Segars, 2001). The extent of communication varies depending on the design of the IS (Alavi & Leidner, 2001). Even though IS have been used extensively to support KM, failure rates may be as high as 70% (Malhotra, 2005).

The IS usage stream of research is well established and extensively focuses on conditions that influence an individual's initial decision to adopt and use IS (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003). Another less-developed stream of research focuses on how the user decides to use the system after initial adoption. Determining what influences a user's decision to continue to use a technology after initial use is key (Bhattacherjee, 2001). Users who incorporate the use of a KM system into their work routine will enhance individual and

organizational performance. Organizations that understand what factors influences their individual workers can design and modify KM systems to maximize KM activities and improve performance. This research document focuses on the individual's post-adoptive intentions and the use of a KM system that facilitates and enhances participation in CoPs.

1.3 Relevance of the Research

The relevance of this research is determined by taking into account the significance of KM for both management as well as academic theory. The landscape of KM is multidisciplined and spans both fields of study.

KM crosses multiple disciplines from psychology to sociology to engineering (Argote, McEvily, & Reagans, 2003). Argote et al. developed a framework that integrates the KM landscape. The model incorporates the key processes of KM on the Y axis and describes key KM context elements on the X axis. This KM research framework model is shown as Figure 1.

	Properties of Units	Properties of the Relationships between Units	Properties of Knowledge
Knowledge Use (Application) Knowledge Transfer (Transfer) Knowledge Codification (Retention) Knowledge Generation (Creation) Knowledge Assurance (Security)	Focus of this category is on the characteristics of the unit Examples: • Experience • Status	Focus of this category is on dyadic relations and pattern of connections Examples: • Communication Type • Connection Intensity • Contact Frequency • Network of Connections	Focus of this category is on the characteristics of knowledge Examples: • Tacit Knowledge • Explicit Knowledge • Personalized • Codified

Figure 1: KM Research Framework adapted from Argote et al. (2003)

The KM processes are labeled differently by different authors; however, they address the processes of knowledge creation, retention, and transfer. Other authors have added elements to address knowledge application and knowledge security (Stankosky, 2005).

Although the literature on KM is expansive in different areas, authors address KM from at least one of three perspectives presented by Argote et al. (2003). The first perspective is the property of the unit. The second is the property of the relationship between the units. The third is the properties of the knowledge. For this research, the Y axis of the original framework is adapted to incorporate elements from Stankosky's framework of KM (2005). The goal of the framework of Argote et al. is to provide a way to connect previous KM research to future research. By linking previous research to future research, the domain is more substantive. This research evaluates the relationship between the individual and the CoP.

Management benefits from having an approach that determines the effectiveness of its KM system based on individual employees and strategic objectives. Management is able to evaluate the use of the KM system and align the KM system to the needs of the employees and the organization. With this type of information, management can better determine the use of limited resources (Goldratt & Cox, 1986). Organizations will tailor individual decisions regarding their individual employees and manage the critical knowledge assets.

The study of the post-acceptance use of KM systems extends academic theory in the area of KM. Many factors have indentified how organizations can benefit from KM, but the evaluation of how individuals use the KM system to perform KM and what turns them into continuous contributors is lacking. Research is needed to explain how the KM user and system characteristics affect the individual user's post-acceptance usage.

Researching the high level of failure rates of KM endeavors and providing a way to evaluate the participation rate of individuals will bridge the gap in the literature (Lin & Tseng, 2005; Small & Sage, 2006; Tseng, 2008). This research addresses why individuals discontinue KM system use after initial acceptance and addresses the limited number of KM empirical studies (Alavi & Leidner, 2001).

This research provides an approach that supports the structures and resources of KM. It extends the literature on CoPs in technology-facilitated environments. Finally, this research addresses academia and the needs of practicing managers and adds to the limited literature on post-acceptance of KM (Brown & Duguid, 2000).

1.4 Research Questions

This research aims to answer the following question: How do KM elements influence a user's intention to continue participation in a CoP that is facilitated and enhanced by technology? Emerging sub-questions:

- How do community and technology elements influence user evaluations of the CoP?
- How do community and technology elements influence each other?
- How do user evaluations influence the user intentions to participate in the CoP?
- How does the user's KM continued-use intentions influence the user's actual KM continued-use behavior?
- How do individual and organizational elements influence KM continued-use intention and KM continued-use behavior?

1.5 Conceptual Model

The conceptual model shows the critical elements that need to be incorporated. The model depicts different elements that influence an individual worker's intention and actual behavior to continue using a KM system. The conceptual model for KM continuance is shown in Figure 2.

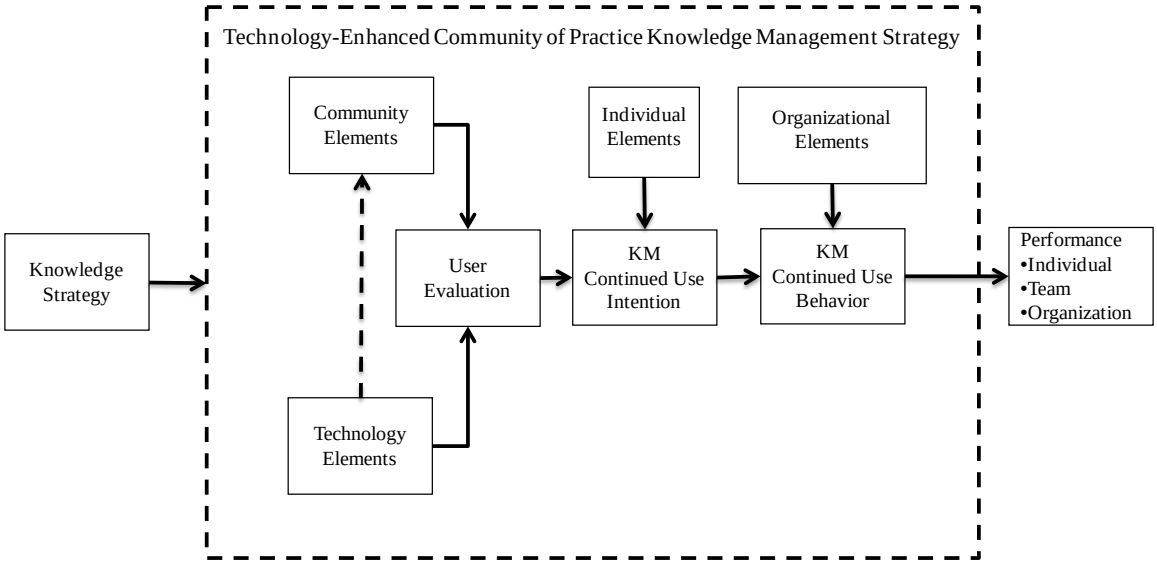


Figure 2: Conceptual Model of KM Continuance

The KM elements inside the dashed figure are the primary focus. The elements outside of the dashed figure are beyond the scope of this examination. The external elements include an organization's knowledge strategy and the impact of KM continuance on individual, team, and organizational performance. These factors are crucial in determining how an organization will direct its KM efforts. The conceptual model depicts an organizational KM strategy that consists of community elements and technology elements (Zack, 2002). The community and technology elements are the major building blocks of a CoP that are facilitated by technology. Additionally,

this examination seeks to define and understand the relationship among the elements. The KM elements include

- Community
- Technology
- User evaluation
- KM continued use intention
- KM continued use behavior
- Individual and organizational

The community element consists of three constructs: trust, network ties, and shared language. These constructs are identified as critical factors influencing the social aspect of KM in several studies (Ardichvili, 2008; Davenport & Prusak, 1998; Gold et al., 2001). Technology is a construct that is used in several studies and is a frequent approach used to facilitate and enhance KM (Malhotra, 2005). The technology KM element measures the quality of the technology used to support KM and is measured by a construct known as system quality.

The community and technology KM elements are measured by comparing individuals' current perception to their initial expectation, an approach known as disconfirmation (Oliver, 1980). The user's comparison results in positive or negative disconfirmation. Positive disconfirmation occurs when the comparison exceeds expectation, while negative disconfirmation occurs when the comparison falls short of expectation. The results of the various levels of disconfirmation influence the user's evaluation.

The user evaluation element consists of the constructs post-usage usefulness and satisfaction. Conceptually, post-usage usefulness and satisfaction are elements adapted from the

Information System and Expanded Information System Continuance Model (Bhattacherjee, 2001; 2008). Satisfaction is an element of the Expectation Disconfirmation Theory (EDT), which is used to model consumer repurchase behavior (Oliver, 1980). Post-usage usefulness is adapted from perceived usefulness, often used in IS acceptance research (Davis, 1989; Venkatesh et al., 2003).The terms post-usage, post-acceptance, and post-adoptive are used interchangeably throughout this research. Perceived usefulness is tested effectively in IS acceptance and post-acceptance research. Post-usage is emphasized to denote a long-term evaluation of previous participation experience (Bhattacherjee et al., 2008). The user's evaluation of the community and technology elements leads to the formulation of a KM continued-use intention (CI).

CI is related to a consumer's repurchase intention developed in the EDT model (Oliver, 1980). CI is a mental state that is formed and influenced by initial use. The initial-use experience can subsequently cause the user to change an initial decision. The next element of the conceptual model influenced by user intention is actual use or continued-use behavior (CB). EDT results in a user's intention to repurchase. Bhattacherjee's (2001) IS continuance model results in an evaluation of a user's intention to continue to use an information system. Bhattacherjee (2008) proposes that acceptance research must be extended to evaluate actual use. This research integrates and examines the relationship between KM CI and KM CB.

Individual and organizational KM elements consist of information technology (IT) self-efficacy and facilitating conditions, respectively. The individual KM element is represented by the construct IT self-efficacy, which is an individual element that determines an individual's confidence in performing a technical activity (Venkatesh et al., 2003). The organizational KM element is represented by the construct facilitating conditions (FC). The FC construct depicts

external conditions that have greater influence on actual behavior over intentional behavior. Organizations influence external conditions that are outside the control of the individual. Overall, the KM continuance model consists of many interlinking elements.

The following vignette provides insight into a complex situation. The vignette illustrates how AFKN is used within the conceptual model in Figure 2.

John is a user of AFKN and a member of the program management (PM) CoP. He joined the CoP last week by requesting access from the PM CoP facilitator. The PM CoP is interested in capturing and disseminating PM best practices. Because John is a new member, he needs to acclimate to the PM CoP and understand how the community functions. Initially, John has low expectations of this community and the supporting technology; however, he is positively disconfirmed, after his initial experience of the community and the technology. The outcome is better than expected. As a result, John makes a positive user evaluation based on his satisfaction and post-usage usefulness. He finds the knowledge useful to his work. Mentally, John intends to continue his participation in the PM CoP. When John follows through with his intention, he returns to the CoP. John is adept at using most IS; as such, he has high IT self-efficacy. In this case, John's intentions to participate in the CoP may have less variance than someone with low IT self-efficacy.

Additionally, John's organization has excellent information system resources, and all unit members receive training on the use of AFKN regularly. John's supervisor is excellent and supports the use of AFKN CoPs in the workplace. John's supervisor and his organization provide time every day to participate in the CoP. John's organization also rewards its members for

contributions made to CoPs. With the organizational support that John receives, it is an easy decision for John to participate in the PM CoP on a regular basis.

The present research investigates whether this vignette exposes a realistic situation and outcome.

1.6 Research Products

The products of this research includes

1. A conceptual model based on previous research about KM and continued usage that incorporates community and technology elements
2. A KM strategy-to-tool taxonomy
3. A research model
4. A questionnaire
5. An evaluation of the critical factors that emerge from the data
6. A refined model based on critical factors
7. A document that explores the various elements of KM continuance

1.7 High-Level Methodology

Research should address substantive issues (Punch, 2003). Research begins by addressing "what needs to be found" before addressing "how it should be accomplished." With this mindset, this research takes a top-down approach that moves from a general research question to evaluation of results (Creswell, 2003).

The methodology proceeds as follows:

1. Define the research problem and translate the problem into questions that are relevant to industry, the profession, and academia.

2. Understand the literature and determine what literature is needed to answer the research questions.
3. Generate ideas and develop conceptual models to address the research questions.
4. Develop and define the scope of the research to establish achievable research goals that address the needs of academia and practitioners.
5. Operationalize the research by defining the details of the research methodology. Determine the measures and measurement tools to achieve content and face validity.
6. Design the data-collection instrument by evaluating previous research. Extend and improve previous research, while increasing content validity and face validity.
7. Implement the data-collection plan on a selected sample developed during step 5.
8. Analyze the data using descriptive and inferential statistics.
9. Interpret and discuss the results of the analysis and generate research findings.
10. Produce the final report that states how the research results address the research question. Recommend areas for future research.

The methodology is very similar to the social science research process proposed by Miller and Salkind (2002). A high level map of the research is shown in Figure 3.

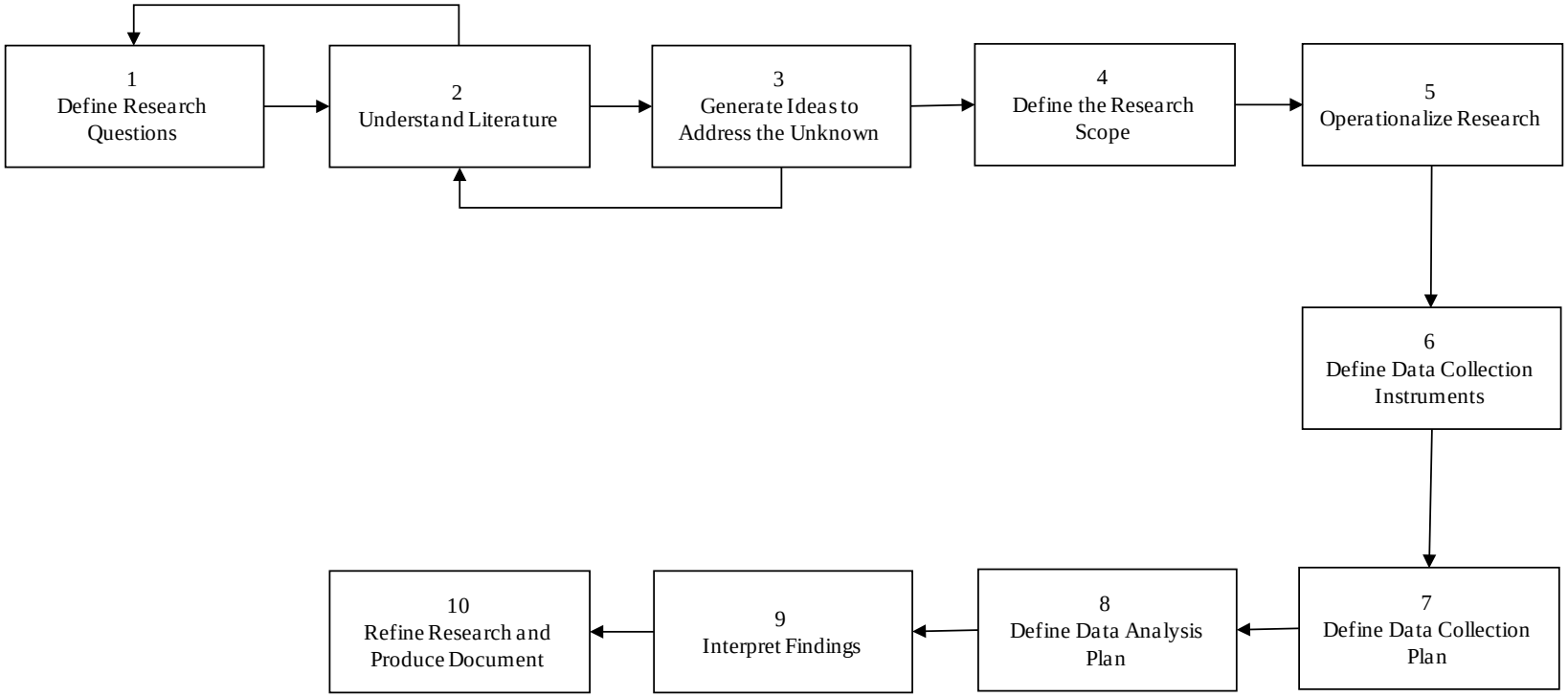


Figure 3: High-level Methodology

1.8 Limitations of the Research

KM is implemented in a variety ways. Each organization's implementation of a KM program is unique. The acceptance and use of KM tools and practices varies depending on the people involved. Evaluating the individual knowledge users' reactions to their AFKN CoP will determine the key influences that impact users' KM continuance intentions and KM continuance usage. The findings may not be generalizable to other organizations.

This research defines KM continuance based on the existing literature. Since continuance is a concept that originated in the marketing literature and has been adopted by the IS literature, it is necessary to stay focused and use constructs parsimoniously.

1.9 Definition of Important Terms

This purpose of this section is to define important terms, establish boundaries, and clarify the research area.

Community of Practice (CoP): A community of practice is a group of individuals or experts that have a common interest in a specific subject. The community may be formal or informal and is bound by shared expertise (Wenger et al., 2002). The premise of the group is to work together to further members' knowledge of the subject.

Disconfirmation: Disconfirmation is the individual's comparison of a current state with a previous expectation or experience. Disconfirmation may take one of three outcomes. First, the comparison may be positive, meaning the result exceeded expectation. Second, the comparison may be neutral or as expected. Third, the comparison may be negative, falling below expectations (Oliver, 1980).

Information Systems (IS): IS are technology-based platforms that enable the individual and organization to collect, store, process, and transfer data/information (Dutta, 1997). The platforms operate using a combination of computer hardware and software. IS may be used individually or in the organizational context.

Information Systems (IS) Continuance: IS continuance is "the users' decision to continue using an IS over the long run" (Bhattacherjee, 2001). IS continuance often differs from IS acceptance in the literature. Acceptance is based on an initial state, whereas continuance is a post-adoptive condition.

Knowledge: Knowledge is defined differently in the literature. Knowledge is often differentiated from information and data. Knowledge is seen as personalized and context specific (Alavi & Leidner, 2001). Knowledge is the justified belief that increases an entity's capacity for effective action (Huber, 1991; Nonaka, 1994).

Knowledge Management (KM): KM comprises a range of practices used in an organization that identify, create, capture, share, access, and apply the insights and experiences of individuals. The insights and experiences may be embedded in organizational processes or practices (Alavi & Leidner, 2001; Stankosky, 2005). This research focuses on the individual viewpoint of the KM practice in an organizational context (Alavi & Leidner, 2001). The objective is driven by the individual or organization.

KM System: A KM system is a type of information system applied to organizational KM (Alavi & Leidner, 2001). The system design supports the individual's and organization's needs by creating, storing, retrieving, transferring, and applying knowledge.

Post-Usage Usefulness: Post-usage usefulness "reflects a long-term, transaction-invariant belief aggregated from prior usefulness perceptions" (Bhattacherjee et al., 2008).

Satisfaction: Satisfaction is a short-term, transaction-specific affect. Satisfaction is related to an experience that has recently occurred (Bhattacherjee et al., 2008).

Trust: According to Mayer (1995) trust is a multifaceted and complex concept. Trust is a "willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor irrespective of the ability to monitor or control that other party" (Mayer et al., 1995).

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Organizations work to manage knowledge effectively. The ultimate goal is to improve firm performance. Organizations realize that knowledge is a critical factor in establishing and maintaining a competitive advantage (Drucker, 1993). KM is a discipline that addresses organizational challenges and improves organizational performance.

Organizations recognize the effect that successful KM can have on the organization's performance. Through KM, individuals and organizations can create, transfer, store, and apply best practices (Alavi & Leidner, 2001). Since KM approaches are becoming established in organizations, it is essential to develop measures and methods to influence performance and fill the gaps in the current KM literature. The gaps identified in the current KM literature are shown below:

1. Organizations have experienced a high level of KM failure rates. Organizations have failed to address the KM elements that influence individuals to continue KM participation (Kerno, 2008; Tseng, 2008).
2. Organizations have had a difficult time assessing the usefulness of KM on the individual, group, and organizational levels. Research is needed to develop methods to evaluate how individuals participate in KM (Lin & Tseng, 2005; Small & Sage, 2006; Tseng, 2008).
3. The number of KM empirical studies is limited (Alavi & Leidner, 2001; McKeen, Zack, & Singh, 2006).

The KM and Systems Acceptance literature provides the background knowledge on the identified gaps. The KM and Systems Acceptance literature constructs are addressed by three concepts: KM, KM Elements, and Systems Acceptance. The KM literature provides a foundational overview on relevant KM constructs. A working definition of knowledge is defined based on the existing literature. Additionally, the construct of knowledge strategy is defined. The construct tests the link between knowledge strategy and KM strategy by explaining how knowledge strategy drives organizational KM strategy. The CoP strategy is the main KM strategy examined.

The KM Elements provide the main ways that influence individuals to practice KM in an organizational context. The KM Elements link the KM constructs to the Systems Acceptance constructs.

The Systems Acceptance constructs address an individual's initial use of technology and continued use of that technology. The relevant research areas of KM, KM Elements, and Systems Acceptance are investigated and shown in Figure 4.

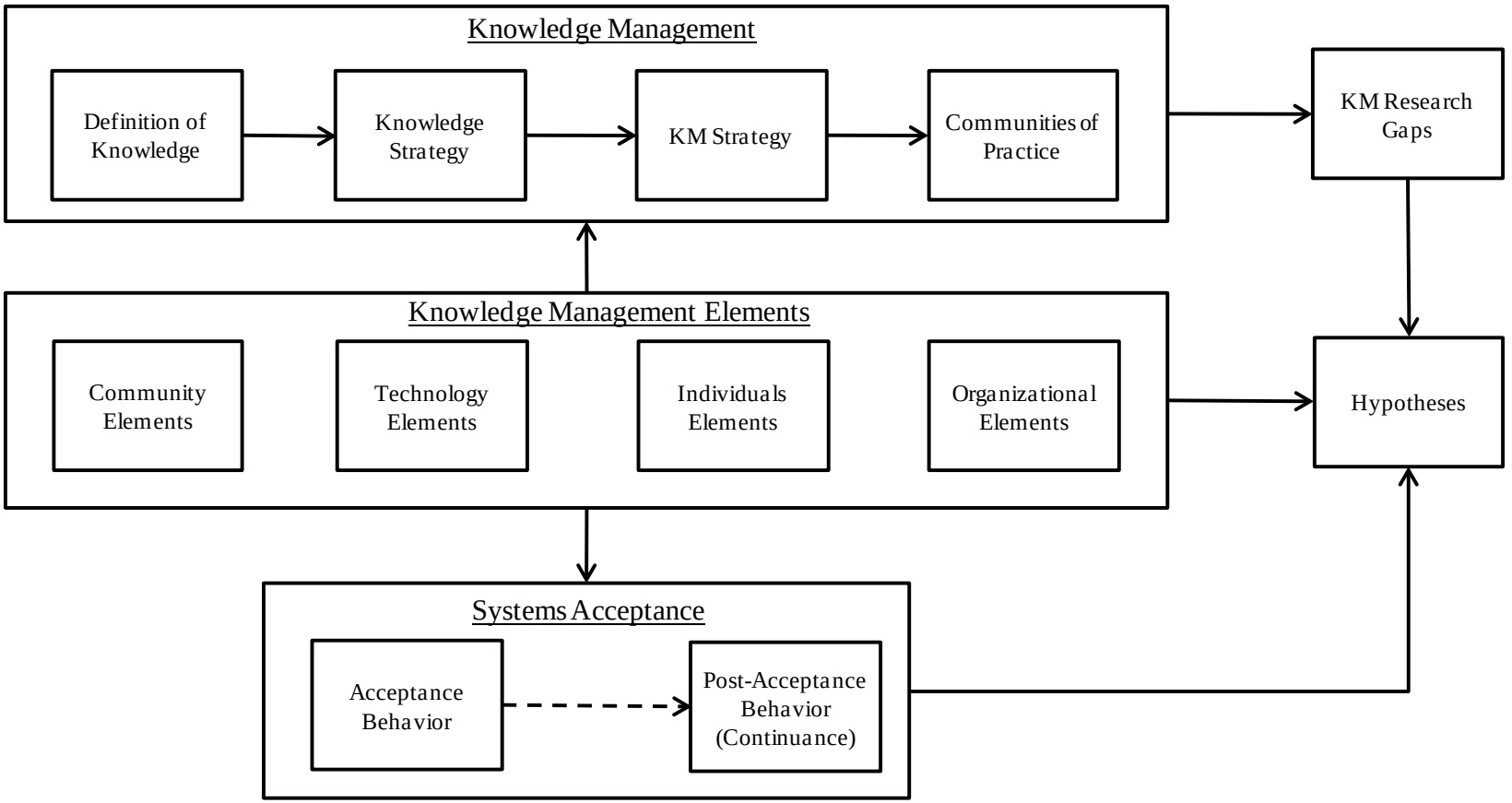


Figure 4: Relevant Research Areas

2.2 Definition of Knowledge

What is knowledge? Past research defines knowledge in different ways. To answer this question it is necessary to understand the concept of data and information. Often organizations confuse data, information, and knowledge, resulting in unnecessary resource investments (Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995; Zack, 1999). Data represents facts and observations that lack specific meaning to the recipient (Zack, 1999). Information is defined as data that is processed (Alavi & Leidner, 2001). Knowledge is defined as processed data in a meaningful context (Zack, 1999). The data and information approach is discussed in the literature but may minimize the multifaceted nature of knowledge (Alavi & Leidner, 2001; Prusak & Cohen, 2001).

Another way of forming the distinction is that "information is data that has been given structure" (Glazer, 1998). The definitions of the term knowledge are extensive; consequently, many researchers are developing working definitions of the term. Knowledge is also defined as a state of mind, an object, a process, a capability, or access to information (Alavi & Leidner, 2001; Carlsson, El Sawy, Eriksson, & Raven, 1996; McQueen, 1998; Schubert, Lincke, & Schmid, 1998; Zack, 1999). For this research, knowledge is defined as a justified belief that increases an entity's capacity for effective action (Huber, 1991; Nonaka, 1994). Table 1 records other definitions of the term knowledge.

Table 1: Definition of Knowledge from Literature

Author (s)	Knowledge definition	Elements
Nonaka and Takeuchi (1995)	Justified true beliefs	Beliefs and commitment Mean contextual Action oriented
Grant (1996)	That which is known	Capacity to be spread Transferability Approprability Specialization
Sveiby (1997)	A capacity to act	Action oriented Constantly changing
Davenport and Prusak (1998)	A fluid mix of framed experience	Fluid and mixture Structured and unstructured
Schubert et al. (1998)	The state of knowing and understanding	Gained through experience or study State of mind
McQueen (1998) ; Carlsson (1996); Zack (1999)	An object to be stored and manipulated	Building and managing knowledge stocks Viewed as an object
Zack (1999)	A process of applying expertise	Ability to simultaneously know and act Viewed as a process
McQueen (1998)	A condition of access to information.	Organized to facilitate access and retrieval of content
Carlsson (1996)	The potential to influence future action	Experience influences future decision making Viewed as a capability

Knowledge exists in many forms in an organization. Just as there are many definitions of knowledge, there are many types of knowledge. Each type of knowledge is developed and shared in different ways throughout the organization.

Two types of knowledge are consistently noted in the literature: tacit knowledge and explicit knowledge. Tacit knowledge is rooted in experience and involvement and has a specific context (Nonaka & Takeuchi, 1995). Tacit knowledge can be subdivided into cognitive tacit knowledge and technical tacit knowledge. Cognitive tacit refers to the mental routines or cause-

effect relationships in the individual's brain. Technical tacit is the know-how related to a specific type of task. Explicit knowledge is the other major type of knowledge. Explicit knowledge is generalized and articulated. Explicit knowledge can be stored and reused readily. Organizations and researchers agree that tacit knowledge is more valuable than explicit knowledge (Lesser & Storck, 2001; Nonaka, 1994). However, many organizations have invested greatly in technology to support explicit knowledge. Making tacit knowledge more accessible is a major quandary for organizations. It is worth noting that the majority of the knowledge debate focuses on the tacit and explicit dichotomy; however, there are other definitions of tacit knowledge.

Beyond tacit and explicit knowledge, there are other forms of knowledge such as individual, social, declarative, procedural, causal, conditional, relational, and practical (Alavi & Leidner, 2001). An organization's best practices and essential frameworks reside in practical knowledge (Alavi & Leidner, 2001; KPMG, 1999). The tacit/explicit dichotomy is the core focus. The various types of knowledge and examples are shown in Table 2.

Table 2: Knowledge Types and Examples Adapted from Alavi and Leidner (2001)

Author(s)	Knowledge types	Definitions	Examples
Polanyi (1967)	Tacit	Knowledge is based on context specific experience, actions, and involvement	Insight into the best ways to deal with a customer
Nonaka (1994)	Cognitive tacit	Models in the mind of the individual	Individual's understanding of causal relationships
Nonaka (1994)	Technical tacit	Know-how applied to specific work	Pilot Skills
Polanyi (1967); Nonaka (1994)	Explicit	Knowledge that is articulated and generalized	Knowledge of major customers in a region
Nonaka (1994)	Individual	Created by and understood by the individual	Insights gained from completed activities
Nonaka (1994); Spender (1996a)	Social	Created and understood by a group	Understanding how the group works together
Zack (1999)	Declarative	Know-what—facts and information	Proper speed to lower landing gear
	Procedural	Know-how—understand basic actions	Steps needed to configure aircraft for landing
	Causal	Know-why—understand the importance of the basic actions	Understand why it is important to maintain proper speed to lower landing gear
	Conditional	Know-when—understand the timing of actions	Understand when it is necessary to configure aircraft for landing
	Relational	Know-with—understand how one actions interacts with another	Understand that is necessary to lower the flaps and decrease throttle in order to obtain proper speed to lower landing gear
KPMG (1999)	Practical	Useful knowledge, best ways to operate	Best practices, lessons learned, useful techniques to improve performance

2.3 Knowledge Strategy

An organization must develop a knowledge strategy before developing a KM strategy. Knowledge strategy is defined as a “competitive strategy built around a firm's intellectual resources and capabilities” (Zack, 2002). The knowledge strategy of the organization focuses on

knowing what kind of knowledge is important and why it is important (Zack, 2002; Zack, 2003). KM strategy addresses how the organization handles knowledge.

The resource-based view (RBV) of the firm and the knowledge-based view (KBV) of the firm are two concepts that enable an organization to develop a knowledge strategy (Barney, 1991; Grant, 1996; Kogut & Zander, 2003). The RBV of the firm provides an explanation of how the organization uses its resources to maintain a competitive advantage (Barney, 1991; Grant, 1996). The RBV of the firm precedes the development of the KBV of the firm and assumes that organizations maintain a unique and particular set of resources that give them a competitive advantage (Barney, 1991; Kogut & Zander, 2003). A competitive advantage is maintained by the attributes of the resources: valuable, rare, imperfectly mobile, and non-substitutable. In the RBV, the firm manages individuals as resources and attempts to develop their knowledge and skills to help the organization accomplish its objectives (Richard, 2000).

The KBV assumes that knowledge is a resource that is useful in obtaining a competitive advantage as well (Grant, 1996). Tacit knowledge cannot be easily transferred outside the organization, making it more valuable than explicit knowledge. Thus, organizations implement methods to disseminate tacit knowledge. The characteristics, transferability, and capacity for aggregation are qualities that enable the organization to better use knowledge as a resource. Transferability refers to the ability to share knowledge readily. Explicit knowledge is transferable and can be shared across the organization (Grant, 1996; Spender & Grant, 1996). Tacit knowledge is challenging to transfer and is more resource intensive. Grant (1996) wrote that “transforming tacit knowledge to explicit knowledge is inefficient, costly, uncertain, and fundamentally flawed.” The capacity for aggregation of knowledge means that an individual has

the ability to share knowledge and acquire knowledge. According to Grant, organizations should focus on the sharing of knowledge across multiple individuals. The organizational goals should encourage the spread of knowledge across many individuals (Dixon, 2000; Sveiby, 1997).

Since a competitive advantage can be obtained by having an effective knowledge strategy, an organization must develop an appropriate KM strategy.

2.4 KM Strategy

KM is broadly defined as activities that enable an individual or organization to manage its knowledge (Zack, 2002). KM may incorporate technology known as a KM system. KM, in its most basic terms, is the concept of creating, retaining, and transferring knowledge (Argote et al., 2003). Others have added the concepts of application and security (Alavi & Leidner, 2001; Stankosky, 2005). KM systems are a specific class of information technology (IT) system that support an organization's endeavor to manage knowledge (Alavi & Leidner, 2001).

2.4.1 KM Strategic Frameworks

The field of KM is very broad and diverse. Organizations must evaluate past efforts, shape the current environment, and advance the field. There are numerous books, articles, and special-issue journals to address the topic. In the last twenty years, interest has intensified worldwide (Begoña Lloria, 2008; Davenport et al., 1998; Hansen et al., 1999; Small & Sage, 2006).

Takeuchi (2001) approached his examination of KM from a global perspective and identified three major approaches in the literature. According to Takeuchi, European countries use a measuring KM approach. European countries emphasize how knowledge can be measured and how it can be calculated into the company's bottom line. Japanese countries approach KM

from a knowledge-creation perspective. The Japanese believe that everyone embodies knowledge and that everyone has a responsibility to interact and create new knowledge. The United States approaches KM from a management perspective. The United States' overarching perspective is that knowledge can be managed and that structures and processes can be intentionally designed into the organization.

Binney (2001) developed a KM spectrum framework by working with managers to understand how they view knowledge. Binney (2001) categorized the strategies into six categories: 1) Innovation/Creation, 2) Asset Management, 3) Analytical, 4) Developmental, 5) Process, and 6) Transactional. Binney's (2001) KM spectrum framework is depicted in Table 3.

Table 3: KM Spectrum Adapted from Binney (2001)

Strategy	Description	Examples
Innovation and creation	The organization designs an environment that encourages knowledge creation.	communities, virtual teams
Asset management	The organization assigns a value to its knowledge.	intellectual property and document management
Analytical	Knowledge is understood by analyzing a wide range of data.	data mining and decision support systems
Developmental	Knowledge is built in the organization by training and educating employees.	workshops, education programs
Process	Knowledge is codified and made explicit in order to improve work processes.	automation, benchmarking, process improvement
Transactional	Knowledge is stored and maintained in IT systems.	customer service and help desk systems

Earl (2001) developed a framework that consists of three main categories and seven subcategories. The three main categories are the technocratic, economic, and behavior approaches. The technocratic category emphasizes a KM approach that is reliant on technology and heavily emphasizes tools to capture, find, and disseminate codified knowledge. The technocratic school subcategories include systems, cartographic, and process. The economic school emphasis is on measuring knowledge resources and tying the results to the organization's performance. The economic school's subcategory is the commercial school. The behavioral school emphasizes the actions individuals take to share and obtain knowledge. The three subcategories of the behavioral school are organizational, spatial, and strategic. Earl's (2001) framework is shown as Figure 5.

Technocratic			Economic	Behavioral		
Systems	Cartographic	Engineering	Commercial	Organizational	Spatial	Strategic

Figure 5: Schools of Knowledge Management (Earl, 2001)

Kakabadse, Kakabadse, and Koizomin developed a five-factor model of KM (2003). The model affirms that KM is a broad arena and needs to incorporate a wide variety of perspectives. The Five Factor Model of KM is shown as Figure 6.

Philosophy-based model	Cognitive model	Network model	Community model	Quantum model

Figure 6: Five-Factor KM Framework (Kakabadse et al., 2003)

Begoña Lloria (2008) developed a model based on Takeuchi's (2001) approach. Begoña Lloria developed a KM spectrum that describes KM on a continuum. Begoña Lloria's spectrum

ranges from descriptive perspective on the left to the normative perspective on the right. The descriptive perspective accentuates the knowledge that is important to the organization. The normative perspective accentuates what the organization should do to manage the knowledge in its organization more effectively. The KM Perspective Model is illustrated in Figure 7.

Knowledge management models	Intellectual capital models	Knowledge creation models	Knowledge management models	
Knowledge-based theory of the firm	European models	Japanese models	U.S. models	
			Academic perspective	Consultancy perspective

Figure 7: KM Perspective Model (Begoña Lloria, 2008)

The framework in this study is a taxonomy that is developed from the previous KM research. The KM taxonomy presented in Table 4 uses the KM strategy framework developed by Zack (2002). Zack divided KM strategy into strategic and operational KM. Strategic KM focuses on the use of KM to improve the effectiveness of strategic decisions. Operational KM focuses on developing the knowledge that is needed to meet the knowledge strategy. Based on the characteristics of the previous KM frameworks, four fundamental KM strategies emerge: discovery, exploitation, social, and technology. This research further delineates the four fundamental KM strategies into a taxonomy of 10 KM implementation strategies: strategic, creation, intellectual property, intelligence, spatial, CoPs, developmental, process, directories, and databases.

Table 4: KM Strategy Frameworks

			Binney (2001)	Earl (2001)	Takeuchi (2001)	Kakabadse, Kakabadse, & Kouzmin (2003)	Begona Lloria (2008)	KM Taxonomy (current)	KM example activities
		Fundamental Strategy	Implementation Strategy						
Knowledge management strategy	Strategic	Discovery		Strategic		Philosophy-based	KBV KM models	Strategic	Strategic planning
			Innovation and creation			Quantum-based	Knowledge creation models	Creation	Vision sharing Goals and Objectives
	Operational	Exploitation	Asset management	Commercial	Measuring knowledge		Intellectual property	Intellectual property	Process workflows Metric standards
			Analytical		Measuring knowledge	Cognitive-based		Intelligence	Quality management Provide feedback
		Social		Spatial	Creating knowledge	Network-based		Spatial	Sharing tacit and explicit knowledge
				Organizational	Creating knowledge	Community of practice		Communities of practice	Virtual teams
			Developmental		Creating knowledge		Consultancy perspective	Developmental	Exchange forms
		Technology	Process-based	Process	Managing knowledge	Cognitive-based	Consultancy perspective	Process	Information systems Data warehousing Databases Expert systems Intranets Webconference Discussion boards Chat E-mail
				Cartographic	Managing knowledge	Cognitive-based		Directories	
			Transactional	Systems	Managing knowledge	Cognitive-based	Academic perspective	Databases	

Besides presenting the four fundamental KM strategies and ten implementation strategies, Table 4 provides examples of KM activities that organizations use to carry out their desired strategy. AFKN uses the social and technology strategies to meet its KM strategy.

2.4.2 KM Fundamental Strategies

Four fundamental strategies emerge from the KM strategy frameworks. Two of the four fundamental strategies are used by AFKN. AFKN uses the social and technology fundamental strategies and their supporting implementation strategies.

The social KM strategy stresses communication as the way to increase the flow of knowledge between individuals in the organization and improve the individual knowledge level within the organization. Social KM strategy is influenced when individuals know each other and develop a level of trust (Prusak & Cohen, 2001). The social KM strategy, as developed in this research, consists of three strategies: spatial, developmental, and CoPs.

Spatial KM, as developed by Earl (2001), focuses on the proper use of space to facilitate interaction of employees in the organization. An example of this approach is the open-wall cubicle concept. The desired outcome is to maximize human contact and enhance interaction. Interaction should increase social capital and allow the emergence of new knowledge (Prusak & Cohen, 2001). This strategy is called the water cooler meeting.

The developmental KM approach can be seen as a direct investment into employee learning (Binney, 2001; Edvinsson & Malone, 1997). Organizations may encourage learning by providing in-seat or online/computer-based training. Organizations have the opportunity to transfer explicit knowledge directly or provide experiential programs that allow the transfer of tacit knowledge. Organizations using this approach create an environment in which individuals

are encouraged to learn and to develop their skills. For this approach to be successful, organizations must provide enough incentives for the employee.

The CoP approach is based on the development of informal groups that have a common focus (Wenger et al., 2002). The members of the community work together to solve common problems, distribute knowledge, share experiences, and develop new knowledge. This approach was explained by Wenger (1998) as a method that increases the cross flow of knowledge in the organization. The approach is an outgrowth of Lave and Wenger's work on apprentice relationships (1991). The CoP is the primary implementation strategy used in the AFKN KM system and is discussed in later sections.

The technology KM strategy is concerned mainly with using IS or IT to capture experiences through the contribution of general users, experts, and processes. The technology KM strategy enables the interaction of users to transfer tacit knowledge (Alavi & Leidner, 2001). Three main technology KM strategies are process, directories, and databases. The process strategy embeds knowledge in processes for reuse. The directory strategy provides a repository of organizational members with their associated expertise and interests. The database strategy captures and converts knowledge into a codified format and stores it in a knowledge database.

The process strategy uses KM systems to codify processes, work practices, procedures, and other improvements (Binney, 2001; Earl, 2001). By codifying knowledge, knowledge becomes ingrained in the organizational operations, resulting in better performance. The process strategy receives inputs from after-action reviews, lessons-learned sessions, and benchmarking of external organizations. The process strategy augments decision-making by providing the most

relevant information. An expert system that helps target new markets is an example of a process KM strategy.

The directory strategy develops profiles of organizational personnel and makes the profiles available to the entire organization (Earl, 2001). All organizational members must develop accurate profiles and be willing to share tacit knowledge when contacted by fellow organizational members. This strategy is known in some organizations as a yellow pages approach.

The directory strategy works well when organizations create enough incentive for employees to exchange knowledge actively rather than submitting only to the knowledge database (Earl, 2001). Additionally, organizations must work to develop an environment of mutual support and trust (Prusak & Cohen, 2001). In this approach, opportunities to network will potentially enhance the system's effectiveness. Networking, trust, and mutual support are key elements of the social strategy and cross into the directory strategy as well.

A database strategy collects the knowledge of individuals in a format that can be used by others (Earl, 2001). The databases in this strategy are domain specific and support a particular decision-making process. For knowledge databases to be successful, individuals must be willing to contribute. As individuals contribute, there should be a process in place to ensure the content is relevant and current (Alavi & Leidner, 2001; Earl, 2001; Gold et al., 2001). This process ensures that the knowledge obtained from the system is of the highest quality.

The AFKN system is designed to address the social and technology fundamental strategies and is built on a CoP framework as the conduit for KM. KM systems facilitate and enhance the AFKN CoP environment. CoPs are one of the implementation strategies used to

accomplish a social KM strategy. The social strategy can be facilitated and enhanced with IT but can be accomplished without IT. Additional understanding of CoPs and how they support a social KM strategy is needed.

2.5 Communities of Practice

CoPs have existed for ages, dating as far back as ancient Greece where workers who performed similar crafts or trades joined to learn more (Lave & Wenger, 1991). In medieval times, guilds were also formed around similar interests (Wenger & Snyder, 2000). CoPs have been cited as a central component to KM success in organizations (American Productivity & Quality Center, 2000). Given that CoPs have existed for a long time, it is necessary to understand how a CoP is categorized, how individuals participate, how CoPs grow and decline, and how they differ from other organizational structures such as groups or project teams.

CoPs are diverse in nature and can vary depending on the situation (Wenger & Snyder, 2000). They are informal groups in which membership revolves around an individual's interest (Gongla & Rizzuto, 2001). CoPs often have a large number of members, yet few are active participants. Participation in a CoP is an important factor in maintaining the vitality and usefulness of the community. CoPs function well when the leadership is strong and focused (McDermott, 2002).

Traditional CoPs are different from groups or teams since individuals in the same discipline choose to join and informally share their knowledge (Lesser & Storck, 2001). Other modes of interaction have been examined, such as virtual communities, yet CoPs have been studied primarily based on face-to-face (FF) interaction (Komito, 1998). Figure 8 shows the intersection between FF and virtual interaction.

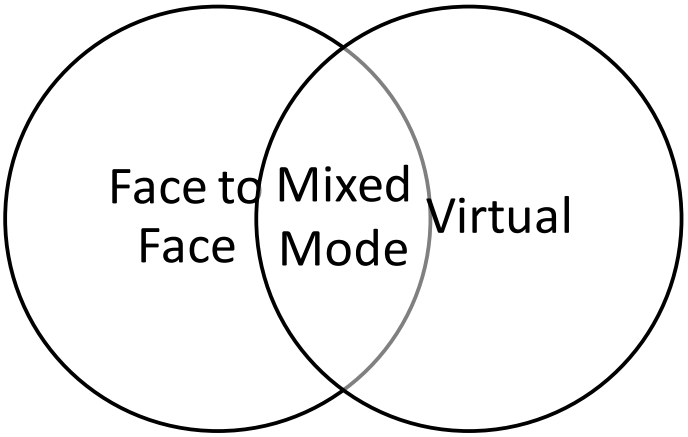


Figure 8: CoP Intersections

In addition to examining the comparison, CoPs are categorized in other ways. Categories include size, length of existence, distance of members from each other, heterogeneity of the group, formality of the group, and boundaries of the organization (Wenger et al., 2002). The categorization of the CoP as FF, mixed interaction, or entirely virtual affects how they operate and determines their use of IT. CoPs that operate in a virtual environment require more IT resources to enhance and facilitate operation (Gongla & Rizzuto, 2001).

In recent years, technology has allowed CoPs to move from primarily FF interaction to virtual interaction because members rarely meet one another directly (Millen, Fontaine, & Muller, 2002). CoPs operate using a combination of technologies such as e-mail, chat, discussion boards, teleconferencing, and web conferencing.

The conceptual viewpoint of the CoP has evolved since its inception. This conceptual viewpoint consists of three main components: mutual engagement, joint enterprise, and shared repertoire (Wenger, 1998). Mutual engagement is how members establish norms and build relationships. Joint enterprise binds members by developing an understanding of how their CoP operates. Finally, a shared repertoire is developed through consistent CoP membership and

expanding reference library. This CoP framework helps ensure that CoP members work to meet a compelling need or solve a particular problem (Millen et al., 2002; Wenger, 1998).

CoPs are organizational systems that go through a lifecycle. The lifecycle is labeled differently by various authors, but the concepts are similar across the literature: potential, building, engaged, active, and adaptive (Gongla & Rizzuto, 2001). The lifecycle of the CoP follows a pattern; however, the timing in each stage varies in each CoP. Understanding the lifecycle of the CoP may help organizations understand individual participation behavior. Table 5 establishes labels for CoP lifecycles and contains a consolidated definition.

Table 5: CoP Lifecycle Terms and Definitions

Gongla and Rizzuto (2001)	Wenger, McDermott, and Synder (2002)	Definitions
Potential	Prepare	People with similar needs find each other and identify the potential for forming the community
Building	Launch	The community comes together around a set of activities
Engaged	Expand	The community is considered established it executes and improves its operation
Active	Consolidate	The community understands and demonstrates the benefits of working as a community
Adaptive	Transform	Communities becomes integral and beneficial to the organization

The CoP strategy is the main approach used for KM in the AFKN system. The AFKN system uses a mixed-mode approach. The technological capabilities of AFKN allow the mixed-mode approach to support the KM activities of AFKN CoPs.

Organizations have invested substantially in KM technology infrastructures, yet organizations practice minimal KM (Malhotra, 2005). The lack of KM performance is a result of poor alignment between the technology possessed by the organization and how it is actually

used. Systems acceptance research addresses an individual's initial acceptance of technology and the follow-on use of the technology. The systems acceptance line of research explores how technology is used to enhance and facilitate AFKN CoPs.

2.6 Systems Acceptance

Systems acceptance addresses an individual's initial acceptance of technology and the follow-on use of the technology. In organizations, individuals face an initial decision as to whether to accept a new technology. Sometimes, the choice to accept the new technology is involuntary. Users do have a choice in their follow-on response. The follow-on response after initial acceptance is known as continued usage or continuance.

Continuance makes IS effective. IS that are continuously used are positioned to make a larger impact on the organization over those in limited use (Cooper & Zmud, 1990; Kwon & Zmud, 1987). Users' continuance behavior is unequal as some will continue to use the system regularly and others will restrict their use.

There are few studies on continuance in a KM environment (Chen, 2007; He & Wei, 2006). The literature on systems acceptance includes initial acceptance and continued use. Further research focuses on how various KM elements influence the user's intention to initially participate in KM and continually use KM.

2.7 Acceptance Behavior Research

The acceptance stream of research focuses on the influences that lead to the user's initial acceptance of IT or acceptance of new technology (Venkatesh et al., 2003). This research is rooted in psychology; as such, it provides another perspective through the lens of KM. Acceptance research is studied in a variety of environments and settings and is critical in

determining the type of technology accepted in an organization. Several acceptance models have been developed. The various models use different antecedents but focus on similar outcomes. The outcomes or dependent variables of those models include the intention to use and the actual use of the system. The main acceptance models are the Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), and Innovation Diffusion Theory (IDT).

2.7.1 Theory of Reasoned Action

The TRA is a fundamental and influential theory with roots in social psychology. The model studies how an individual's intentions lead to actual behavior (Ajzen, Fishbein, & Fishbein, 1980; Ajzen, 2005; Fishbein, Ajzen, & Ajzen, 1975). The model is used to predict many human behaviors (Sheppard, Hartwick, & Warshaw, 1988; Venkatesh et al., 2003)

The two main constructs, attitude toward behavior and subjective norm, lead to behavior intention. Attitude toward a behavior is "an individual's positive or negative feelings about performing the target behavior" (Fishbein et al., 1975). Subjective norm is "the person's perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein et al., 1975). TRA influences behavioral intention indirectly through attitude and subjective norms; therefore, it is expected that antecedents using IS operate through attitude and subjective norms. Comparatively, many antecedents influence an individual's decision to perform KM (Kuo & Young, 2008). The TRA is a useful model to study KM.

2.7.2 Theory of Planned Behavior

The TPB model is an extension of the TRA model. The model explains situations in which individuals do not have control over their behavioral intentions. The TPB expands the TRA by adding a construct called Perceived Behavioral Control (PBC) (Ajzen, 1985; Ajzen, 1991). PBC is "the perceived ease or difficulty of performing the behavior" (Ajzen, 1991). Additionally, PBC addresses individuals' beliefs that resources, skills, and opportunities are available to accomplish their intentions.

The TPB research is useful in understanding the skills and resources that are needed to operate the KM system and the opportunities made available through the use of the KM system (Kuo & Young, 2008). By extending the TRA into the TPB model, the TPB becomes a robust model that explains intention and behavior in environments ranging from completely voluntary to involuntary.

2.7.3 Technology Acceptance Model

Davis (1989) adapted the TRA and applied it to the individual acceptance of technology that later became the TAM. The TAM is designed specifically for the IS context. The two primary constructs are Perceived Usefulness (PU) and Perceived Ease of Use (PEU). The TAM enhances the job performance of the individual by lowering the level of effort. The positive experience influences intention to use the system.

The TAM provides a concise explanation of a user's intention to use a system and is widely used in the IS context. The TAM removes the attitude and subjective norms constructs (Venkatesh & Davis, 2000).

2.7.4 Innovation Diffusion Theory

The IDT, developed by Rogers (2003), explains how individuals can reduce uncertainty when adopting a new technology. Rogers defined diffusion as "the process in which an innovation is communicated through certain channels over time among members of a social system." Rogers defined innovation as "an idea, practice, or object that is perceived as new by the individual." The IDT entails that individuals collect information from the social environment about the new technology and develop beliefs about using the technology that ultimately drive the acceptance or non-acceptance of the technology.

Rogers (2003) developed a set of characteristics—relative advantage, compatibility, complexity, triablity, and observability—that explain the rate at which an individual adopts a technology. Moore and Benbasat (1991) explained and extended the characteristics presented in Rogers' 1983 text. The characteristics of the IDT core constructs are summarized in Table 6 (Moore & Benbasat, 1991).

Table 6: IDT Core Constructs (Moore & Benbasat, 1991)

Construct	Definition
Relative advantage	Degree to which an innovation is perceived as being better than its precursor
Ease of use	Degree to which an innovation is perceived as being difficult to use
Image	Degree to which an innovation is perceived to enhance one's image or status in one's social system
Visibility	Degree to which one can see others using the system in the organization
Compatibility	Degree to which an innovation is perceived as be consistent with the existing values, needs, and past, experiences of potential adopters
Results demonstratability	Tangibility of the results of using the innovation, including their observability and communicability
Voluntariness of use	Degree to which use of the innovation is perceived as being voluntary or of free will

Rogers' (2003) process model describes how an individual adopts an innovation:

- The individual is exposed to and obtains knowledge about the innovation.
- The individual forms an attitude about the innovation from the initial knowledge obtained.
- The individual decides whether to reject or accept the innovation.
- The individual begins to use the innovation.
- The individual decides whether to continue to use the innovation beyond initial use.

IDT research serves a twofold purpose, helping to understand the initial acceptance phenomena and the post-adoptive behavior. Rogers (2003) called this type of use confirmation. Saga and Zmud (1993) called the behavior routinization. Bhattacherjee (2001) called the behavior continuance.

Post-adoptive research appears to be a small extension of acceptance research; however, the mechanisms that affect users' post-acceptance decisions are different from their initial acceptance decisions (Bhattacherjee, 2001). The fact that a user could initially accept a technology and later discontinue use is an anomaly that is not explained in the technology-acceptance literature (Bhattacherjee, 2001).

2.8 Post-Adoptive Behavior Research

Many studies investigate initial technology acceptance (Ajzen, 1991; Davis, 1989; Venkatesh et al., 2003). However, there is less empirical work on post-adoptive behavior. Researchers develop and test models that look at post-acceptance behavior across different stages of IS (Cale & Eriksen, 1994; Cooper & Zmud, 1990; Kwon & Zmud, 1987).

Post-acceptance usage behavior typically follows two schools of thought. One school looks at deep or complex usage of the system (Saga & Zmud, 1993). The deep and complex usage is how the user adapts the system beyond the basic functions. The other school is continuance behavior, which is the focus of this research.

2.8.1 Continuance Research

Continuance research is evaluated from two perspectives. One perspective examines continuance behavior as an extension of initial acceptance behavior (Mathieson, 1991; Taylor & Todd, 1995a). The other approach examines continuance as a post-confirmation of the initial decision (Tiwana & Bush, 2005). The first approach views continuance through the same factors that led to the initial acceptance of the technology. The continuance decision via the initial acceptance approach is evaluated by numerous approaches, including the IDT (Rogers, 2003), the TAM (Davis, 1989), the TBP (Ajzen, 1991; Taylor & Todd, 1995a), and Social Cognitive Theory (Compeau & Higgins, 1995). These approaches assume that the same characteristics that explain initial acceptance will also explain continuance.

Continuance viewed as a post-confirmation of the initial decision is different from continuance behavior as an extension of initial acceptance behavior because a different set of psychological conditions are referenced (Bhattacherjee, 2001; Tiwana & Bush, 2005). This approach posits that initial acceptance does not necessarily guarantee continued usage. EDT is used to examine the post-confirmation of the initial decision continuance behavior (Oliver, 1980). Disconfirmation, satisfaction, and perceived usefulness are the three main constructs of EDT. The EDT approach deals with individuals' decisions to determine their future based on the past.

EDT is extended and blended to further examine the difference between early and late adopters (Parthasarathy & Bhattacherjee, 1998). Bhattacherjee (2001) developed a model of IS continuance based on EDT. This paper is one of the first to develop and test a model based specifically on continuance behavior. The EDT model is rooted in consumer behavior research and extends into the context of IS. One of the key findings of this study is that a user may discontinue using a system after initially accepting it (Bhattacherjee, 2001).

2.8.2 IS Continuance Model

The IS continuance model, grounded in consumer satisfaction behavior research, is based on EDT (Anderson & Sullivan, 1993; Oliver, 1993). The EDT model suggests that an individual's decision to repurchase or use a product is based on the confirmation of an initial expectation, the perception of the product performance, and the level of satisfaction with the product. A purchaser's initial expectation is theorized to influence satisfaction. In the EDT model, satisfaction is the key construct that drives repurchase intention. The EDT model, shown as Figure 9, uses the notation t1 and t2 to denote pre-consumption versus post-consumption.

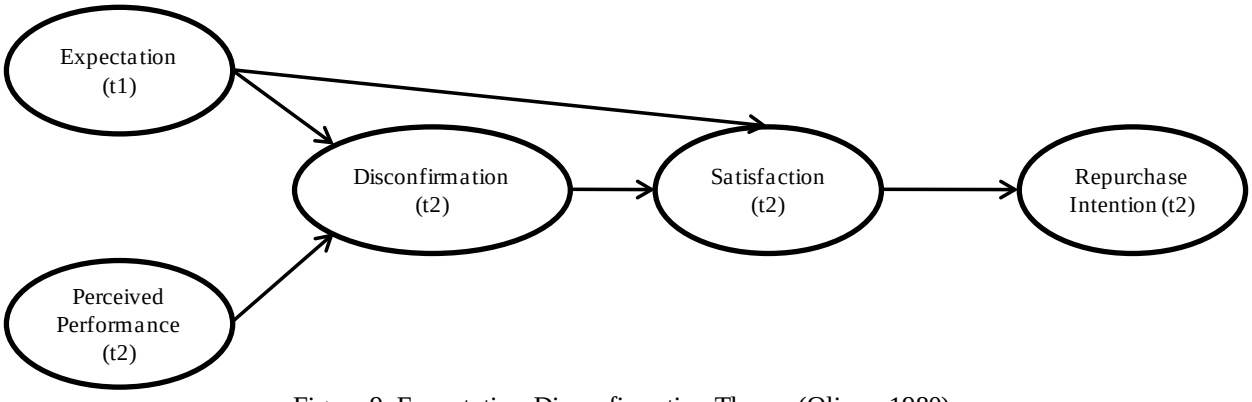


Figure 9: Expectation-Disconfirmation Theory (Oliver, 1980)

Continuance intention is similar to repurchase intention in the IS continuance model. For IS, acceptance is the initial decision. First, a consumer purchases an item, which is the initial decision. Second, a consumer develops an initial opinion of the item purchased. For IS, a user's first use of the system may weigh heavily on the future use. Third, based on experience and initial expectations, a consumer may discontinue repurchasing the product or, in the IS context, discontinue using the system.

The IS continuance model shows that an individual's intention to continue using an information system is influenced by satisfaction with the system and perception of the system's usefulness (Bhattacherjee, 2001). Perceived usefulness and satisfaction are both influenced by disconfirmation. The disconfirmation aspect of the model compares the user's previous use to the user's actual use. Bhattacherjee (2001) developed the IS Continuance Model shown as Figure 10.

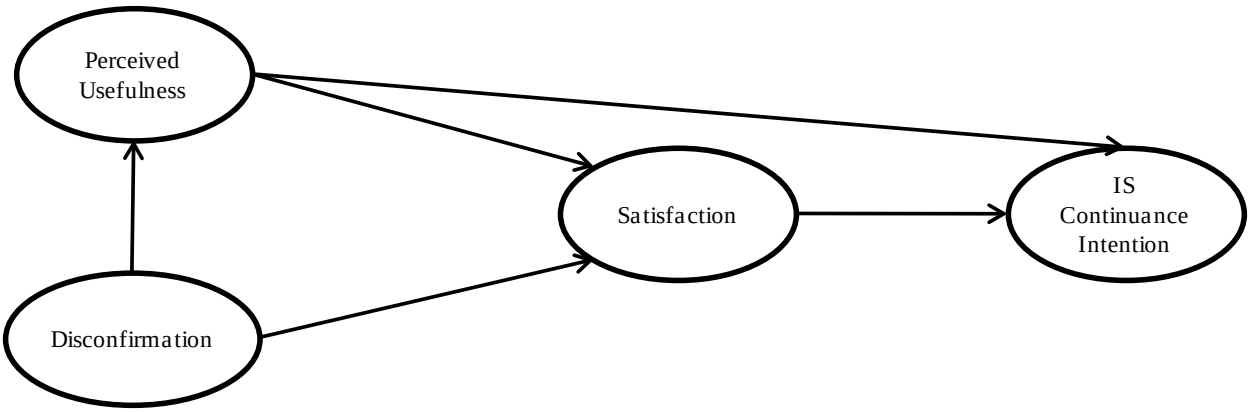


Figure 10: IS Continuance Model (Bhattacherjee, 2001)

The IS continuance model shares some structural similarities with the EDT, but there are some adaptations as well. The IS continuance model incorporates the t1 expectation from Figure 9 into the disconfirmation construct in Figure 10. Additionally, perceived usefulness is a measure

of a user's post-usage acceptance, which is a stronger determinant of user satisfaction (LaTour & Peat, 1980).

Bhattacherjee et al. (2008) proposed an extension to the IS Continuance Model by evaluating and elaborating on factors that influence the original model. The extended model looks at the factors of IT self-efficacy and facilitating conditions. These two constructs are part of PBC as developed in the TPB (Ajzen, 1985; Ajzen, 1991). Users' perception that the organization's support is out of their control is known as facilitating conditions (Bhattacherjee et al., 2008). The motivation to examine FC is driven by the need to explain behavior beyond continuance intention and address actual continuance. The extended model is shown as Figure 11.

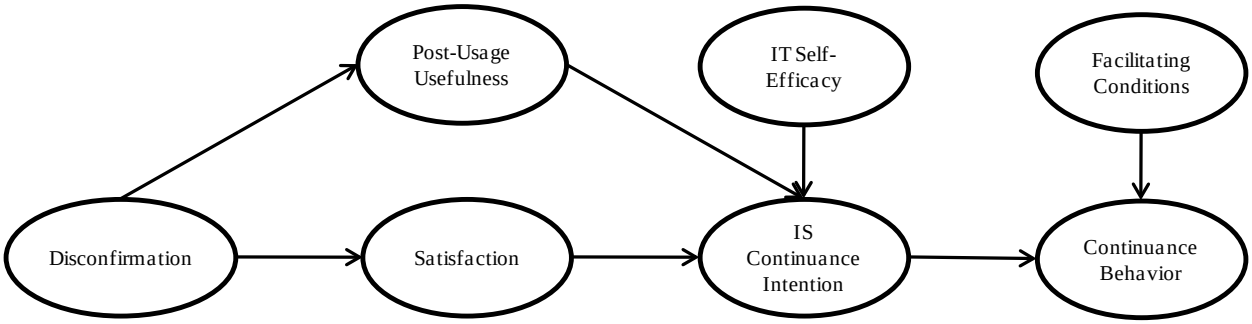


Figure 11: Extended IS Continuance Model (Bhattacherjee et al., 2008)

Bhattacherjee's et al. (2008) extended model changes the terminology from perceived usefulness to post-usage usefulness to avoid confusion with previously developed initial acceptance models. The extended model removes the relationship between usefulness and satisfaction, since the relationship between satisfaction and usefulness is not clearly defined. The

extended model adds IT self-efficacy (SE) and facilitating conditions. IT self-efficacy addresses an internal constraint. Facilitating conditions address an external constraint.

In Sections 2.2–2.6 of this document, key aspects of organizational knowledge strategy and KM make a case for organizations to successfully accomplish KM. Sections 2.7–2.9 provide a complementary framework that enables organizations to measure whether their members will continue to accomplish KM beyond initial use. Furthermore, KM elements influence the accomplishment of KM in an organizational setting.

2.9 Knowledge Management Elements

Individuals and their organizations must cultivate the KM elements to successfully implement a KM strategy. Four KM elements from the literature make accomplishing a KM strategy possible. The four KM elements are community, technology, individual, and organizational, as shown in Table 7.

Table 7: KM Elements and Enabling Conditions

Element	Enabling conditions
Community	Community leadership Common interest Trust Familiarity with others Cooperative environment
Technology	Reliable User friendly Accurate Operation policy Content screened Accessible
Individual	Self-Efficacy Participation Sharing
Organizational	Executive commitment Rewards Encourage knowledge sharing Provide resources Provide training Organizational structure Open or closed culture Experiment without failure

2.9.1 Community

The community KM element explains an individual's behavior in a social context. Previous research shows the influence that social interactions have on KM (Prusak & Cohen, 2001). The community KM element is evaluated through the lens of Social Capital Theory (SCT). SCT posits that an individual's relationships lead to social actions (Nahapiet & Ghoshal, 1998). Nahpiet and Ghoshal presented SCT as a multidimensional construct that consists of three components: relational, structural, and cognitive. The relational dimension of SCT addresses four components: trust, norms, obligation, and identification. The structural dimension consists of network ties, network configuration, and appropriable organization. The cognitive dimension

consists of shared language and shared narratives. The three dimensions of SCT, including the influences of trust, network ties, and shared language, are examined.

Trust is seen as a content-dependent, multifaceted, and complex concept (Kelton, Fleiscmann, & Wallace, 2008). Though there is much debate on the concept of trust, trust is an important predictor of human behavior and has been studied extensively (Kramer & Tyler, 1996, Mayer, 1995). Generally, the literature looks at trust in two ways. Mayer et al. (1995) studied how people develop and evaluate trust. The human or social dimension is focused on the relationships that exist. Others evaluate trust in artifacts such as IS (McKnight, Choudhury, & Kacmar, 2002). The trust of IS is focused on the security and quality of data. Trust is a common thread in social systems and IS, making trust the link between the social side and the information side. Therefore, trust is a social belief relevant to the study of KM continuance.

Benevolence and competence-based trust are the most relevant factors to KM continuance. Trust is based on competence, benevolence, and integrity (Bhattacherjee, 2002; Mayer et al., 1995). Competence is the ability of the trustee to do what the trustor needs. Benevolence is the trustee's caring and motivation to act in the trustor's interest. Benevolence is arguably more relevant than competence and integrity in KM environments (He, Fang, & Wei, 2009). Integrity refers to the trustee's honesty and promise-keeping ability. McKnight, Choudhury, and Kacmar (2002) concluded that competency-based trust, on Internet and Web-based environments, includes "ability, capability, and good judgment."

Trust is conceptualized as interpersonal; however, in the KM environment, this may not be the case. Individuals interact through a KM system with other users or extract information left in the system. Trust is applied at a collective level in virtual communities and groups (Jarvenpaa,

Knoll, & Leidner, 1998; Ridings, Gefen, & Arinze, 2002). In a KM environment, trust is generalized at the collective level rather than as a dyadic relationship seen in other environments (He et al., 2009). CoPs that are facilitated and enhanced by technology can be viewed as collectives. Users make their evaluation of trust based on the competence and benevolence they perceive.

The structural dimensions of SCT are concerned with the individual's accessibility to others in the community (Nahapiet & Ghoshal, 1998).The structural dimensions consist of network ties, network hierarchy, and appropriable organization of relationships. There is some indication that network ties strengthen when individuals are in frequent contact. Network ties are important because the ties indicate the availability of resources to an individual. Individuals with stronger network ties find greater access, better timing, and a greater set of referrals. They may also find information at their fingertips instead of having to make an extensive search (Burt, 1992). Network ties and trust are only part of the equation. A rich network hierarchy signifies the ease and flexibility of information sharing within the network. A strong appropriable organization is a representation of preexisting relationships that are transferred from one setting to another. Accessible individuals are more likely to interact and have an opportunity to perform more KM.

The cognitive dimension of SCT deals with the commonalities that exist in social groups. Commonalities exist because of common interest and common location among the group. Common interest and common location typically results in the development of a common language. The existence of a common language enhances the social exchange that can occur within and between social groups. The cognitive dimension posits that sharing between social

groups may occur on the basis of a shared language. Shared languages influence the community KM element in AFKN CoPs.

A shared or common language allows individuals to communicate ideas that are impossible to share without a common point of reference (Prusak & Cohen, 2001). The ability to access a common language allows individuals to share information with each other in a timely manner. These actions can result in breakthroughs that can create new knowledge (Nonaka & Takeuchi, 1995). This research conceptualizes that trust, network ties, and shared language will influence an individual's satisfaction and post-usage usefulness.

2.9.2 Technology

The technology KM element construct measures how technology influences KM and KM continuance. The technology KM element construct shows how IS facilitate and enhance KM activities. IS are computer-based systems consisting of an organized set of procedures. When executed, IS provides information to support processes and decision making (Lucas, 1990). IS are a collection of components that help people operate and manage the organization (Huff & Munro, 1985; Nickerson, 1998). Alavi and Leidner (2001) defined KM systems as a class of IS designed to manage organizational knowledge. KM systems allow organizations to better manage their processes by creating, storing, transferring, and applying new knowledge. A KM system is used to facilitate and enhance individual and collaborative KM activities in an organization. In the literature, organizations place too much emphasis on the technical side of the KM system at the expense of the social and cultural aspects of KM (Davenport & Prusak, 1998; Malhotra, 2005). A KM system must be implemented as part of a sound KM strategy.

The attributes of the technology KM element influence a CoP member's ability and willingness to participate in the community. The attributes examined include reliability, user friendliness, accuracy, and accessibility. The technology element represents the quality of the knowledge, the effectiveness of accessing the knowledge, and the ease at which interaction can occur.

2.9.3 Individual and Organizational

Organizations are the facilitators of KM as they provide the resources and the strategy to accomplish KM. Individuals are the main contributors. All knowledge starts with the individual and spirals between others, resulting in the creation of new knowledge (Nonaka, 1994). Nonaka said that knowledge creation and organizational KM elements are useful and individual in nature. For example, individuals determine whether they will participate in a CoP and share their knowledge (Wenger, 1998).

Individual and organizational KM elements are modeled using the concept of Perceived Behavior Control (PBC). PBC is the belief that individuals have adequate control over their behavior (Ajzen, 1991). PBC is a multifaceted construct that contains the constructs of self-efficacy and controllability. Applying the PBC concept to IS allows for the explanation of individual behaviors in voluntary and involuntary situations (Venkatesh & Davis, 2000). Self-efficacy is individuals' perception of their ability to accomplish a task. Individuals who believe they can accomplish a certain task are more likely to succeed at the task. IT self-efficacy is individuals' perception of their ability to operate the technology effectively (Venkatesh et al., 2003). Controllability is the perceived control individuals feel they have over the resources needed to accomplish a task.

As noted, PBC has two clear components: self efficacy and controllability. Self-efficacy emerges from an internal locus of control (internal constraint). Controllability is aligned with an external locus of control (external constraint) (Bhattacherjee et al., 2008; Taylor & Todd, 1995b). PBC focuses on the controllability aspect of the construct. Bhattacherjee et al. examined the internal and external locus of control in the Extended IS continuance model. Venkatesh et al. (2003) examined the influence of IT self-efficacy but found the influence to be negligible. While the multiple construct nature of PBC may be unclear, Bhattacherjee et al. showed that self-efficacy positively influences IS continuance intention. Controllability, also known as FC, positively influences actual usage. IT self-efficacy and FC are expected to influence KM continued use intentions and KM continued use.

The organizational KM element encompasses actions by the organization that influence individuals to practice KM in the organization. Organizational KM elements are external to the individual and thus out of their control. The organizational KM element uses the construct Facilitating Conditions (FC). FC encompasses the following concepts that are controlled by the organization: supportive leadership, organizational structure, and availability of resources. Venkatesh et al. (2003) define FC as "the degree to which an individual believes the organizational and technical infrastructure exists to support use of the system."

FC encourages or enhances an individual's ability to use a given system. The organization's leadership can support and encourage KM by providing resources, such as training, time to collaborate virtually, up-to-date computers, high speed access, and remote access to KM resources (Davenport et al., 1998; Kerno, 2008). The organization's encouragement and enhancement come from resources that are external to the individual

(Bhattacherjee et al., 2008). Additionally, an organization should reduce unnecessary rules and regulations and structure itself so employees are encouraged to interact freely and cohesively (Davenport & Prusak, 1998; McKeen et al., 2006). Organizations must work to lessen and eliminate barriers to KM by integrating and embedding KM as part of the IT system and the daily work routine (Wiig, 1997).

2.10 Previous AFKN Research

AFKN was previously evaluated by Fitzgerald (2004). Fitzgerald identified factors that affect participation between high use and low use AFKN CoPs. Fitzgerald found factors that differ between the successful and unsuccessful AFKN CoPs.

Fitzgerald (2004) used an open-ended and closed-ended questionnaire to obtain data for the independent variables. He used archival data of the CoP to map a composite level of participation for the various CoPs. Fitzgerald's model, shown as Figure 12, depicts 10 factors that are hypothesized to influence participation.

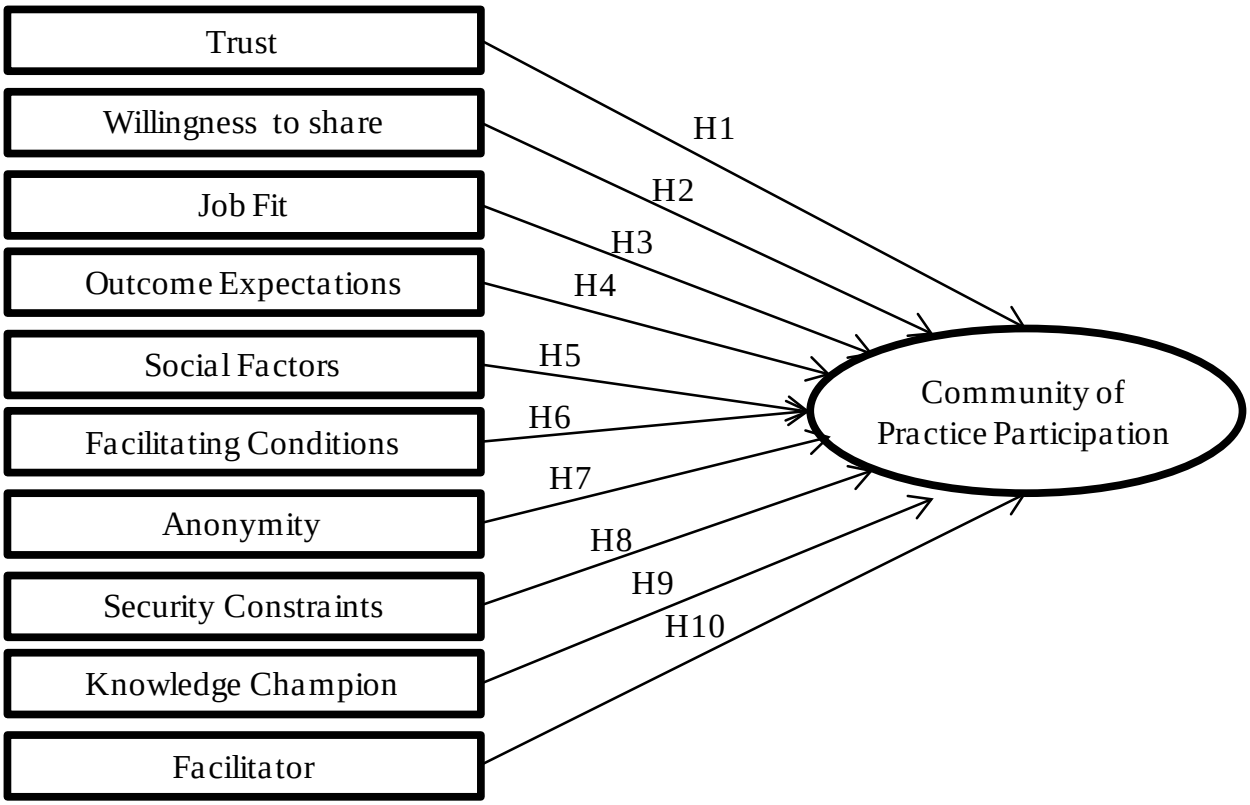


Figure 12: AFKN CoP Model (Fitzgerald, 2004)

The method used to analyze the data was factor analysis. Four significant factors include trust, facilitator, willingness to share, and security constraints. The marginal significant factor is job performance. Fitzgerald (2004) reported that the research effort was partially successful. The limitations included some self-report bias and generalizability problems. Fitzgerald recommended that future research should include factors that are applicable outside of military CoPs. He called for other researches to improve the validity of the survey and incorporate or evaluate the influence of CoP demographic factors such as size and member composition.

Fitzgerald's research (2004) is an initial step in investigating the operation and performance of the AFKN system. Based on the limitations and discussions with AFKN

administrators, the need for research continues. There is a need to improve generalizability and measure the use of AFKN. The research should improve the generalizability concerns of previous research. AFKN administrators are finding ways to measure the use of AFKN and its impact on performance.

2.11 Gaps in the Existing Literature

The development of a research model expands theory in a new direction, extending the existing literature on IS continuance and KM. There are some noted gaps in the KM literature.

1. Organizations have experienced a high level of KM failure rates. Organizations have failed to address the KM elements that influence individuals to continue KM participation (Kerno, 2008; Tseng, 2008).
2. Organizations have had a difficult time assessing the usefulness of KM on the individual, group, and organizational levels. Research is needed to develop methods to evaluate how individuals participate in KM (Lin & Tseng, 2005; Small & Sage, 2006; Tseng, 2008).
3. The number of KM empirical studies is limited (Alavi & Leidner, 2001; McKeen et al., 2006).

2.12 The Research Model

The research model uses concepts and definitions from the KM and continuance literature placed in the context of the AFKN environment. The approach captures individuals' perceptions of their interactions within AFKN CoPs.

The hypotheses are drawn from the theory that individuals will continually use a system that provides them usefulness and satisfaction. The community element shows how the strength

of individuals' level of trust, network ties, and shared language influences their actions within their CoP. The technology KM element influences the structural dimension of network ties. Both the community elements and technology elements directly influence users' perceptions of usefulness and satisfaction. These factors subsequently influence users' intention to continue to participate in the CoP, which in turn directly influences actual participation. Users' intentions to participate are also influenced by their IT self-efficacy, which influences their confidence in using the system. Finally, users' actual use is influenced by their perception of external support from their organization. The research model is shown in Figure 13. The rationales for the hypothesis selection are listed in Table 8.

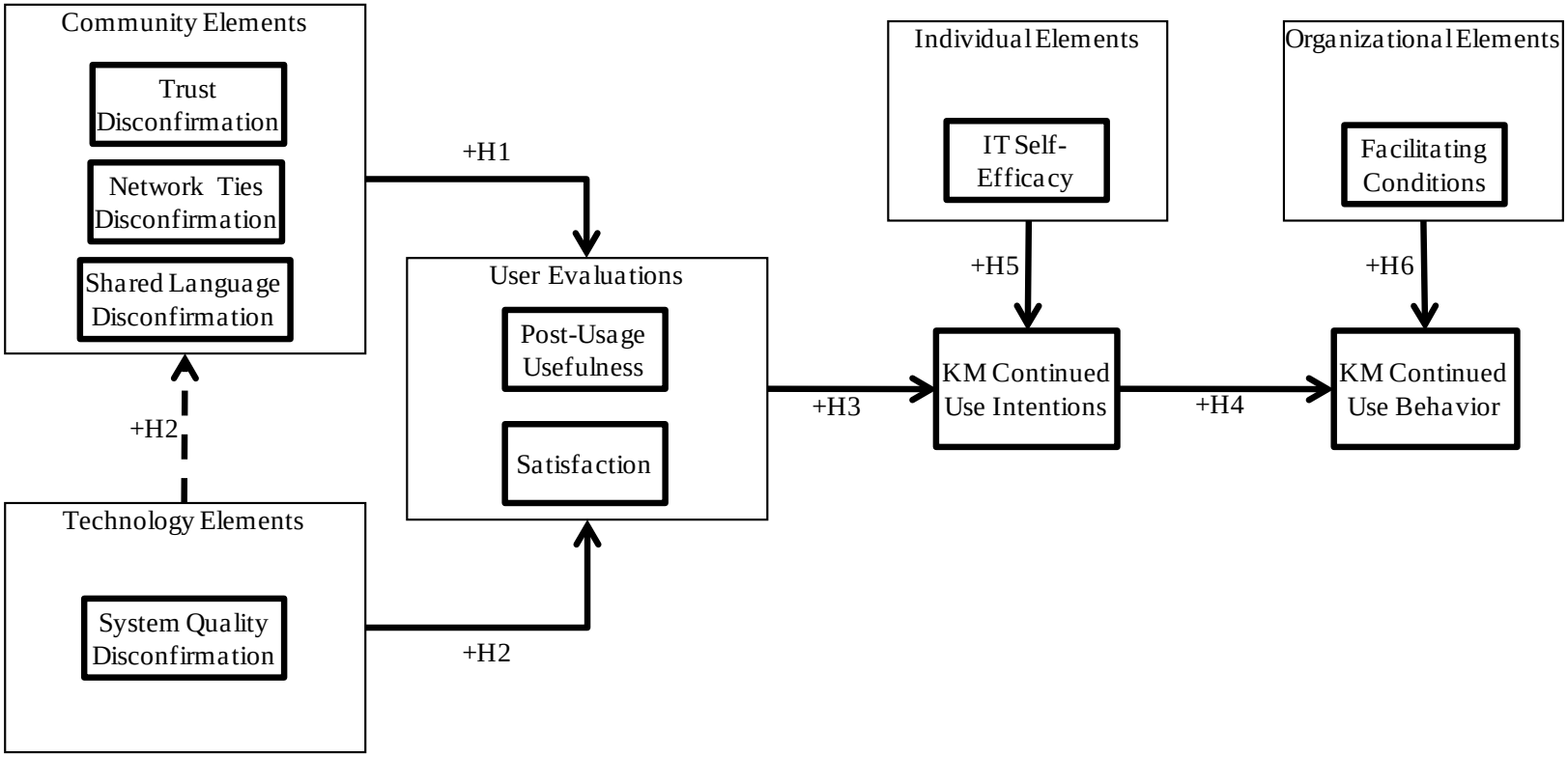


Figure 13: Research Model of KM Continuance

(H1) Hypothesis 1: Community elements are positively related to user evaluations.

H1a: Trust disconfirmation is positively related to post-usage usefulness assessment.

H1b: Trust disconfirmation is positively related to satisfaction.

H1c: Network ties disconfirmation is positively related to post-usage usefulness assessment.

H1d: Network ties disconfirmation is positively related to satisfaction.

H1e: Shared language disconfirmation is positively related to post-usage usefulness assessment.

H1f: Shared language disconfirmation is positively related to satisfaction.

(H2) Hypothesis 2: Technology elements are positively related to user evaluations. They positively influence community elements.

H2a: System quality disconfirmation is positively related to network ties disconfirmation.

H2b: System quality disconfirmation is positively related to post-usage usefulness assessment.

H2c: System quality disconfirmation is positively related to satisfaction.

(H3) Hypothesis 3: User evaluations positively influence KM continued-use intentions.

H3a: Post-usage usefulness is positively related to KM continued-use intention.

H3b: Satisfaction is positively related to KM continued-use intention.

(H4) Hypothesis 4: KM continued-use intention is positively related to KM continued-use behavior.

(H5) Hypothesis 5: IT self-efficacy is positively related to KM continued-use intention.

(H6) Hypothesis 6: Facilitating Conditions positively influence KM continued-use behavior.

Table 8: Support for the Evaluation of the Hypotheses

Hypothesis	Support for the evaluation
1	Shows the influence of the community KM element on the individual user in a given CoP. The community KM element is a measure of CoP trust as well as an evaluation of the community environment. These measures provide a snapshot into the social context of the CoP
2	Shows the influence of technology KM element on the user in a given CoP. It shows how technology influences the community KM element and the user's evaluation of the CoP. These measures provide an indication of how strongly the community is linked to and by technology.
3	Shows how the user's evaluation of CoP in the form of usefulness and satisfaction influence their intentions to continue participation in the CoP. This measure is an indicator of whether the user finds membership in the CoP worth their time investment.
4	Shows how the user's KM continued use intention influences KM continued use behavior.
5	Shows the influence of an individual KM element (IT self-efficacy) on KM continued use intention.
6	Shows the influence of leadership and organizational KM elements (facilitating conditions) on KM continued use behavior.

CHAPTER 3: METHODOLOGY

3.1 Introduction and Requirements

This chapter provides a data collection and analysis framework for the research. The framework includes the approach and methodology needed to carry out the research endeavor. The requirements defined by Creswell (2003) are presented, so that connections between the literature and theory can be drawn.

A properly defined line of research must be established and supported by a methodology that meets the defined requirements:

- The body of knowledge on KM and post-acceptance behaviors will benefit academia and management through a new understanding of how community and technology elements influence the usage intentions and actual use of a KM system. The literature is minimal in direct application to a KM system. This research will extend previous research and build by adding social constructs.
- The theory is tested with the evaluation of a questionnaire that extracts the required information and enables the testing of the stated hypotheses.
- The research problem is specified in terms of larger constructs that are broken down into smaller constructs. The smaller constructs provide the opportunity for evaluation.
- The intent of this research is to integrate the findings into the body of knowledge on KM post-acceptance behavior. This research should also prove to be generalizable beyond the AFKN environment.

3.2 Approach

The approach used in this research endeavor is postpositive in nature. The approach uses preexisting theory in order to evaluate a new approach (Creswell, 2003). A quantitatively designed questionnaire is used to collect the data. The questionnaire uses several preexisting constructs that are adapted for this specific context.

The research is empirical in nature and is based on the interpretation of experiences, observations, and outcomes. The lack of systematic field studies that build on previous work is noted as a problem in the literature (Argote et al., 2003; Huber, 1991). KM is built on an extensive body of knowledge through numerous studies in various fields, yet the focus on working across the various fields is lacking and stands to diminish KM as a discipline (Argote et al., 2003). The lack of connections across the KM literature has renewed emphasis that empirical research can provide a bridge between academia and practice (Booker, Bontis, & Serenko, 2008).

The data were collected using an online questionnaire. This method is effective because it allows the collection of large quantities of information from a large number of respondents in dispersed locations (Punch, 2003). The questions were self-administered, and observations required individuals to recollect their experience participating in their AFKN CoP. The target sample group for this questionnaire was a cross section of members using AFKN CoPs.

3.3 Research Methodology Process

The steps listed in Figure 14 show the basic framework that was used for the research process based on Miller and Salkind (2002).

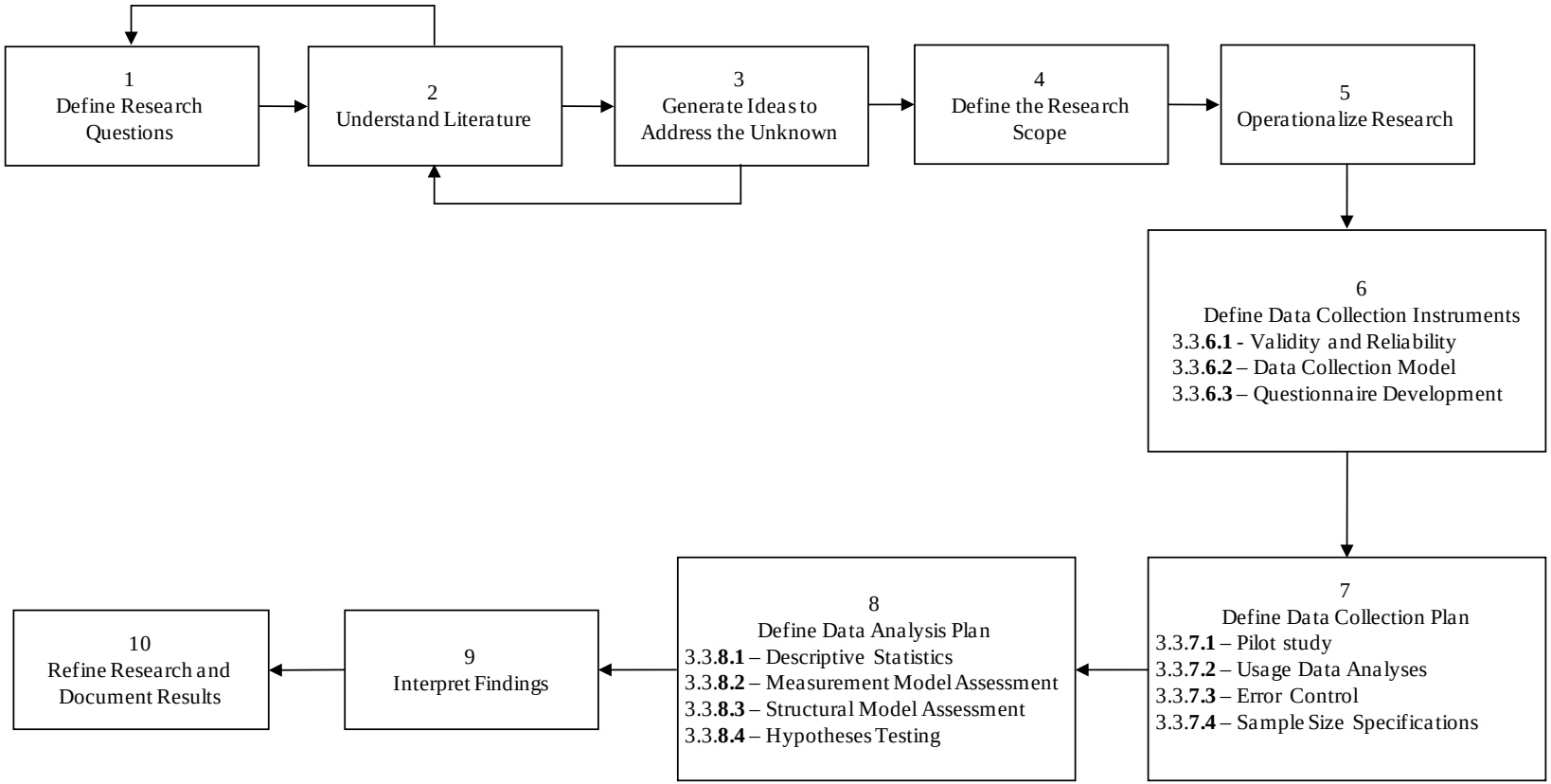


Figure 14: Research Methodology

3.3.1 Define Research Questions

The objective of this step is to understand the environment and to develop questions that help understand the environment in a clearer manner. The main question for this research is How do KM elements influence a user's intention to continue participation in a CoP that is facilitated and enhanced by technology? The question is further refined through sub-questions.

3.3.2 Understand the Literature

In order to understand whether the problem of interest is unique, it is necessary to understand the literature of KM and IS post-acceptance behavior. The process of understanding the literature is iterative in nature. The result is a set of refined questions and an understanding of the phenomena of interest. As defined in Chapter 2, the gaps uncovered by this research are that

1. Organizations have experienced a high level of KM failure rates. Organizations have failed to address the KM elements that influence individuals to continue KM participation (Kerno, 2008; Tseng, 2008).
2. Organizations have had a difficult time assessing the usefulness of KM on the individual, group, and organizational levels. Research is needed to develop methods to evaluate how individuals participate in KM (Lin & Tseng, 2005; Small & Sage, 2006; Tseng, 2008).
3. The number of KM empirical studies is limited (Alavi & Leidner, 2001; McKeen et al., 2006).

3.3.3 Generate Ideas to Address the Unknown

A conceptual model was developed that reflects what was observed and what is known. The conceptual model provides a framework through which observations of behaviors are made. The observations help support or refute the theory. The conceptual model is shown in Chapter 1, Figure 2.

3.3.4 Define Research Scope

The research scope provides a boundary for the project. The goal of this boundary is to provide a manageable framework that focuses on the topic and addresses the research question in a coherent manner. The research question is subdivided into the following questions:

- How do community and technology elements influence user evaluations of the CoP?
- How do community and technology elements influence each other?
- How do user evaluations influence the user intentions to participate in the CoP?
- How does user KM continued-use intentions influence actual KM continued-use behavior?
- How do individual and organizational elements influence KM continued-use intention and KM continued-use behavior?

3.3.5 Operationalize Research

The conceptual model translates into an operational research model in which key constructs are identified by multiple item measures (Ahire & Devaraj, 2001). The operational

constructs translate into measurable behaviors or methods. The measures must be clear and precise to describe the construct adequately.

The research model theorizes that individuals' intention to continue using a KM system is influenced by their previous experience, their levels of satisfaction, and their post-usage usefulness (Bhattacherjee, 2001; Bhattacherjee et al., 2008). The research model also theorizes that community elements such as trust, network ties, and shared language influence the relationship of satisfaction and post-usage usefulness. Additionally, a technology element known as system quality influences network ties, satisfaction, and post-usage usefulness. Individual IT Self-Efficacy is theorized to influence KM continued-use intention, while intention and facilitating conditions are theorized to result actual KM continued usage. The research model is developed and presented in Chapter 2, Figure 13.

3.3.6 Define Data Collection Instruments

The data-collection methods used in the research align with the definition of the constructs from the research model to ensure the data is valid. For this research, the questionnaire was the proposed method of data collection. The questionnaire is the chosen research approach that allows the results of the sample to be generalized across a population (Creswell, 2003). The questionnaire measured the constructs of the research model using multiple item measures. The constructs meet the four conditions presented by Edwards and Bagozzi (2000):

- Cause and effect between construct and measure must be distinct entities.
- The construct and measure must co-vary.

- There must be temporal precedence between change in the construct and change in the measure.
- It must be possible to eliminate rival explanations for the causal relationship.

These conditions were used to develop questions for the data collection model with special attention given to developing clear questions that explain distant constructs.

3.3.6.1 Validity and Reliability of the Questionnaire

Preexisting measurement were used to the greatest extent possible (Kitchenham & Pfleeger, 2002a). By using preexisting measurement, the process of refining and validating the measurement instrument is strengthened. Tests of scale refinement and validation were conducted. In order to ensure the validity of the research instrument, several types of validity must be met (Kitchenham & Pfleeger, 2002a):

- Face Validity – Cursory review of items by untrained judges.
- Content Validity – Subjective assessment of how appropriate the instrument seems to a group of reviewers.
- Criterion Validity – Extent to which the instrument predicts a set of criteria of interest.
- Construct Validity – How the instrument behaves. The set of measures for a particular construct should measure that construct.

The first step was to make sure that the questionnaire met face and content validity (Kitchenham & Pfleeger, 2002a). Face validity was achieved through a pilot study, whereas content validity was achieved through a careful review of the literature, use of expert knowledge, and evaluation of case studies. Criterion validity examines whether the items

measure what they are intended to measure. Finally, construct validity evaluates the following:

- Reliability – The degree of stability or consistency of scale, as statistically determined by Cronbach's Alpha (Bagozzi, Yi, & Phillips, 1991).
- Unidimensionality – The extent to which observed indicators are strongly associated with each other and represent a single concept.

It is important to note that face and content validity happen before large scale questionnaire deployment. Additionally, some aspects of validity testing are not possible until final analysis of the data. Internal and external validity are accomplished by verifying the relationship between variables and measuring how the findings predict future behavior (Nunnally, 1978).

3.3.6.2 Data Collection Model

The data collection model shows how the questionnaire items align with their associated constructs. The data collection model consists of 10 question groupings totaling 53 questions. The ovals represent questions used to measure an individual's response. Each part of the model is tested by asking a group of questions related to the specific constructs. The community KM element consists of three question groupings and a total of 14 questions. The technology KM element consists of one question grouping for four questions total. User evaluation consists of two question groupings and eight questions total. Individual KM and organizational KM elements consist of one question grouping each. Each question grouping consists of four and eight questions, respectively. The final two groupings are KM CI and KM CB. KM CI consists of three questions, and KM CB consists of three questions. Seven

questions are collected that explain the demographic attributes of the sample population. Two questions are used to collect open response data. The data collection model is shown in Figure 15.

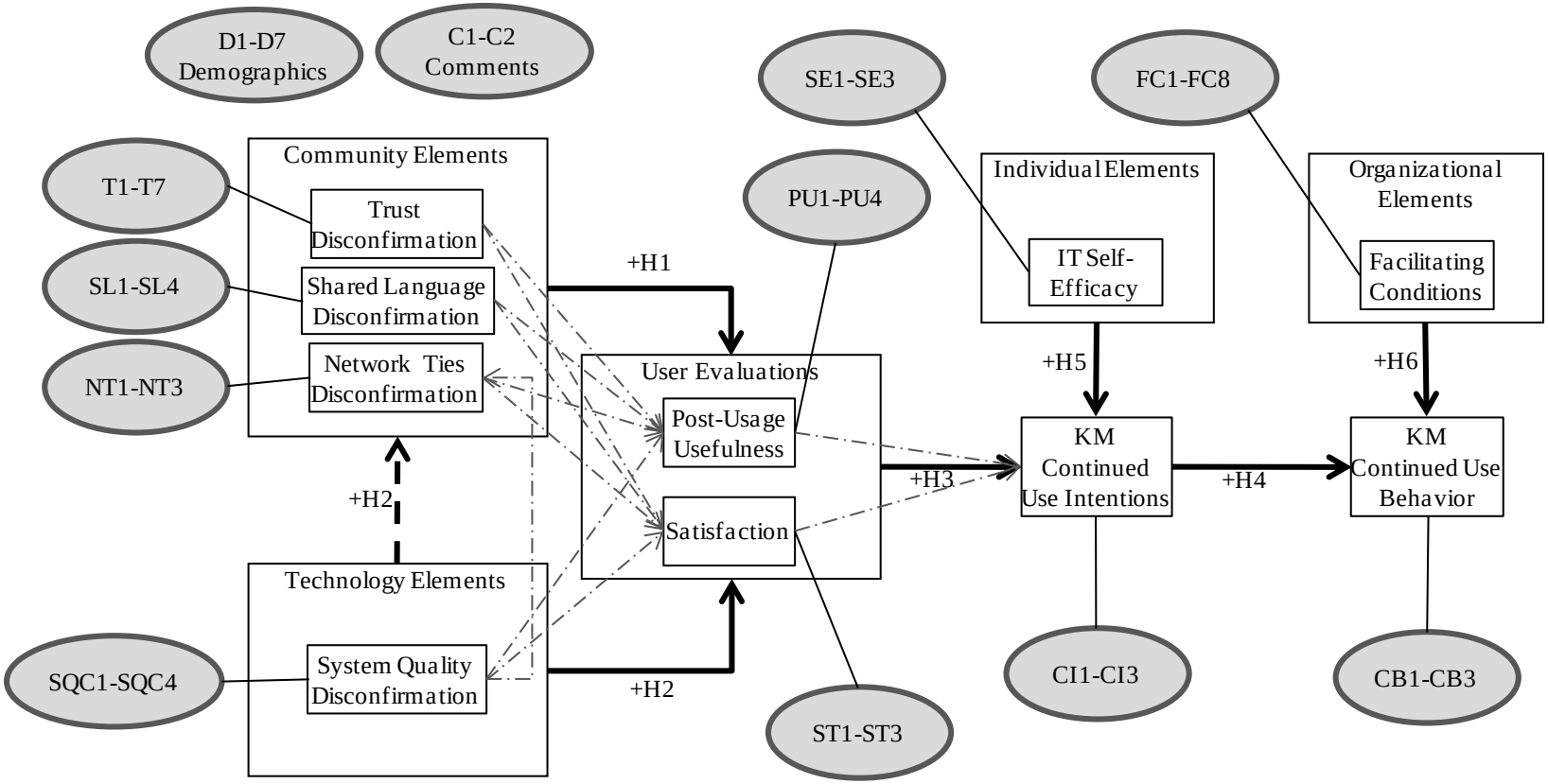


Figure 15: Data Collection Model

3.3.6.3 Questionnaire Development

An effective data collection plan was implemented to develop an appropriate questionnaire. Punch (2003) and DeVellis (2003) provided questionnaire development recommendations. The researcher must understand what is being measured. The constructs represented in the model must be measured by appropriate items. Respondent attitudes must be addressed by the questionnaire. A measurement scale must be appropriate for the items being measured. Expert opinion and pilot testing should be planned for the development of new questionnaires. Finally, reliability, validity, and factor analysis must be addressed in questionnaire development.

The current study brings together two conceptual frameworks. The frameworks emphasize the characteristics of KM that support the employment of a KM strategy and influence the individual's continued use of a KM system. The constructs are based on previously developed multi-item constructs or from theoretical concepts in the literature. The constructs used in this model are listed in Table 9.

Table 9: Measurement Constructs

Construct	Measurement of construct	Source
Community Elements	Trust Disconfirmation (T) Network Ties Disconfirmation (NT) Shared Language Disconfirmation (SL)	Nahapiet and Ghoshal (1998); Tiwana and Bush (2005); McKnight, Choudhury, and Kacmar (2002)
Technology Elements	System Quality Disconfirmation (SQC)	Clay, Dennis, and Ko (2005); McKinney, Yoon, and Zahedi (2002); Petter, Delone and McClean (2008)
User Evaluations	Post-usage usefulness (PUU) Satisfaction (ST)	Davis (1989); Bhattacherjee (2001) Spreng, MacKenzie, and Olshavsky (1996); Bhattachejee (2001)
Individual Elements	IT Self-Efficacy (SE)	Bhattacherjee, Perols, and Sanford (2008)
Organizational Elements	Facilitating Conditions (FC)	Bhattacherjee, Perols, and Sanford (2008); Venkatesh (2003)
Knowledge Management Continued Use Intentions	Knowledge Management Continued Use Intentions (CI)	Bhattacherjee (2001)
Knowledge Management Continued Use Behavior	Knowledge Management Continued Use Behavior (CB)	Bhattacherjee, Perols, and Sanford (2008)

The community KM element is modeled by three constructs—trust disconfirmation, network ties disconfirmation, and shared language disconfirmation. Trust, network ties, and shared language are measured using the disconfirmation framework. The disconfirmation framework asks individuals to compare their current experience compared to their expectation of that experience (Bhattacherjee, 2001; Oliver, 1980). Trust disconfirmation uses seven items developed from previous research (McKnight et al., 2002; Nahapiet & Ghoshal, 1998; Tiwana & Bush, 2005). The items measure the competency and benevolence of trust. Network ties disconfirmation uses four items developed from previous research

(Nahapiet & Ghoshal, 1998). Shared language disconfirmation uses four items developed from previous research (Nahapiet & Ghoshal, 1998).

The technology KM element is modeled by a single construct—system quality disconfirmation. The construct is measured by two items developed from previous research (Clay et al., 2005; McKinney et al., 2002; McKinney et al., 2002).

User evaluation is measured by two constructs. The constructs are post-useful usefulness and satisfaction. Post-useful usefulness is measured by four items adapted from Davis (1989) and Bhattacherjee (2001). Satisfaction is measured by four items adapted from Spreng et al. (1996) and Bhattacherjee (2001).

Individual KM is measured by the construct IT self-efficacy. IT self-efficacy is measured by four items (Bhattacherjee et al., 2008). Organization KM is measured by the construct facilitating conditions which consist of eight items adapted from Bhattacherjee et al. and Venkatesh (2003). KM CI is measured by three items (Bhattacherjee, 2001). KM CB is measured by two items adapted from Bhattacherjee et al. Demographic (D) data are measured by seven items. User comments (C) are collected with two questions. All KM continuance measurement items are listed in Table 10. The demographic and user comment items are in Table 11.

Table 10: KM Continuance Measurement Items

Construct	Item	Question
Trust disconfirmation	T1	My trust in other CoP members is more than I expected.
	T2	My belief that other CoP members have good intentions is more than I expected.
	T3	My belief in the reliability of other members is more than I expected.
	T4	My CoP's effectiveness in sharing knowledge is more than I expected.
	T5	My CoP's general knowledge of the subject matter is more than I expected.
	T6	My CoP's overall capability as an expert source of knowledge is more than I expected.
	T7	My trust in this CoP's ability to protect sensitive material is more than I expected.
Network ties disconfirmation	NT1	Members know each other more closely than I expected.
	NT2	Members professionally interact (in CoP activities) more closely than I expected.
	NT3	Members network more often than I expected.
Share language disconfirmation	SL1	A common language is used to share ideas more than I expected.
	SL2	A common set of terms is known by members more than I expected.
	SL3	My CoP developed a unique set of common words to communicate ideas more than I expected.
	SL4	Members use technical terms common to all members more than I expected.
System quality disconfirmation	SQC1	The reliability of accessing knowledge is more than I expected.
	SQC2	The accuracy of stored knowledge is more than I expected.
	SQC3	The ease of using the AFKN interface is better than I expected.
	SQC4	Technical support for AFKN interface is better than I expected.
Post-usage usefulness	PUU1	Being a member of this AFKN CoP will increase my productivity (e.g., completion of work is faster).
	PUU2	Being a member of this AFKN CoP will improve my performance (e.g., makes my work routine better).
	PUU3	Being a member of this AFKN CoP will make me more effective (e.g., help me make better decisions).
	PUU4	I find this AFKN CoP to be useful in my job.
Satisfaction	ST1	Very dissatisfied . . . Very satisfied
	ST2	Very displeased . . . Very pleased
	ST3	Very frustrated . . . Very contented
	ST4	Absolutely terrible . . . Absolutely delighted
Self-efficacy	SE1	I can perform my job using AFKN resources without assistance from others.
	SE2	I can perform my job using AFKN resources if I have adequate time to complete the job.
	SE3	I can perform my job using AFKN using only the online help feature as a reference.
	SE4	I am confident in my ability to perform my job using AFKN resources.
Facilitating conditions	FC1	I have the resources to access AFKN.
	FC2	I can use the AFKN whenever I need it.
	FC3	I have full control over my use of AFKN.
	FC4	The actions of my supervisor affect how much I participate within my CoP.
	FC5	Employees receive a thorough orientation of AFKN.
	FC6	The organization provides the time needed to participate in CoPs.
	FC7	My organization's leadership supports the use of CoPs.
	FC8	My organization encourages me to integrate the use of CoPs into regular processes.

Construct	Item	Question
Continued-use intention	CI1	I intend to continue using this AFKN CoP in the future.
	CI2	My personal intentions are to continue using this AFKN CoP to acquire, create, store, or transfer knowledge.
	CI3	If permitted by my organization, I would like to continue using this AFKN CoP to acquire, create, store or transfer knowledge.
Continued-use behavior	CB1	Number of times you visited this AFKN CoP in the last month?
	CB2	What percentage of work do you currently perform using knowledge from this AFKN CoP?
	CB3	How much time, of your weekly routine, do you spend sharing knowledge with this AFKN CoP?

Table 11: Demographic and User Comments

Construct	Item	Question
Demographic data	D1	To which CoP do you belong?
	D2	Is your participation in this CoP voluntary?
	D3	How many months have you been a member of your CoP?
	D4	What is your rank?
	D5	How would you characterize your membership in this CoP?
	D6	How would you describe the purpose of this CoP?
	D7	How would you characterize your CoP?
User comments	C1	What factors, positive or negative, affect your decision to routinely participate in your CoP using AFKN?
	C2	Please provide your comments about the questionnaire for future research.

The attitude of the respondent is addressed by collecting demographic data that establish how the respondent is positioned. The type of questions asked of the respondent can make data collection difficult. Questionnaires that ask individuals to recall past experiences may receive poor response unless free reporting is incorporated (C. C. Miller, Cardinal, & Glick, 1997). Free reporting allows the respondent to skip questions or leave answers blank. Some other factors can improve response rates to include asking specific questions about events, avoiding forced recall of the distant past, and ensuring respondent confidentiality.

A seven-point Likert Scale was used for all constructs except KM continued-use intention and KM continued-use behavior. A scale of seven points accomplishes two things. The scale allows the measurement of differences by providing a measure of variability. The scale also allows questionnaire respondents to provide a neutral response and delineate meaningful divisions between responses (DeVellis, 2003; Punch, 2003). The number of points used in scale development is balanced between increased variability and better reliability. Closed-ended questions are written clearly and avoid ambiguous language such as "sometimes" and "often." An open-ended response helps clarify additional thoughts that the respondent needs to convey.

3.3.7 Define Data Collection Plan

Several authors identified a set of actions that provide a system of checks and balances for data collection (Creswell, 2003; Punch, 2000). The checks and balances ensure that the data collection is implemented in a manner consistent with the intent of the research (Creswell, 2003; Landaeta Feo, 2003). The map shown in Figure 16 presents a flow view of blocks 7 and 8 of Figure 14.

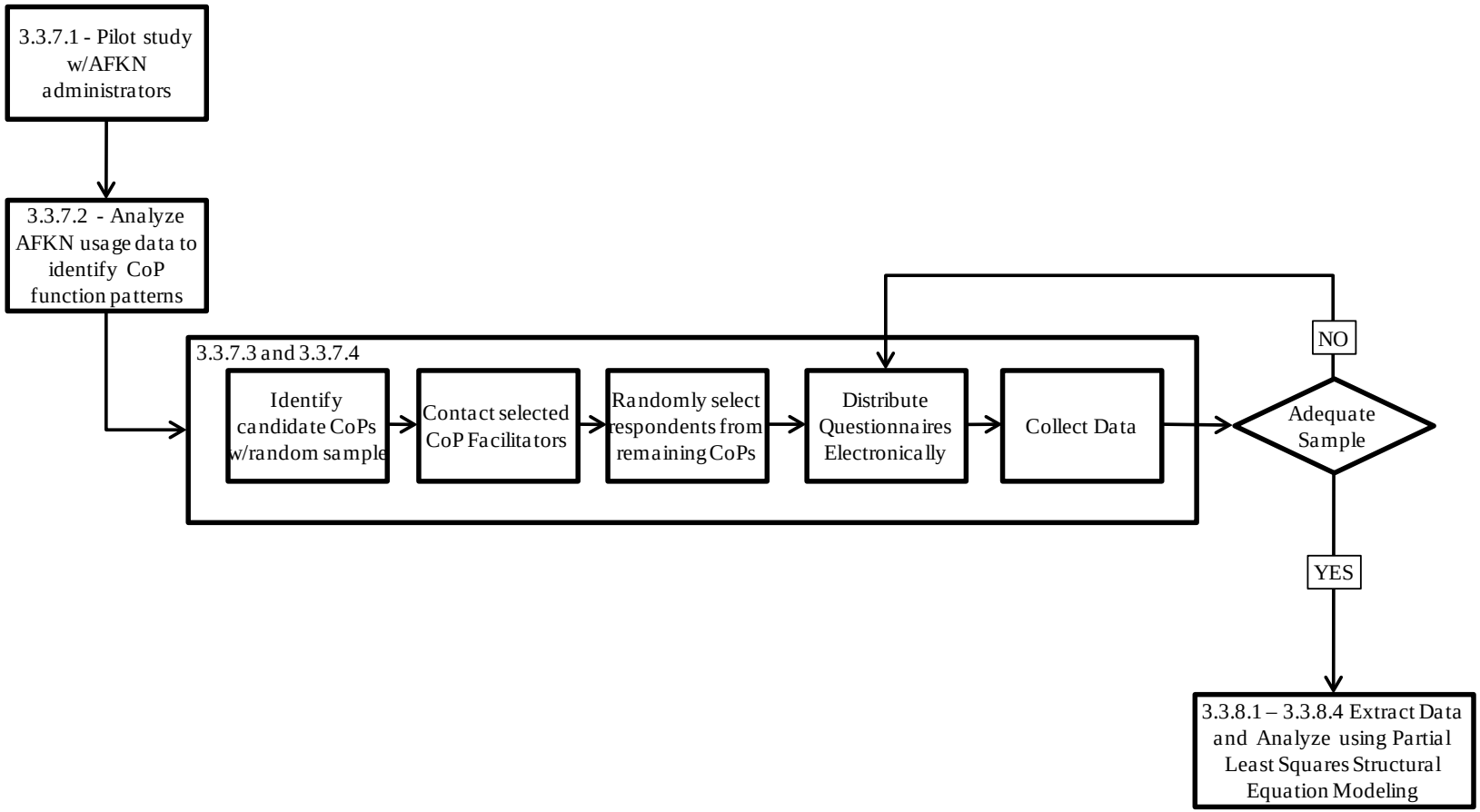


Figure 16: Data Collection Plan to Analysis Map

The method of data collection is an online questionnaire. The online method allows individuals to be contacted in mass over a short period of time (Leedy & Ormrod, 2005). The individuals chosen as the sample population were contacted by e-mail. The e-mail contained an open link for individuals to answer the questionnaire. The data were collected for two weeks.

3.3.7.1 Pilot Study

After developing a questionnaire, a pilot study is required to provide a preliminary test of the research design. The pilot study allows the questionnaire to be tested for face validity and reliability. A pilot study does not have a hard set of standards; therefore, it should consist of available experts and individuals who provide useful feedback. The pilot study allows feedback from respondents to improve the clarity of the data collection instrument (DeVellis, 2003). Permission to conduct the pilot study and follow-on study were obtained thru the Institutional Review Board process (Appendix A).

Although the questions in this research were developed from previously tested and validated items, the reliability and validity of the questions are not automatically guaranteed. This pilot study consisted of 25 AFKN administrators and knowledge owners. These individuals are familiar with the operation of AFKN CoPs and the language used in the system. The goal of the pilot study was to improve validity and reveal problems with reliability.

The results of the pilot study questionnaire (Appendix B) were analyzed for descriptive statistics, internal consistency, Pearson's correlation, and participant comments.

Of the 25 individuals who were contacted, fourteen AFKN administrators and knowledge owners completed the questionnaire. Table 12 summarizes the descriptive information.

Table 12: Descriptive Statistics, Percent of Voluntary CoP Participation, Pilot Study

Variable	Count	Percentage
Percent of voluntary		
Yes	11	78.57
No	3	21.43
Months of CoP membership		
Less than 1		
1 to 12	2	14.29
13 to 24	1	7.14
25 to 36	2	14.29
37 to 48	2	14.29
49 to 60	1	7.14
More than 60	6	42.86
Rank distribution		
E-1 through E-4	1	7.14
E-5 and E-6		
E-7 through E-9	1	7.14
O-1 through O-3		
O-4 through O-6	1	7.14
O-7 through O-10		
GS-1 through GS-5		
GS-6 through GS-10		
GS-11 through GS-15	1	7.14
Contractor	10	71.43
Other		
Position in CoP		
Facilitator	8	57.14
Expert	2	14.29
Leader	3	21.43
Beginner		
Outsider	1	7.14
Bystander		
Purpose of CoP		
Organizational CoP	3	21.43
Project team CoP	5	35.71
Functional interest CoP	6	42.86
Individual characterization of CoP		
Clearinghouse CoP	8	57.14
Interactive CoP	1	7.14
Process CoP	3	35.71
Total	14	

Results of the reliability analysis are shown in Table 13. The analysis was conducted using Minitab v 15 software for multivariate item analysis. The item analysis provides the average and standard deviations for each question grouping. Additionally, item analysis provides data on the Pearson's correlation and Cronbach's Alpha.

Table 13: Pilot Study Construct Reliability and Changes

Construct	# Items	Cronbach's Alpha	Item Removed	New # Items	New Cronbach's Alpha
Trust disconfirmation	7	0.805	T4	6	0.841
Network ties disconfirmation	3	0.856		N/A	N/A
Shared language disconfirmation	4	0.930		N/A	N/A
System quality disconfirmation	4	0.764		N/A	N/A
Post-usage usefulness	4	0.923		N/A	N/A
Satisfaction	4	0.981	ST4	3	0.982
IT self-efficacy	4	0.928	SE4	3	0.938
Facilitating conditions	8	0.788	FC4	7	0.835
KM continue use intentions	3	0.972		N/A	N/A
KM continue use behavior	3	0.812		N/A	N/A
Demographic data	7	N/A	D1, D3	5	N/A
User comments	2	N/A		N/A	N/A

All the results of the reliability analysis were acceptable with alphas exceeding 0.70 (DeVellis, 2003; Nunnally, 1978). The alphas for trust disconfirmation, system quality disconfirmation, facilitating conditions, satisfaction, and IT self-efficacy can be improved by removing one item each. By removing item T4 from trust disconfirmation, the alpha increases to 0.841. Removing item SQC1 increases the alpha of system quality disconfirmation to 0.783. Removing item FC4 increases alpha to 0.835 for the facilitating conditions construct. Removing item ST4 increases alpha to 0.982 for the satisfaction construct. Removing item SE3 increases alpha to 0.938 for the IT self-efficacy construct. The questions that decrease alpha in the pilot study may need to be reworded to minimize

misinterpretation that results in measurement error (Nunnally, 1978). Removing and/or rewording questions are alternative options that may improve reliability. Given the limited size of the pilot study group, no questions were removed. However, feedback from Air Force survey administrators required the elimination of several questions: T4, SE3, FC4, and ST4. The removal of these questions increases the reliability of each construct. The post-pilot reliability analysis is shown in Table 13.

Seven respondents provided statements regarding the questionnaire as part of the pilot study. The statements provide additional insight to improve the performance of the measurement instrument and the research. One respondent acknowledged being a "member of several CoPs, but tend to use them all in the same manner." This comment augments the notion that different CoPs exists within AFKN. The comment may also support the notion that a member's usage is the primary determinant of how a CoP is perceived to function. For example, a member looking for an interactive CoP experience will use tools such as e-mail and discussion forums. Whereas, a member who is looking strictly for information will use the CoP to search for documents directly.

Another respondent felt that the questionnaire "focused on CoP members rather than CoP administrators." The questionnaire uses the term members without specifying the dual roles of the pilot study group that included members who were administrators and CoP knowledge owners. This explains the feelings of disconnect from this administrator. The dual role of knowledge owners as members of a CoP was clarified in the instruction section to improve this response. In addition, a line was added to the instructions stating that single-

member CoPs, who interact or provide information to visitors primarily, should answer questions in reference to CoP visitors.

One respondent suggested that the general questionnaire should not be "sent to knowledge owners to avoid biased responses." This concern was minimized by sending questionnaires to a cross section of users that included non-knowledge owners and knowledge owners that are the sole member of the CoP.

Two of the comments addressed the respondent's need to carefully read the questions that use the disconfirmation approach. Future research could employ a two-step approach that establishes a measure of initial expectations followed by a measure of disconfirmation at a later time. This approach has been used in a research project that examined the disconfirmation approach (Chen, 2007).

A final respondent stated that questions 8-10 and 12-15 should mention the social network tools in the question stem. The respondent indicated that users who don't use those AFKN features may be confused by the questions. A statement to clarify the tools used to enhance CoPs was added to the final questionnaire. The updated questionnaire is shown in Appendix C.

3.3.7.2 Usage Data Analyses

An analysis of AFKN usage data is necessary to confirm the characteristics of AFKN CoPs as expressed by AFKN expert opinion. AFKN experts have observed that CoPs usually function in one of three ways. The three ways are identified as three strata. The strata include the clearinghouse, interactive, and process CoPs. The clearinghouse CoP is typically a document exchange. Individuals can visit the CoP website to obtain needed information. The

individuals who visit the clearinghouse CoP are members of AFKN but may not be members of that specific CoP. The interactive CoP operates like a traditional CoP. The members interact together on a regular basis. As part of the normal operation, members meet consistently and interact virtually. Process CoPs are designed to hold functions that individuals use as part of their normal work routine.

Prior to contacting AFKN members, two analyses were performed on a set of usage data provided by AFKN. The AFKN data were collected for all CoPs from January 1, 2010, through March 15, 2010. The quantitative data collected included the number of CoP members, visitors, pages viewed, documents viewed, documents added, wiki pages accessed, discussion forum posts, e-mails sent, the date of CoP creation, and the date of last CoP access. The analyses were performed to determine the distribution of AFKN CoPs and ultimately the appropriate sample needed to measure the AFKN population. The two analyses performed were analysis of variance (ANOVA) and a K-means cluster analysis.

The first analysis conducted was an ANOVA. ANOVA allows the comparison of mean responses based on different factors. ANOVA tests if means are different across the comparison factors. The initial step of the ANOVA involved the random selection of 99 out of 14,700 open CoPs. Open CoPs were chosen because the front pages of the CoPs were accessible without obtaining additional permission from the knowledge owners. Next, the front pages were viewed to determine if a CoP was a clearinghouse, interactive, or process CoP. A CoP was designated as a clearinghouse if the stated purpose identified it as a central repository; as such, documents or links to documents were located on the front page. A CoP was designated as interactive if the stated purpose was to connect people together. Interactive

CoPs often had links to active discussion forums with marked references to experts. A CoP was designated as a process CoP if the purpose stated that the CoP contained task-related tools. The task-related tools could be used by individuals in specific career fields to accomplish a job. To further simplify the identification of the CoPs, the clearinghouse, interactive, and process CoPs were designated A, B, and C. Once the random selection of 99 CoPs was completed, the means for the different categories of AFKN data were compared using the ANOVA approach. The ANOVA compared the means of categories A, B, and C. The results of the ANOVA revealed a difference of means, at a significance level of 0.05, for the categories documents added and discussion forum posts. The summary analysis for each ANOVA is shown in Appendix D.

The second analysis conducted was a K-Means cluster analysis. K-Means clustering is an algorithm that is used to accomplish data mining (Chan & Lewis, 2002). Data mining is "the analysis of observational data sets to find unsuspected relationships" (Hand, Mannila, & Smyth, 2001). Macqueen (MacQueen, 1966) developed the K-Means cluster approach that minimizes the distance variance within a cluster while maximizing the variance between clusters. The process is performed for a predetermined number of iterations. This research conducted a K-Means cluster analysis across the eight AFKN usage data categories. The different combinations were examined to see if a predictable pattern existed and if the three strata emerged. The analysis was conducted using a random start position 10 times for 10 iterations. The results of the K-Means analysis did not confirm the establishment of the three strata. Appendix E provides a summary of the K-Means cluster analysis.

Based on the results of the two analyses, the AFKN usage data do not provide an indication of three different strata. Since the three strata cannot be determined, the AFKN CoPs were classified into five strata based on the number of members in the CoP.

3.3.7.3 Error Control

The Tailored Design Approach is incorporated as part of the AFKN research effort (Dillman, Christian, Dillman, & Smyth, 2009). Several aspects of the Tailored Design Approach emphasize methods to improve questionnaire response and quality. Overall, the goal of the methods is to minimize errors due to coverage, sampling, nonresponse, and measurement.

Coverage and sampling errors were minimized in this study by developing a concise sampling methodology. Identifying candidate CoPs must be accomplished in a systematic manner. CoPs of interest should be active in the AFKN system. CoPs should also have a base of members that use AFKN in various ways and with different levels of participation. For example, some individuals will have high-level usage and some individuals will be observers. The goal of the research was to survey a full range of users.

Once the candidate CoPs were identified, the principal investigator contacted the CoP facilitator to request the CoP's participation in the research project. Prior to the facilitator's accepting the invitation, the principal investigator explained the university and organization-specific legal policy. Compliance with the university and AF policies had to be satisfied before contacting participants. For participating in the questionnaire, the CoPs were offered a copy of the results, with recommendations, when the results become available.

The individuals selected to participate in this research endeavor should represent a cross-section of typical AFKN users. This cross section of AFKN users was selected from different CoPs across the five strata. A proportional random sample was taken across all five strata to minimize coverage and sampling error. The proportional random sampling approach works to minimize sampling error; however, follow-up was required to ensure that potential respondents participated in the questionnaire.

Besides coverage and sampling errors, nonresponse error was minimized by positively encouraging CoP members to complete the electronically distributed questionnaire throughout the open period. Encouraging nonrespondents reduces nonresponse error and minimizes the need to expand the size of the sample. Encouragement included updates on the percentage of completed questionnaires and the number of days remaining to complete the questionnaire. Additional follow-up e-mails included appeals to help out their CoP. The follow-up e-mails were sent at pre-established intervals. The principal investigator contacted the potential respondents at day 3, 6, 9, and 12.

Beyond coverage, sampling, and nonresponse error, measurement errors must be minimized. Measurement errors were minimized by ensuring that the questionnaire was well designed with concisely written questions. The use of previously validated questions helps to reduce the chance of measurement error. The AFKN research study used preexisting questions that are worded appropriately for this research context. Similar to preexisting research, consistent scales were used throughout the questionnaire. Overall, the AFKN study incorporated some of the steps of the Tailored Design Approach to improve question response and quality.

Additionally, the Tailored Design Approach encourages obtaining sponsorship, maintaining confidentiality, and displaying appreciation. Sponsorship was obtained by contacting the AFKN administrators. After AFKN administrator approval, an electronic message describing this research and requesting permission to survey CoP members was sent to CoP knowledge owners. The confidentiality and security of CoP members was a priority and the message clearly stated that the accessibility of the data was limited to the principal investigator and one supportive AFKN administrator. Since the AFKN administrators acknowledged the importance of this research, knowledge owners informed the potential respondents of the research. Finally, the principal investigator ensured that potential respondents and knowledge owners were shown written appreciation before, during, and after the survey period. Showing appreciation is a component of the Tailored Design Approach that aligns with the Air Force culture.

3.3.7.4 Sample Size Specifications

Numerous researches have addressed the topic of sample size (Cohen, 1988; Cohen, 1992; Kitchenham & Pfleeger, 2002b; Nunnally, 1978). There are three parameters to estimate the appropriate sample size. The parameters are the significance level alpha (α), the power level ($1-\beta$), and the effect size (Cohen, 1992). The significance level is the risk of rejecting the null hypothesis when the null hypothesis is true (Type I error). Power level is the probability of failing to reject a null hypothesis that is false (Type II error). Effect size is the degree of difference between the null hypothesis and alternative hypothesis (Cohen, 1992).

Effect size is research specific and ranges from zero to one. Cohen (1992) proposed three levels of effect size—small, medium, and large. The numerical divisions for each level depend on the research method that is chosen for the analysis. The specific ranges of effect size in this research were determined by Cohen's (1988) f^2 index. Cohen's f^2 index was used to determine the effect size for multiple regression studies as in this research. This study conducted an analysis using a multiple regression method known as structural equation modeling (SEM). SEM can be conducted by two methods. One approach to SEM is known as covariance based. The other approach is variance based and is known as partial least squares (PLS) SEM. The ranges for effect size for SEM studies are small (0.02–0.15), medium (0.15–0.35), and large (0.35 or greater) (Cohen, 1992). Covariance-based SEM is a large sample-size technique. Kline (2005) defined large as over 200 hundred cases. Using Cohen's (1988) f^2 index to calculate sample size may require a sample size larger than 200 depending on other factors.

To determine the proper sample size using the f^2 index, the maximum number of independent variables affecting a dependent variable, the significance level, power level, and effect size must be determined. The maximum number of independent variables approach was used in this study. The parameters used in this study are a significance level of 0.05, a power level of 0.80, and a medium effect size. The significance level and power level used in this research are often used in the literature (Chin, Marcolin, & Newsted, 2003; Sosik, Kahai, & Piovoso, 2009). The parameters provide a balance between Type I and Type II errors, resulting in an obtainable sample size.

The effect size was selected based on the results of the coefficient of determination (R^2) of previous research. A R^2 value of 1.96 percent corresponds to a small effect size; a R^2 value of 13.04 percent corresponds to a medium effect size, and a R^2 value of 25.92 percent corresponds to a large effect size (Cohen, 1988; Cohen, 1992). An f^2 index value is determined by Equation 1 (Cohen, 1992; Hubona, 2009).

$$f^2 = \frac{R^2}{1 - R^2} \quad (1)$$

As an example, Bhattacherjee (2001) reported a R^2 of 41 percent for continuance intention. This R^2 generates an f^2 index value of 0.69 exceeding the large effect-size criteria. Previous continuance research has results with a medium to large effect size based on R^2, which makes the choice of a medium effect size reasonable (Bhattacherjee et al., 2008; Chen, 2007). This study calculated sample size by using the noncentrality parameter (λ), f^2, the number of predictors, power, and α to iteratively determine the correct sample size. The calculation continued until there was no change in the value of λ. The formula to calculate sample size for multiple regression studies using λ and f^2 is Equation 2.

$$N = \frac{\lambda}{f^2} \quad (2)$$

Alternatively, λ can be determined using Cohen's Table 9.4.2 for the appropriate power level (1988). After determining λ, Equation 2 was used.

Using a power of 0.80, ES of 0.15, and an α of 0.05, the required sample size to measure the research model shown in Figure 13 was 76 (Cohen, 1992). This was confirmed by a statistical software known as G*Power 3, which arrived at a sample size of 77 (Faul,

Erdfelder, Buchner, & Lang, 2009). Both methods provide an accurate determination of sample size. Cohen's (1992) approach assumes that the data is normally distributed, observations are independent, errors are negligible, and homoscedasticity is met. The PLS approach can be used in situations that do not meet these assumptions. Since PLS does not meet the assumptions, the sample size must be increased by 15 percent (Lehmann, 2006). According to an electronic message from Chin (personal communication, April, 24, 2010), it is reasonable to increase the sample size of 76 to 100, a 30 percent increase, to compensate for measurement errors. Given the difference between the 15% and 30% recommendation, this study used the recommendation to increase the sample size to 100. This result is short of the number of cases that Kline (2005) recommended for covariance-based SEM; however; the sample size is adequate to perform PLS SEM.

In addition to developing a sample-size plan for the KM continuance model, this study developed a sample-size plan to increase the generalizability of the study to the entire AFKN population. To obtain an appropriate sample, 375 CoPs were selected based on a stratified random sample to represent the population of AFKN CoPs at a 0.05 significance level with a 5% margin of error. The sample size was based on a 0.05 significance level and assumed a 5% margin of error with no adjustment for response rate due to a limit on the amount of CoPs that could be contacted. The sample size was determined by Equation 3.

$$n = \left(\frac{\frac{P[1-P]}{\frac{A^2}{Z^2} + \frac{P[1-P]}{N}}}{R} \right) \qquad (3)$$

The parameters in the equation were as follows: 1) n is the required sample size, 2) N is the size of the population, 3) P is the estimated variance in population in decimal form (0.5 for 50-50, 0.3 for 70-30), 4) A is the margin of error or precision desired in decimal form (0.03, 0.05, 0.1 for 3%, 5%, 10%), 5) Z is based on confidence level (1.6449 for 90%, 1.96 for 95% confidence, and 2.5758 for 99%), and 6) R is the estimated response rate in decimal form (Watson, 2001).The five strata are shown in Table 14.

Table 14: Stratification of AFKN CoPs

Strata	# of members	% of AFKN CoPs	# of CoPs planned
1	Greater than 1000	0.4	2
2	100 to 999	10.1	38
3	10 to 99	46.2	173
4	5 to 9	14.9	56
5	1 to 4	28.4	106
Total		100	375

After confirming the participating CoPs, a random sample of 384 of the 300,000 individuals was needed to complete the questionnaire as determined by Equation 3. The actual number of respondents surveyed was planned to be much greater based on an anticipated response rate of 30% to 35%. The respondents were proportionally distributed across the five strata. This study contacted 0.38% of the users of AFKN, approximately 1150 individuals, to obtain 384 completed questionnaires.

There were two sample size thresholds to be met. The first sample threshold was 100 respondents. This threshold allowed the KM continuance model to be tested using PLS SEM. The second sample threshold was 384. This threshold allowed this research to generalize findings across the AFKN population.

3.3.8 Define Data Analysis Plan

The objective of this phase was to analyze the data collected from the individual questionnaires. SEM is the method used to analyze the data and is accomplished by one of two approaches.

One approach is based on ordinary least squares (OLS) and uses a maximum likelihood approach to generate a covariance matrix. The OLS approach is often mentioned as the covariance-based approach. The covariance-based SEM approach has several assumptions similar to other multivariate methods. The assumptions are normally distributed data, independent observations, and linear relationships (Kline, 2005). The covariance-based SEM approach also requires a large sample size to meet the assumptions and converge on a solution. Two-hundred is considered to be a large sample size for covariance-based SEM (Kline, 2005). Covariance-based SEM is useful in confirming that a theoretical model fits the observed data (Sosik et al., 2009).

The second approach is PLS. PLS SEM is a variance-based approach that uses a process called regularization. Regularization is a process that makes large coefficients less likely to occur than smaller ones (Sosik et al., 2009). Regularization is a form of dimensional reduction that reduces independent and dependent variables to their principal components. PLS is sometimes called component-based SEM. PLS is not limited by the assumptions associated with covariance-based SEM such as normality of data, independent observations, and variable uniformity (Chin, 1998; Chin et al., 2003). PLS also offers the ability to model reflective and formative measures (Haenlein & Kaplan, 2004; Sosik et al., 2009). PLS is predictive in nature and can handle many independent variables. PLS SEM is an approach

that is useful in situations in which theory is not well developed (Wold, 1985). KM and systems acceptance research are well established, but their combination is not; thus, PLS is an appropriate method of analysis.

The PLS approach allows the evaluation of the relationships between independent variables, dependent variables, and interrelationships of both. PLS is an SEM approach that is widely conducted using a two-step process (Chin, 1998; Sosik et al., 2009). The first step is the estimation of the measurement model similar to factor analysis. A measurement model shows how the measurement items relate to their latent construct. A latent construct cannot be observed directly. The measurement model provides reliability information and factor loadings about their latent construct. The second step is the estimation of the structural or path model. The structural model estimates the path coefficients that determine the relationship between independent variables and dependent variables (latent constructs). The path coefficients indicate the strength of the relationships between constructs. Additionally, PLS generates t-values, R^2, composite reliability, and average variance extracted (AVE). The steps conducted to evaluate the data are summarized in Figure 17.

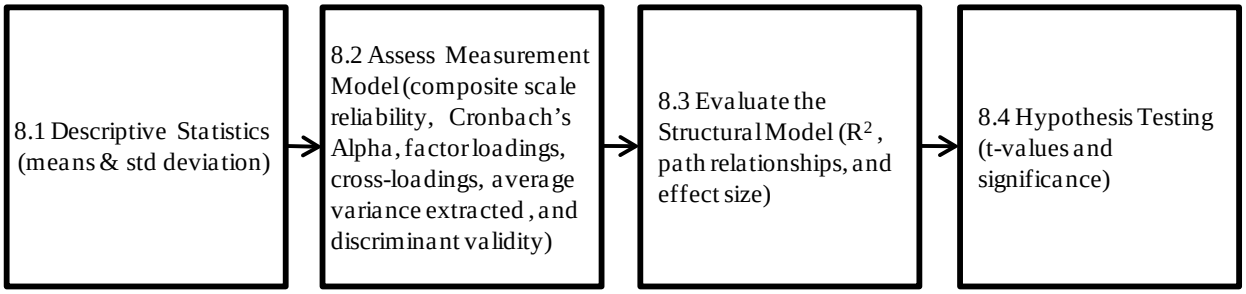


Figure 17: Data Analysis Process

3.3.8.1 Descriptive Statistics

Descriptive statistics consists of means and standard deviation that reveal the consistency of the sample. The statistical information shows how different variables are associated with other variables.

3.3.8.2 Measurement Model Assessment

The next step was to evaluate the measurement model for reliability and validity. PLS analysis measures internal consistency reliability and indicator reliability. Internal consistency is measured by Cronbach's Alpha and Composite reliability. Composite reliability is known as Dillon Goldstein's Rho (Hubona, 2009; Sosik et al., 2009). The composite reliability is the sum of the square of standardized loadings divided by the summation of the sum of the square of the standardized loadings and measurement errors of indicators (Hair, 1998). Internal consistency reliability is a measure of the factors' random error. Indicator reliability is the amount of indicator variance explained by the latent variable. Convergent and discriminate validity are determined as part of a PLS analysis. Convergent validity is determined by ensuring that each measurement item loads on its respective latent construct and has a significant t-value. Convergent validity is also assessed by examining the AVE. Discriminate validity is determined by showing that factors load on their respective constructs and the construct's AVE analysis is much larger than other correlations in the model. The AVE analysis is determined by replacing the 1s in the cross-correlation matrix with the square root of the AVE for the construct and comparing it to the other correlations in the rows and columns.

3.3.8.3 Structural Model Assessment

The evaluation of the structural model is the next step in the PLS analysis. Covariance-based SEM produces a goodness-of-fit index that is useful; however, one is not available for PLS (Hubona, 2009). Without a goodness-of-fit index, there are several other items to be evaluated. R^2 is examined for all latent dependent variables and the statistical significance of all path relationships determined. Effect size is another parameter determined from the structural model.

3.3.8.4 Hypothesis Testing

Hypothesis testing is the final step that is determined from the structural model. Significant paths between latent constructs indicate a hypothesis that is acceptable. The probability of rejecting a true null hypothesis is set at $\alpha=0.05$ for this research.

3.3.8.5 Bootstrapping and PLS Algorithm

The numerical values calculated in steps 3.3.8.2–3.3.8.4 of Figure 17 are determined by two methods—bootstrapping and PLS Algorithm. The first method, bootstrapping, is a non-parametric sampling technique that resamples with replacement a designated number of cases from the original sample (Mendenhall & Sincich, 2007). Bootstrapping is useful in situations where data do not follow underlying assumptions (Hubona, 2009; Sosik et al., 2009). Bootstrapping is used in PLS to estimate the t-values of the item loadings for the outer model and the path coefficients for the inner model. Bootstrapping also provides the mean values for the inner and outer model weights and the outer model item loadings.

The second method is the PLS algorithm. The PLS algorithm is an iterative process that occurs in three primary stages (Wold, 1985). The first stage is the iterative estimation of the latent variable scores. The first stage continues until the change in the outer weights falls below the convergence criterion on two successive iterations. Stage two estimates the outer weights, outer loadings, and path coefficients. Stage three provides an estimation of location parameters and converts standardized estimates into the units of the observed variables (Chin & Newsted, 1999; Hubona, 2009).

3.3.9 Interpret Findings

Descriptive statistics provide insight about those who answer the questionnaire. The demographic data provide the number of respondents, their CoP affiliation, and information on their CoP experiences. These data provide an additional link when blended with the PLS analysis. The results of the analysis support or disprove the hypotheses.

Continued-use systems acceptance theory proposes that individuals whose experience is better than expected make higher user evaluations. Higher levels of user evaluations result in the formation of higher levels of KM continued-use intentions and subsequently higher levels of KM continued-use behavior. The results of this study demonstrate how community and technology KM elements influence users' evaluations of their AFKN CoP. User evaluation influences an individual's KM continued-se intentions. KM continued-use intention was expected to influence KM continued-use behavior. Both intention and behavior were expected to be influenced by individual and organizational KM elements.

With any research, the desired outcomes may not be evident for many reasons. Some of the possibilities include misalignment between measurement scale and theory, reaching a

flawed conclusion about a theory by misinterpreting results, too few or too many questionnaire items for each latent construct, omission of constructs that have more influence, and application of theory to a new context providing results counter to theory. To ensure the best outcomes, care was taken in questionnaire development, data collection, and analysis.

3.3.10 Refine Research and Document Results

The final goal was to produce a final report. Careful data collection and analysis made the production of the report possible. The final report must balance the needs of academia and practicing managers to be relevant. Subject feedback and expert opinion of the analysis were needed to produce the final document. Conclusions, limitations, and suggestions for improvement are highlighted in the final research document. The conceptual model, research model, hypotheses, and data collection model lead to the analysis and final conclusions. Suggestions for future research are included.

CHAPTER 4: DATA ANALYSIS AND RESULTS

4.1 Introduction

Data collection, data handling, analysis of the data, and hypotheses testing were used to formally evaluate the research model. This chapter summarizes the results of the methodology presented in Chapter 3 as follows:

- Implement data collection plan
    - Methodology from sections 3.3.7.3 and 3.3.7.4
- Implement data analysis plan
    - Methodology from sections 3.3.8.1 through 3.3.8.4
- Interpret findings
- Refine research and document results

The data collection model, presented in Figure 15, highlights the relationship among 10 variables: trust disconfirmation, network disconfirmation, shared language disconfirmation, system quality disconfirmation, user evaluation, IT self-efficacy, facilitating conditions, knowledge management continued-use intentions, and knowledge management continued-use behavior. The relationships are tested by PLS using Smart PLS Version 2.0 (Ringle, Wende, & Will, 2005). SmartPLS provides an assessment of the measurement and structural models. SmartPLS provides t-values and path coefficients for the measurement and structural models. It also provides a R^2 for the structural model. Hypotheses are assessed based on the path coefficients of the structural model.

4.2 Implement Data Collection Plan

This section describes how the sample was obtained and how the questionnaire was conducted, as addressed previously in sections 3.3.7.3 and 3.3.7.4. Sampling was performed by randomly selecting 375 Open CoPs in AFKN. The CoP facilitators or knowledge owners were contacted to see if they were interested in allowing their CoP to be surveyed. Once a commitment was obtained from a CoP, its members became part of the candidate pool. Of the 375 Open CoPs that were contacted, 157 agreed to allow their members to become part of the candidate pool. The candidate pool was established for the those 157 CoPs and consisted of 13,750 individuals. Eleven-hundred-fifteen invitations were sent to randomly selected members across the 157 CoPs to obtain a minimum of 100 responses. The questionnaire was open and available for two weeks. The analyses of the descriptive data were conducted using Minitab version 15 (Minitab, 2007).

4.3 Implement Data Analysis Plan

This section addresses the results that were obtained after implementing the data analysis plan explained in Chapter 3. The remaining subsections provide the specific results for the methodology addressed in sections 3.3.8.1–3.3.8.4.

4.3.1 Implement Data Analysis Plan: Descriptive Statistics

The response rate was 21.1% with 235 complete responses. This amount is above the 100 required to test the KM continuance model but below the 384 responses needed to generalize to the AFKN population that was developed as part of the sample size specifications of section 3.3.7.4. However, due to organization constraints, no additional members may be surveyed. As a result, the margin of error is increased to 6%, making the

required responses 200. The demographic breakdown of the respondents is 43% civilian, 22.5% officer, and 34.5% enlisted. Overall, 54% of the respondents were members of a clearinghouse CoP, 18% were in an interactive CoP, and 28% were in a process CoP. Table 15 displays the results of the responses.

Table 15: Sample Characteristics

Variable	Count	Percentage
Percent of voluntary		
Yes	213	90.64
No	22	9.36
Months of CoP membership		
Less than 1	9	3.83
1 to 12	69	29.36
13 to 24	55	23.4
25 to 36	49	20.85
37 to 48	23	9.79
49 to 60	18	7.66
More than 60	12	5.11
Rank distribution		
E-1 through E-4 (1)	3	1.28
E-5 and E-6 (2)	32	13.62
E-7 through E-9 (3)	46	19.57
O-1 through O-3 (4)	18	7.66
O-4 through O-6 (5)	35	14.89
O-7 through O-10 (6)	0	0
GS-1 through GS-5 (7)	0	0
GS-6 through GS-10 (8)	4	1.7
GS-11 through GS-15 (9)	6	2.55
Contractor (10)	73	31.06
Other (11)	18	7.66
Position in CoP		
Facilitator	19	8.09
Expert	20	8.51
Leader	35	14.89
Beginner	64	27.23
Outsider	29	12.34
Bystander	68	28.94
Purpose of CoP		
Organizational CoP	66	28.09
Project Team CoP	51	21.7
Functional Interest CoP	118	50.21
Individual characterization of CoP		
Clearinghouse CoP	126	53.62
Interactive CoP	43	18.3
Process CoP	66	28.09
Total	235	

4.3.2 Implement Data Analysis Plan: Measurement Model Assessment

The assessed measurement model establishes model reliability and validity. The items evaluated as part of the measurement model are internal consistency reliability and indicator reliability. Internal consistency reliability is measured by evaluation of the Cronbach's Alphas and the Composite Reliabilities of the constructs shown in Table 16 (Fornell & Larcker, 1981; Sosik et al., 2009). The acceptable level is 0.7 for an exploratory study (Chin, 1998; Hair, 1998). The 0.8 or 0.9 level is the desired level in later stages of research (Nunnally, 1978). This research extends previously addressed theory and therefore is exploratory in nature, making the 0.7 level acceptable. The 10 constructs have Cronbach's Alphas above 0.81 and composite reliabilities above 0.86. Both exceed the 0.7 level acceptable for exploratory research.

Table 16: Composite Reliability, Cronbach's Alpha, and Average Variance Extracted

Variable constructs	# of items	M	SD	Composite reliability	Cronbach's Alpha	Average Variance Extracted (AVE)
Facilitating Conditions	7	4.62	1.26	0.863	0.815	0.477
IT Self-Efficacy	3	4.90	1.46	0.937	0.898	0.831
KM CB	3	2.11	1.0	0.896	0.826	0.742
KM CI	3	5.35	1.60	0.975	0.962	0.930
Network Ties Disconfirmation	3	4.07	1.23	0.924	0.877	0.802
Post-Usage Usefulness	4	4.78	1.45	0.960	0.944	0.856
Shared Language Disconfirmation	4	4.46	0.95	0.896	0.843	0.686
Satisfaction	3	5.10	1.27	0.945	0.913	0.852
System Quality Disconfirmation	4	4.56	1.31	0.893	0.841	0.677
Trust Disconfirmation	6	4.76	0.97	0.931	0.911	0.692

Indicator reliability is a measure of the proportion of each indicator's variance that is explained by the respective latent variable. An acceptable rule of the thumb is that each item's loading should be 0.7 or greater. This results in a square root of approximately 0.5 or

greater. The bold items in Table 17 represent the loadings for the measure model. All of the loadings exceed the 0.7 threshold with the exception of FC1, FC2, FC5, and SL4. Removing FC1, FC2, and FC5 simultaneously improves the facilitating conditions construct's AVE to 0.631. It also increases the composite reliability to 0.870 while decreasing the Cronbach's Alpha to 0.799. Removing SL4 improves the shared language construct's AVE to 0.807. It increases the composite reliability to 0.926 and Cronbach's Alpha to 0.880.

Table 17: Loadings and Crossloadings

	Facilitating conditions	IT self-efficacy	KM CB	KM CI	Network ties disconfirmation	Post-usage usefulness	Shared language disconfirmation	Satisfaction	System quality disconfirmation	Trust disconfirmation
FC1	**0.688**	0.469	0.322	0.395	0.045	0.421	0.154	0.475	0.440	0.306
FC2	**0.605**	0.340	0.279	0.266	0.102	0.284	0.132	0.389	0.358	0.223
FC3	**0.713**	0.359	0.272	0.320	0.184	0.344	0.233	0.427	0.410	0.380
FC5	**0.526**	0.468	0.249	0.212	0.303	0.416	0.239	0.427	0.420	0.358
FC6	**0.762**	0.339	0.320	0.348	0.290	0.358	0.199	0.457	0.288	0.300
FC7	**0.763**	0.315	0.365	0.440	0.215	0.416	0.213	0.440	0.338	0.262
FC8	**0.744**	0.325	0.383	0.431	0.180	0.430	0.144	0.402	0.269	0.209
SE1	0.502	**0.903**	0.318	0.467	0.138	0.556	0.169	0.636	0.507	0.297
SE2	0.452	**0.924**	0.285	0.441	0.235	0.608	0.202	0.617	0.552	0.379
SE3	0.495	**0.907**	0.358	0.435	0.239	0.612	0.220	0.627	0.564	0.415
CB1	0.401	0.298	**0.843**	0.506	0.181	0.430	0.085	0.344	0.250	0.247
CB2	0.374	0.319	**0.842**	0.405	0.246	0.440	0.206	0.331	0.280	0.288
CB3	0.410	0.290	**0.898**	0.392	0.266	0.358	0.280	0.275	0.217	0.292
CI1	0.473	0.419	0.454	**0.957**	0.235	0.722	0.172	0.624	0.370	0.348
CI2	0.542	0.523	0.534	**0.968**	0.263	0.747	0.221	0.676	0.451	0.371
CI3	0.460	0.476	0.482	**0.968**	0.222	0.723	0.251	0.591	0.421	0.376
NT1	0.231	0.178	0.245	0.231	**0.861**	0.310	0.473	0.259	0.290	0.516
NT2	0.227	0.202	0.249	0.205	**0.908**	0.330	0.474	0.323	0.357	0.498
NT3	0.262	0.214	0.222	0.236	**0.917**	0.373	0.428	0.335	0.344	0.502
PUU1	0.531	0.646	0.451	0.654	0.369	**0.931**	0.313	0.694	0.560	0.480
PUU2	0.534	0.609	0.451	0.668	0.382	**0.952**	0.328	0.694	0.533	0.511
PUU3	0.488	0.562	0.438	0.656	0.372	**0.914**	0.306	0.635	0.535	0.498
PUU4	0.495	0.583	0.424	0.814	0.284	**0.902**	0.255	0.723	0.535	0.454
SL1	0.209	0.191	0.192	0.186	0.461	0.322	**0.861**	0.222	0.330	0.521
SL2	0.237	0.172	0.129	0.216	0.414	0.249	**0.893**	0.232	0.376	0.501
SL3	0.200	0.161	0.163	0.174	0.402	0.235	**0.865**	0.230	0.365	0.502
SL4	0.242	0.187	0.232	0.158	0.406	0.258	**0.676**	0.159	0.278	0.396
ST1	0.511	0.570	0.312	0.613	0.377	0.653	0.253	**0.912**	0.599	0.468
ST2	0.635	0.682	0.324	0.612	0.290	0.721	0.203	**0.942**	0.669	0.455
ST3	0.569	0.650	0.388	0.589	0.286	0.684	0.254	**0.915**	0.640	0.460

	Facilitating conditions	IT self-efficacy	KM CB	KM CI	Network ties disconfirmation	Post-usage usefulness	Shared language disconfirmation	Satisfaction	System quality disconfirmation	Trust disconfirmation
SQC1	0.307	0.391	0.137	0.325	0.276	0.425	0.381	0.507	**0.820**	0.504
SQC2	0.407	0.502	0.258	0.356	0.324	0.535	0.374	0.542	**0.823**	0.584
SQC3	0.472	0.564	0.232	0.371	0.253	0.503	0.320	0.630	**0.853**	0.449
SQC4	0.476	0.479	0.312	0.361	0.365	0.454	0.274	0.580	**0.794**	0.467
T1	0.296	0.311	0.237	0.272	0.475	0.381	0.481	0.337	0.453	**0.801**
T2	0.322	0.312	0.240	0.333	0.466	0.436	0.507	0.389	0.517	**0.866**
T3	0.291	0.308	0.183	0.250	0.528	0.365	0.508	0.391	0.477	**0.851**
T5	0.327	0.310	0.270	0.283	0.447	0.409	0.514	0.392	0.521	**0.842**
T6	0.377	0.391	0.330	0.377	0.475	0.537	0.441	0.520	0.556	**0.833**
T7	0.411	0.327	0.300	0.345	0.420	0.445	0.475	0.419	0.490	**0.794**

Construct validity of the measurement model is determined by evaluating factor loadings and cross-loadings, while establishing convergent and discriminant validity. A generally accepted rule of thumb is to accept items with loadings of 0.7 or greater. Bollen (1989) suggested that larger factor loadings indicate unidimensionality. Items should load closely with their respective constructs and load poorly with other constructs. All items load well with the exceptions noted previously of FC1, FC2, FC5, and SL4. Table 17 illustrates loadings and crossloadings.

Convergent validity is a measure of how well the measurement items relate to the construct (D. T. Campbell & Fiske, 1959; L. Campbell, Campbell, & Dickinson, 2004). Convergent validity is established when the AVE is 0.5 or greater (Fornell & Larcker, 1981). AVE is a measure of the variance shared between the construct and its indicators. Each measurement item should load on its latent construct with significant t-value (Chin, 1998). Table 16 indicates that all AVE are in a range from 0.67 to 0.93 with the exception of facilitating conditions at 0.48.

Discriminant validity is established when each set of measurement items correlates weakly to other sets of measurement items (D. T. Campbell & Fiske, 1959). Discriminant validity is established when the square root of the AVE is consistently greater than the off-diagonal correlations. Discriminant validity can also be established by removing items that load poorly or appear to load on more than one construct. Table 18 reflects discriminate validity for all measurement items. As previously noted, the removal of FC1, FC2, FC5, and SL4 improves the AVE for the facilitating condition and shared language constructs.

Improving AVE will improve the discriminant validity of each set of measures. Tables 16–18 show a model that is well-developed and meets reliability and validity standards for PLS.

Table 18: Discriminant Validity

	Latent variables	1	2	3	4	5	6	7	8	9	10
1	Facilitating conditions	**0.691**	0	0	0	0	0	0	0	0	0
2	IT self-efficacy	0.5303	**0.912**	0	0	0	0	0	0	0	0
3	KM CB	0.4597	0.3514	**0.861**	0	0	0	0	0	0	0
4	KM CI	0.511	0.4915	0.509	**0.964**	0	0	0	0	0	0
5	Network ties disconfirmation	0.2685	0.2222	0.2655	0.2494	**0.895**	0	0	0	0	0
6	Post-usage usefulness	0.5535	0.6484	0.4768	0.7585	0.3785	**0.925**	0	0	0	0
7	Shared language disconfirmation	0.2667	0.215	0.2151	0.2225	0.5097	0.3241	**0.828**	0	0	0
8	Satisfaction	0.6204	0.6877	0.3695	0.6552	0.3437	0.7436	0.2559	**0.923**	0	0
9	System quality disconfirmation	0.5097	0.5926	0.2892	0.4305	0.3708	0.5848	0.408	0.6893	**0.823**	0
10	Trust disconfirmation	0.4104	0.3973	0.3186	0.3787	0.5624	0.5243	0.5834	0.4993	0.6087	**0.832**

4.3.3 Implement Data Analysis Plan: Structural Model Assessment

The structural model is assessed by estimating the amount of variance (R^2 values) and the path coefficients. The R^2 values measure the predictive power of the model on the dependent variables (Chin, 1998; Chin et al., 2003). The level of R^2 is explained differently in various literatures. Falk and Miller (1992) considered an R^2 that ranges from 11% to 75% as significant. Chin (1998) and Chin et al. (2003) developed different categories to explain the levels of R^2 significance. An R^2 of greater than 0.67 is considered substantial, 0.33 to 0.67 is moderate, and 0.19 to 0.33 is weak.

Path coefficients indicate the strength of the relationships between the different constructs tested in the model. T-values are used in the measurement model and structural model to determine the significance of the paths. The path coefficients are estimated using the bootstrapping method with the recommend sample size of 500 (Chin, 1998). Significant path relationships indicate support for the hypotheses (Bentler, 1985). Chin et al. (2003) recommended that standardized paths be at least 0.20 and ideally 0.30 to be considered meaningful.

The results of the model shown in Figure 18 indicate that there are three significant paths that meet the recommended 0.20 cutoff. Five significant paths exceed the recommended 0.30 cutoff. Six paths fall below the 0.20 cutoff. However, two of the six paths are statistically significant at the 0.05 level. The variance explained by trust disconfirmation, network ties disconfirmation, shared language disconfirmation, and system quality disconfirmation to post-usage usefulness and satisfaction is 40% and 50%, respectively. The pathways from trust disconfirmation to post-usage usefulness and satisfaction are all

significant at or above the $p = 0.05$ level. The pathway from shared language disconfirmation to satisfaction is significant at the $p = 0.05$ level. The pathways from network ties disconfirmation to post-usage usefulness and satisfaction are all insignificant. The pathway from shared language disconfirmation to post-usage usefulness is insignificant. The system quality disconfirmation to post-usage usefulness and satisfaction are all significant above the $p = 0.05$ level. System quality disconfirmation also has a significant path above the $p = 0.05$ level to network ties disconfirmation. The variance explained by system quality disconfirmation to network ties disconfirmation is 14%. The amount of KM CI variance explained by post-useful usefulness, satisfaction, and IT self-efficacy is 60%. The pathways from post-useful usefulness and satisfaction are significant above the $p = 0.05$ level. The pathway from IT self-efficacy to KM CI is insignificant. The amount of variance explained by KM CI is moderate based on Chin et al. (2003) and is similar to variance obtained in the IS research of Bhattacherjee et al. (2008) and the KM research of Chen (2007). The amount of KM CB variance explained by KM CI and facilitating conditions is 31%. The pathways from KM CI to KM CB and FC to KM CB are both significant above the $p = 0.05$ level. The variance explained is weak according to the Chin's criteria (1998). The variance also indicates that the model shows a similar result in intentions to action from previous research (Bhattacherjee et al., 2008). This result indicates that the model functions in a similar fashion to previous research.

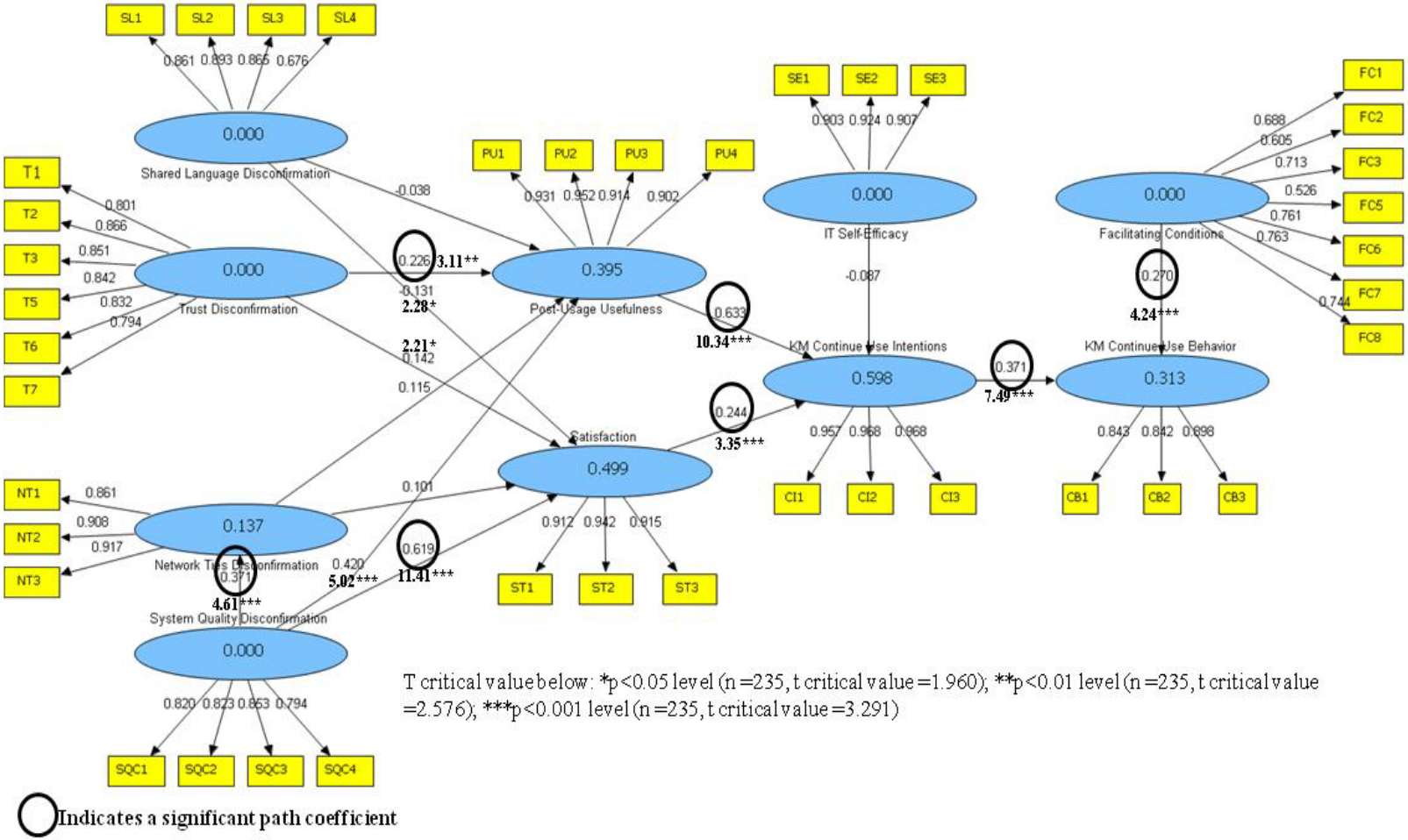


Figure 18: KM Continuance PLS Model

4.3.4 Implement Data Analysis Plan: Hypothesis Testing

Hypothesis tests were carried out to examine the relationships between the 10 constructs. The hypotheses were formed based on previous studies and research frameworks and tested with the data collected using PLS estimation. Hypotheses in PLS analyses are examined by evaluating the significance of the path coefficient that describes each hypothesis. For example, the hypothesis *satisfaction is expected to positively influence KM CI* would be examined by the significance of the path. As an example in Bhattacherjee's work, the pathway from satisfaction to CI was a $\beta = 0.57$, significant at $p < 0.001$ (2008). Based on this indication, I would reject the null hypothesis and accept that satisfaction has a positive influence on CI. Table 19 provides a summary of the structural paths, path coefficients, and associated t-values for the supporting hypotheses. Table 19 also provides summarized results and findings that emerged from the statistical analysis (SA) of the KM Continuance Model and anecdotal analysis (AA) of user comments. The anecdotal analysis shown in Appendix F was conducted by initially dividing the comments into positive and negative classifications. The positive and negative classifications were then divided into six categories. The six categories are 1) repository performance, 2) access, 3) content, 4) organizational support, 5) time, and 6) collaborative performance. The six categories were developed based on the principal investigator's experience. The comments in the six categories document the users' evaluations of their CoP experience and will be explored more extensively in future research.

4.3.4.1 Hypothesis One

The first hypothesis explored the relationship between community KM elements and user evaluations. The specific variables tested were trust disconfirmation, network ties disconfirmation, shared language disconfirmation, post-usage usefulness, and satisfaction. The variables resulted in six supporting hypotheses. Based on the significance of the pathways, the null hypothesis is rejected for each hypothesis with the exception of H1C, H1D, and H1E. H1B and H1E are both statistically significant, but their path coefficients do not exceed the 0.20 threshold. H1A is statically significant, exceeding the 0.20 threshold at 0.226 but falling short of the 0.30 desired threshold. The results for these hypotheses indicate that the community KM elements have minimal influence on a user's evaluation.

4.3.4.2 Hypothesis Two

The second hypothesis explored the relationship between technology KM elements and user evaluations. The specific variables tested were system quality disconfirmation, network ties disconfirmation, post-usage usefulness, and satisfaction. The variables resulted in three hypotheses. Based on the significance of the pathways, the null hypothesis is rejected for H2A, H2B, and H2C. The pathway coefficients for each path exceed the desired 0.30 threshold, indicating pathways that strongly influence their dependent variable. The pathways of hypotheses H2B and H2C are 0.420 and 0.619, respectively, indicating that SQC has a strong influence on a user's post-usage usefulness and satisfaction levels.

4.3.4.3 Hypothesis Three

The third hypothesis explored the relationship between user evaluations and KM continued-use intentions. The specific variables tested were post-usage usefulness, satisfaction, and KM continued-use intentions. The variables resulted in two hypotheses. Based on the significance of the pathways, the null hypothesis is rejected for H3A and H3B. H3A is 0.633, which indicates that users' evaluations of post-usage usefulness have a strong and significant influence on their KM continued-use intention.

4.3.4.4 Hypothesis Four

The fourth hypothesis explored the relationship between KM continued-use intentions and KM continued-use behavior. The variables resulted in a single hypothesis. Based on the significance of the pathway, the null hypothesis is rejected for the hypothesis. The path coefficient for H4 is 0.371, which exceeds the 0.30 desired threshold. The level indicates that KM continued-use intention influences KM continued-use behavior; however, the level of the path coefficient indicates that other factors that were not evaluated influence KM continued-use behavior.

4.3.4.5 Hypothesis Five

The fifth hypothesis explored the relationship between IT self-efficacy and KM continued-use intentions. The variables resulted in a single hypothesis. The pathway for hypothesis five is below 0.20 and has an insignificant t-value. As a result, the null hypothesis is not rejected for the hypothesis. The result for this hypothesis indicates that IT self-efficacy does not influence KM continued-use intentions. This result was not unexpected as the results have

varied in the literature. The results may indicate that IT self-efficacy operates differently in the context of KM.

4.3.4.6 Hypothesis Six

The sixth hypothesis explored the relationship between facilitating conditions and KM continued-use behavior. The variables resulted in a single hypothesis. Based on the significance of the pathway, the null hypothesis is rejected for the hypothesis. The pathway coefficient for H6 is 0.270, exceeding the minimum 0.20 level. This pathway coefficient level indicates that facilitiatiing conditions influence KM continued-use behavior. The level also indicates that factors that were not explored in this study may influence KM continued-use behaviors.

Table 19: Summary of Hypotheses

Hypothesis	Path coefficients	T-Value	Hypothesis supported	Explanation	Findings	Limitations	Implications
H1A	0.226**	3.11	Yes	A significant indication that T influences PUU. The path coefficient is approximately half the size of SQC influence on PUU by comparison.	Community elements influence a user's evaluation of the KM system (SA, AA) The influence of individual community elements is not uniform (SA)	Individuals may make a composite judgment of the community environment Noninteractive demographics of the current study may have limited the evaluation of community elements	Managers and CoP facilitators must encourage trust of individuals and the system. Network ties and a shared language willdevelop as a byproduct of trust. Managers and CoP facilitators must understand how individuals are using CoPs. CoP facilitators must arrange the CoP differently for interaction versus noninteraction
H1B	0.142*	2.21	Yes	A significant indication that T influences ST. However, the path coefficient is below minimum level of 0.20.			
H1C	0.115	1.54	No	An insignificant indication that NT does not influence PUU.			

Hypothesis	Path coefficients	T-Value	Hypothesis supported	Explanation	Findings	Limitations	Implications
H1D	0.101	1.74	No	An insignificant indication that NT does not influence ST.			
H1E	-0.038	0.53	No	An insignificant indication that SL does not influence PUU.			
H1F	-0.131*	2.28	Yes	A significant indication that SL influences ST. However, the path coefficient is below minimum level of 0.20. The negative path coefficient may indicate that respondents were confused by the questions they were asked in this category			

Hypothesis	Path coefficients	T-Value	Hypothesis supported	Explanation	Findings	Limitations	Implications
H2A	0.371***	4.61	Yes	A significant indication that SQC influences NT. While this relationship was significant, it had minimal influence on NT to PUU or NT to ST.	Technology elements have a strong influence on a user's evaluation of a KM system (SA) Individuals form a judgments based on accessibility and quality of the content (AA)	Different CoP types may require different technologies Different CoPs may require different evaluations Individuals of the same CoPs may view their CoPs in different ways	AFKN administrators must ensure that the system is accessible all the time CoP facilitators must make sure CoP content is organized and current CoP membership should be reviewed periodically so that those who do not want to be members are removed Management must insure that the systems are accessible and current
H2B	0.420***	5.02	Yes	A significant indication that SQC influences PUU. The path coefficient exceeds the desired value of 0.30.			

Hypothesis	Path coefficients	T-Value	Hypothesis supported	Explanation	Findings	Limitations	Implications
H2C	0.619***	11.41	Yes	A significant indication that SQC influences ST. The path coefficient exceeds the desired value of 0.30 and is the most significant factor influencing ST.			
H3A	0.633***	10.34	Yes	A significant indication that PUU influences KM CI. The path coefficient exceeds the desired value of 0.30 and is the most significant factor in explaining the KM CI.	Post-usage usefulness has a stronger influence on KM CI than satisfaction (SA) Both user evaluation constructs are driven by performance as shown in the extended comments (SA, AA)	The satisfaction and post-usage usefulness measures are used across numerous contexts Individuals may be making very different evaluations based on their experiences, even though they may mark the questionnaire the same way	The user evaluation is a bottom-line judgment CoP facilitators must evaluate the performance of their CoP Members must be asked about the currency of the content Performance is important If CoP is not helping performance, it will not be used
H3B	0.244***	3.35	Yes	A significant indication that ST influences KM CI. The path coefficient exceeds the desired value of 0.30.			

Hypothesis	Path coefficients	T-Value	Hypothesis supported	Explanation	Findings	Limitations	Implications
H4	0.371***	7.49	Yes	A significant indication that KM CI influences KM CB. The path coefficient exceeds the desired value of 0.30.	As expected, KM CI influences KM CB (SA) Intervening factors may limit the conversion of KM CI to actual behavior (SA, AA)	KB CB was determined by using self-reported information Actual usage may be higher or lower based on actual metrics	Managers and CoP facilitators must develop ways to improve their awareness of KM participation Current metrics provide a limited view of usage, especially for interactive CoPs
H5	-0.087	1.22	No	An insignificant indication that IT SE does not influence KM CI. The negative path coefficient may indicate that respondents may have been confused by the questions	IT self-efficacy was expected to influence KM CI, but it did not (SA) Individuals were neutral in their responses to the questions (SA) No comments mention a lack of skill (AA)	This measure may not have asked the right questions for this context Questions may need to be more specific about particular aspects of the system	Individuals who are confident in their abilities are an important factor to CoP usage Individuals may be confident about things they don't understand CoP knowledge owners should educate their CoP about different AFKN functions periodically (Tip-of-the-day concept)

Hypothesis	Path coefficients	T-Value	Hypothesis supported	Explanation	Findings	Limitations	Implications
H6	0.270***	4.24	Yes	A significant indication that FC influences KM CB. The path coefficient is above the minimum level of 0.20 but below 0.30.	Facilitating conditions influenced KM CB by about 6% (SA) Time, leadership directives, and support are major factors (AA) Additional factors did not make measures better than before (SA) Individuals comments can be converted into future questions (AA)	Additional constructs should be evaluated outside of the facilitating conditions construct	Managers must provide resources (time, training, faster systems, and motivation) in many forms. Leadership is important, especially in terms of mandating or encouraging the use of CoPs Organizational policies are important

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed)

4.4 Lessons Learned from Data Analysis

Overall, the data collection and analysis plan went well. There were several lessons learned. First, the use of periodic reminders was an approach that was useful in increasing the response rate and receiving feedback. The process was time consuming yet achievable with the advent of technology. Second, the online questionnaire was implemented across two systems. This redundancy enabled respondents who did not have access to one system to gain access on the other. Third, developing the data collection plan in advance allowed the questionnaire to be modified as additional constraints were added to the data-collection process. The final lesson learned was to have other alternatives other than continuing to survey if the response rate is not as initially planned. The alternative may be to adjust the analysis or to accept a larger margin of error.

CHAPTER 5: CONCLUSIONS

5.1 Introduction

This chapter examines the results of this research. Initially, a review of the research questions and findings is presented. Next the research products developed as part of the study are examined. The implications for managers and academics are discussed. Finally, conclusions are covered.

5.2 Research Questions

The original research question asked *How do KM elements influence a user's intention to continue participation in a CoP that is facilitated and enhanced by technology?* From the original research question four sub-questions emerged. The sub-questions with conclusions are the following:

- How do community and technology elements influence user evaluations of the CoP?

The results of the statistical examination show that community and technology elements influence user evaluation of the CoP. However, the influence is not uniform across all elements. This research examined the community elements of trust, network ties, and shared language using a disconfirmation approach. The elements were based on Social Capital Theory and were expected to work together to influence the user's evaluation (Nahapiet & Ghoshal, 1998). In this examination, trust disconfirmation was the only community element shown to influence the user's evaluation of post-usage usefulness. The other elements showed minimal-to-no significant pathways. The reason for this may lie in the demographics of the survey group. According to the data, approximately 18% of the respondents denoted that their CoP was interactive. The data also indicate a neutral-to-negative response to the community KM element questions. These two data

combinations may indicate that there was limited amount of interaction that was occurring among the CoP members who responded to the questionnaire. As a result, they were limited in how they could respond to the questions based on their experience with AFKN.

In contrast to the community KM element, the statistical analysis of the technology KM element showed a positive influence on both post-usage usefulness and satisfaction. While AFKN members may have limited experience with the community aspects of AFKN, many were clear on their answers regarding system quality disconfirmation. No matter what kind of CoP members belong to, they all require technology to access the AFKN system.

- How do community and technology elements influence each other?

The statistical analysis of the technology element of system quality disconfirmation positively influences the community element of network ties disconfirmation. The data show that users' experience with the technology side of the AFKN system influences how network ties are formed. However, as previously noted, while network ties disconfirmation is influenced by system quality disconfirmation, its influence mediated through network ties is not significant on post-usage usefulness or satisfaction.

- How do user evaluations influence the user intentions to participate in the CoP?

The statistical analysis of user evaluations in the form of satisfaction and post-usage usefulness have a significant influence on an individual's KM continued-use intention. According to the statistical analysis post-usage usefulness has a stronger influence when compared to satisfaction on KM continued use intention. This finding indicates that an individual's KM CI decision is based on the evaluation of the CoP KM environment. Several anecdotal comments from the extended-response section of the survey support this finding.

- How do user KM continued-use intentions influence actual KM continued-use behavior?

The statistical analysis shows that KM CI is a significant influence on KM CB. While the intention-to-action gap exists in the current study, the variance explained by intentions on behavior is similar to previous IS research at 27% (Bhattacherjee et al., 2008). The current study uses self-reporting measures of usage behavior. This approach may not indicate an individual's actual usage behavior.

- How do individual and organizational elements influence KM continued-use intention and KM continued-use behavior?

Individual and organizational elements were examined using the constructs of IT self-efficacy and facilitating conditions. IT self-efficacy was expected to influence KM CI; however, the statistical data did not support that expectation. In the Bhattacherjee et al. (2008) research, IT self-efficacy influenced IS continued-use intentions. However, it was noted that this influence may vary in different contexts. The construct facilitating conditions was established in previous research to model the influence of external resources and was expected to influence KM CB. Previous research noted that other factors could be viewed as external resources that could influence behavior (Bhattacherjee et al., 2008; Venkatesh et al., 2003). Facilitating conditions as used in this research added additional factors to explore other dimensions viewed as external resources. Facilitating conditions influenced the KM CB by 6%.

5.3 Research Product

As this research developed over time, several research product milestones were developed to ensure successful completion. The research products that were developed include

- A conceptual model based on previous research about KM and continued usage that incorporates community and technology elements.

A conceptual model was developed that blended the conceptual underpinnings of KM with the marketing-based approach of continued usage. The conceptual model incorporated the key elements of a KM strategy that is social and technical in nature. The continued-usage approach evaluates the influence of satisfaction and post-usage usefulness on continued use or participation in a KM effort.

- A KM strategy-to-tool taxonomy

To develop the conceptual model, it was necessary to understand the KM approaches that were developed previously. The goal of the KM strategy-to-tool taxonomy was to compare and contrast previous KM approaches. The result was the development of a taxonomy that builds and extends previous research. The developed taxonomy is used in study.

- A research model

After developing the conceptual model, different preexisting constructs were introduced that could possibly explain the relationships that emerged from the research question. The research constructs that were used in this study were not new, but their application as part of a continued use approach was an expansion in a different direction.

- A questionnaire

A questionnaire was developed that used many preexisting questions that were established with the various constructs. The objective was to develop a tight questionnaire with a solid psychometric base. The questions were also adapted for the specific research context. The questionnaire was developed and evaluated by conducting discussions with AFKN

administrators, following Air Force guidance, and conducting a pilot study. The results of the pilot study indicated that the questionnaire had good psychometric properties, which made it possible to remove several questions.

- An evaluation of the critical factors that emerge from the data

The conceptual model was developed into the research model. The research model was developed into the data-collection model. The data-collection model used preexisting measures to the greatest extent possible. Several items were removed from the questionnaire as previously addressed; however, the model that was tested was as initially conceived. After collecting data from respondents and analyzing the data, several possible changes emerged.

- A refined model based on critical factors

According to results of the statistical data evaluation, the relationships that are part of community KM appear to have minimal influence on the user's evaluation that leads to KM CI. While the constructs should have operated independently, individuals in this study appeared to see them as one. Additionally, many respondents may have been unfamiliar with the various aspects of operating in a community environment. The model is influenced slightly by directly linking shared language and network ties to the user evaluation constructs. According to this finding, these constructs should be maintained unless their removal makes the model too parsimonious for future research. IT self-efficacy showed no influence on the model when linked to KM CI. However, IT self-efficacy logically influences system quality disconfirmation. Using IT self-efficacy in this manner helps to explain why some users' evaluations are strongly influenced by system quality. Users with higher IT SE may have higher expectations for system

operation but may also be more willing to search for and use additional features. Individuals who use AFKN in this manner may experience improved satisfaction and post-usage usefulness.

To better refine the KM Continuance Model for future research, the data set was analyzed based on the clearinghouse, interactive, and process CoP categories. The division of the data set of 235 samples resulted in 126 samples for clearinghouse CoPs, 43 for interactive CoPs, and 66 for process CoPs. Using an R^2 of 0.395 from the original model resulted in an effect size of 0.69. An effect size of this magnitude allows each category of CoP to be tested without a loss of statistical power. The results of the comparison across the clearinghouse, interactive, and process CoPs were similar with the following exceptions. Hypothesis H1B was not supported when the clearinghouse and process CoPs were examined exclusively, which indicates that trust disconfirmation had no influence on a user's evaluation in the form of satisfaction. In addition, Hypotheses H1A and H1B were not supported for the interactive CoP. The path coefficients for the interactive CoPs were of a greater magnitude than those of the clearinghouse and process CoPs. This difference indicates that the community KM element influence is stronger for the interactive CoPs. This trend supports theory and supports keeping the community KM elements in the model.

Another difference when comparing the original model to the three subgroups is the influence of post-usage usefulness and satisfaction on KM CI. In the original model, the ratio for the path coefficients of post-usage usefulness to satisfaction is 3 to 1. The ratios for the clearinghouse, interactive, and process CoPs are approximately 1 to 1, 6 to 1, and 26 to 1, respectively. These results indicate that post-usage usefulness has a strong influence of KM CI for interactive and process CoPs.

The last indicated difference is manifested in the path coefficients magnitude for facilitating conditions or Hypothesis 6 for the interactive CoPs. The path coefficient is significant and approximately twice the magnitude of the clearinghouse CoP and five times the magnitude of the process CoP. This result indicates that organizational support is influential in moving an individual from KM CI to KM CB. The analysis of the CoP subgroups indicates that different parts of the KM CI model may be removed when examining a certain type of CoP. An example of this is the community KM element and the clearinghouse and process CoPs. The summary results of these analyses are shown in Appendix G.

- A document that explores the various elements of KM continuance

The first document that explores KM continuance is currently being produced. Subsequent documents will follow based on the data collected in this research.

5.4 Managerial Implications of the Results

The relevance of this research is determined by taking into account the significance of KM for both management and academic theory. This section addresses the implications of this research for managers of KM. Although this examination addresses a specific KM environment, its results are generalizable beyond the Air Force.

An early objective of this research was to develop an approach that allows management to determine the effectiveness of a KM system based on individual employees and strategic objectives. This research examined individuals across numerous CoPs. The results show that the overall objective of AFKN to support CoPs that are facilitated and enhanced by technology is being met with varying degrees of success (SA, AA).

Another objective was for management to better align the use of the KM system to the needs of the employee and organization. By examining the results of the model and respondent comments, it is evident that individuals have limited time (SA, AA). Respondents reported that clearinghouse and process CoPs that were up to date and accessible were a great resource (AA). However, several respondents indicated that their CoP—and AFKN as a whole—was difficult to access, difficult to navigate, and contained information that was not being maintained (AA). Respondents who used AFKN interactively found the tools cumbersome and immature at this point (AA). Individuals will often send e-mails rather than using the online collaborative tools such as chat, discussion forums, and web conferencing due to poor interfaces across the AFKN system (AA). The new social network features of NetworkNow were noted as useful, but the respondent felt the network features were still too immature to work effectively (AA). This feedback could allow a CoP knowledge owner to adjust the CoP and tailor the resources for its members. For AFKN administrators, work is needed to improve system linkages, making the full array of features accessible anytime and anywhere (AA).

Research was needed to determine how and why an individual becomes a continuous user in order to improve the failure rates of KM efforts (Kerno, 2008; Tseng, 2008). The analysis of the data shows that trust and system quality are factors that influence an individual's evaluation of the system (SA). This finding is supported by positive and negative comments in Appendix F. The individual experiences vary, but users indicate that CoP content maintenance, CoP accessibility, and general time availability are factors that influence their continued usage (AA). Accessing AFKN requires a card interface, and this particular feature limits the time that users

can spend on the system (AA). Unless individuals have the same home accessibility as work accessibility, they are less likely to participate in their CoP and be continuous users (AA).

Research was needed to better understand how individuals participate in a KM environment (Lin & Tseng, 2005; Small & Sage, 2006; Tseng, 2008).There are two keys to better comprehending participation that are revealed in this study. First, management of the content is the most important aspect (SA, AA). Respondents reported in Appendix F that accessing accurate and timely knowledge was an important feature. These comments are in agreement with the KM continuance model. Second, interactivity is an important feature; however, it takes on different forms depending on the user (AA). To improve interactivity, individuals must understand what tools are available and how to access them. AFKN is currently marketing the security and privacy of its social networking tool. AFKN must emphasize these features. Additionally, AFKN must show the integration of social networking best practices. A summary of findings, limitations, and implications was presented in Table 19 (Chapter 4).

5.5 Future Research

Earlier in this research, a KM research framework was introduced (Figure 19) to help integrate the different streams of KM research. This research focused on the KM relationship that existed between units. As such, the research sought to understand the linkages that would produce a routine KM participant in a technology-enhanced CoP environment. Given the intense focus on this particular area, it is necessary to step back and evaluate other possibilities related to this research that are viable for future study.

	Properties of Units	Properties of the Relationships between Units	Properties of Knowledge
Knowledge Use (Application) Knowledge Transfer (Transfer) Knowledge Codification (Retention) Knowledge Generation (Creation) Knowledge Assurance (Security)	Focus of this category is on the characteristics of the unit Examples: • Experience • Status	Focus of this category is on dyadic relations and pattern of connections Examples: • Communication Type • Connection Intensity • Contact Frequency • Network of Connections	Focus of this category is on the characteristics of knowledge Examples: • Tacit Knowledge • Explicit Knowledge • Personalized • Codified

Figure 19: KM Research Framework adapted from Argote et al. (2003)

Respondents placed a great emphasis on the influence of technology in the CoP environment. Further research is needed to better understand the different technological needs based on the type of user and the type of CoP. Individuals who access a clearinghouse and process CoP may have different needs from those using their CoP interactively.

This research effort studied a wide range of CoP users. More research is needed to focus on the interactive CoP user. While theory supported the development of community KM, the results in this research were limited and deserve in-depth examination.

This research did not receive any responses from the highest ranking individuals in the organization. They were not intentionally omitted and could be a useful aspect to pursue. Senior ranking individuals are part of the AFKN system. An examination of how senior individuals use KM and if they interact in the KM environment would be interesting to conduct. It would be interesting to note how the CoPs function when senior officials are known to be part of the community or observing passively.

Numerous individuals were contacted who were no longer military members or no longer participated in AFKN. These individuals are still on the roster for many CoPs, which could be problematic. Knowledge owners have a limited amount of time to invest in the management of the CoP. An interesting study would track the workload of knowledge owners who have inactive or vacated CoP members. The same research could examine the impact of non-member CoP visitors. CoP visitors are individuals who have access to the knowledge of the CoP but are not required to establish membership in the CoP.

A final area of study could investigate the link between continuance behavior and performance at the individual, team, and organizational level. This relationship was proposed as part of the conceptual model but was outside the scope of the current study.

5.6 Conclusions

This investigation designed and implemented a 10-step research process. A KM strategy-to-tool taxonomy was developed that allowed the examination of KM continuance behavior. The

research study developed conceptual, research, and data collection models to examine the KM continuance behavior that exists in the AFKN KM system.

The study addressed one primary question with four sub-questions that resulted in the development of 14 testable hypotheses. The individual members of the examined AFKN CoPs were the unit of analysis. The data were collated by an online questionnaire that was developed from previously validated items. The data collection plan was designed to minimally impact the user while collecting the data in an efficient manner.

The results of this investigation demonstrate that a user's evaluation of a community environment that is enhanced by technology relies heavily on the quality of the system. The results of the investigation did support a finding that community KM, as manifested by trust, network ties, and shared language disconfirmation, has a small influence on a user's evaluation and subsequent KM continued-use intentions. The research results indicate that managers of KM systems must ensure system accessibility and knowledge quality. Managers must also ensure that their members have the time and tools to participate. Finally, managers must remove users who are not participating in the knowledge effort while purging and archiving knowledge that is no longer at the forefront.

The usefulness of a study to a larger body of work is determined by its repeatability and dissemination by the researcher beyond study completion. The usefulness is also determined by the extensions to the body of knowledge that are inspired by the research. This study has taken steps to place itself within an overall KM research framework, making it useful for future study.

APPENDIX A: INSTITUTIONAL REVIEW BOARD APPROVAL

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Eric J. Tucker**

Date: **February 25, 2010**

Dear Researcher:

On 2/25/2010, the IRB approved the following activity as human participant research that is exempt from regulation:

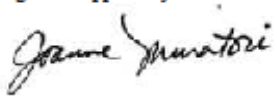
Type of Review:	Exempt Determination
Project Title:	KNOWLEDGE MANAGEMENT DETERMINANTS OF CONTINUANCE BEHAVIOR: EVALUATING THE AIR FORCE KNOWLEDGE NOW SYSTEM
Investigator:	Eric J Tucker
IRB Number:	SBE-10-06734
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Joseph Bielitzki, DVM, UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 02/25/2010 02:27:22 PM EST



IRB Coordinator

APPENDIX B: PILOT STUDY QUESTIONNAIRE

Pilot Survey for AFKN Knowledge Management Continuance Behavior (Respondent Order)

In this study, Air Force Knowledge Now (AFKN) includes a range of social and technology components used for the purpose of sharing knowledge. Please answer questions based on the community that contacted you or the one in which you are most active. Several questions will ask you to compare your initial experience with your current experience. Other questions will ask you about factors that affect your AFKN experience.

Please use your personal experience and answer the questions to the best of your knowledge. The results are kept confidential and your identity is not linked your answers. If you are unsure of any questions, leave the response blank.

Your comments on the clarity of the questions are welcome. Your time is valued. Thank you for your participation.

Please answerer questions in terms of disagreement or agreement as follows: Strongly Disagree (SD), Disagree (D), Disagree Somewhat (DS), Neutral (N), Agree Somewhat (AS), Agree (A), and Strongly Agree (SA).

#	Item	**Trust – Compared to my initial membership in this AFKN CoP, …**	SD	D	DS	N	AS	A	SA
1	T1	My trust in other CoP members is more than I expected.							
2	T2	My belief that other CoP members have good intentions is more than I expected.							
3	T3	My belief in the reliability of other members is more than I expected.							
4	T4	My CoP's effectiveness in sharing knowledge is more than I expected.							
5	T5	My CoP's general knowledge of the subject matter is more than I expected.							
6	T6	My CoP's overall capability as an expert source of knowledge is more than I expected.							
7	T7	My trust in this CoP's ability to protect sensitive material is more than I expected.							

#	Item	**Network Ties - Compared to my initial membership in this AFKN CoP, …**	SD	D	DS	N	AS	A	SA
8	NT1	Members know each other more closely than I expected.							
9	NT2	Members professionally interact (in CoP activities) more closely than I expected.							
10	NT3	Members network more often than I expected.							

	Item	**Satisfaction**						
		This section asks you to rate your satisfaction using different scales.						
		How do you feel about your overall experience using AFKN?						
11	ST1	Very Dissatisfied	Dissatisfied	Dissatisfied Somewhat	Neutral	Satisfied Somewhat	Satisfied	Very Satisfied

#	Item	Shared Language - Compared to my initial membership in this AFKN CoP, …	SD	D	DS	N	AS	A	SA
12	SL1	A common language is used to share ideas more than I expected.							
13	SL2	A common set of terms is known by members more than I expected.							
14	SL3	Members use technical terms common to all members more than I expected.							
15	SL4	My CoP developed a unique set of words to communicate ideas more than I expected.							

#	Item	System Quality - Compared to my initial membership in this AFKN CoP, …	SD	D	DS	N	AS	A	SA
16	SQC1	The reliability of accessing knowledge is more than I expected.							
17	SQC2	The accuracy of stored knowledge is more than I expected.							
18	SQC3	The ease of using the AFKN interface is better than I expected.							
19	SQC4	Technical support for AFKN interface is better than I expected.							

#	Item	Satisfaction						
		This section asks you to rate your satisfaction using different scales.						
		How do you feel about your overall experience using AFKN?						
20	ST2	Very Displeased	Displeased	Displeased Somewhat	Neutral	Pleased Somewhat	Pleased	Very Pleased

#	Item	Self-Efficacy	SD	D	DS	N	AS	A	SA
21	SE1	I can perform my job using AFKN resources without assistance from others.							
22	SE2	I can perform my job using AFKN resources if I have adequate time to complete the job.							
23	SE3	I can perform my job using AFKN using only the online help feature as a reference.							
24	SE4	I am confident in my ability to perform my job using AFKN resources.							

#	Item	Facilitating Conditions	SD	D	DS	N	AS	A	SA
25	FC1	I have the necessary resources to access AFKN.							
26	FC2	I can use the AFKN whenever I need it.							
27	FC3	I have full control over my use of AFKN.							
28	FC4	The actions of my supervisor affect how much I participate within my CoP.							
29	FC5	Employees receive a thorough orientation of AFKN.							
30	FC6	The organization provides the time needed to participate in CoPs.							
31	FC7	My organization's leadership supports the use of CoPs.							
32	FC8	My organization encourages me to integrate the use of CoPs into regular processes.							

#	Item	Satisfaction						
		This section asks you to rate your satisfaction using different scales.						
		How do you feel about your overall experience using AFKN?						
33	ST3	Very Frustrated	Frustrated	Frustrated Somewhat	Neutral	Contented Somewhat	Contented	Very Contented

#	Item	Post-Usage Usefulness	SD	D	DS	N	AS	A	SA
34	PUU1	Being a member of this CoP will increase my productivity (e.g., completion of work is faster).							
35	PUU2	Being a member of this CoP will improve my performance (e.g., makes my work routine better).							
36	PUU3	Being a member of this CoP will make me more effective (e.g., help me make better decisions).							
37	PUU4	I find this CoP to be useful in my job.							

#	Item	KM Continued Use Intention	SD	D	DS	N	AS	A	SA
38	CI1	I intend to continue participating in this CoP in the future.							
39	CI2	My personal intentions are to continue participating in this CoP to acquire, create, store, or transfer knowledge.							
40	CI3	If permitted by my organization, I would like to continue participating in this CoP to acquire, create, store or transfer knowledge.							

#	Item	KM Continued Use Behavior
41	CB1	**Number of times you visited this AFKN CoP in the last month?** 0 |1-3|4-6|7-9|10-12| more than 12
42	CB2	**What percentage of work do you currently perform using knowledge from this AFKN CoP?** 0%|1-10%|11-20%|21-30%|31-40%| more than 40%
43	CB3	**How much time, of your weekly routine, do you spend sharing knowledge with this AFKN CoP?** Less than 1 hour |1-3|4-6|7-9|10-12| more than 12 hours

#	Item	Satisfaction						
		This section asks you to rate your satisfaction using different scales.						
		How do you feel about your overall experience using AFKN?						
44	ST4	Absolutely Terrible	Terrible	Somewhat Terrible	Neutral	Somewhat Delighted	Delighted	Absolutely Delighted

#	Item	Demographics
45	D1	**To which CoP do you belong?** [Select from dropdown menu] List the community that contacted you or the one in which you are most involved.
46	D2	**Is your participation in this CoP voluntary?** Yes/No
47	D3	**How many months have you been a member of your CoP?** Less than 1|1-12|13-24|25-36|37-48|49-60| more than 60
48	D4	**What is your rank? If not listed, insert response in user entry box.**
		• E-1 through E-4 • E-5 and E-6 • E-7 through E-9 • O-1 through O-3 • O-4 through O-6 • O-7 through O-10 • GS-1 through GS-5 • GS-6 through GS-10 • GS-11 through GS-15 • Contractor • Other:_____

#	Item	Demographics
49	D5	**How would you characterize your membership in this CoP?** • Facilitator (Makes sure CoP operates smoothly) • Expert (Highly knowledgeable on the subject matter, expertise is sought by CoP members) • Leader (Supports the CoP, listens to facilitator and members to provide the CoP resources) • Beginner (New to the CoP, learning the community, intend to engage when acclimated) • Outsider (Primary affiliation is in another CoP, but this CoP is relevant to you) • Bystander (CoP member who does not engage, but uses the resources of the CoP)
50	D6	**How would you describe the purpose of this CoP?** • Organizational CoP (membership includes your entire organization) • Project Team CoP (membership is exclusive to specific project teams) • Functional Interest CoP (membership is based on interests, not team or organizational affiliation)
51	D7	**How would you characterize your CoP?** • Clearinghouse CoP (primarily a document exchange) • Interactive CoP (members interact on a regular basis) • Process CoP (contains functions that individuals use as part of their work routine)
52	D8	**What factors, positively or negatively, affect your decision to routinely participate in your CoP using AFKN?** Please use the block below to type your comments. COMMENTS: (250 character maximum)
53	D9	**Please provide your comments about the questionnaire?**

APPENDIX C: STUDY QUESTIONNAIRE

Survey for AFKN Knowledge Management Continuance Behavior

In this study, Air Force Knowledge Now (AFKN) includes a range of social and technology components used for the purpose of sharing knowledge. Some of the social and technology tools that are part of AFKN are discussion forums, blogs, wikis, and NetworkNow. Please answer questions based on the community that contacted you. If you are the sole member of your CoP and primarily interact with CoP visitors, please answer questions based on that interaction. Several questions will ask you to compare your initial experience with your current experience. Other questions will ask you about factors that affect your AFKN experience. Thank you for your participation.

Please answerer questions in terms of disagreement or agreement as follows: Strongly Disagree (SD), Disagree (D), Disagree Somewhat (DS), Neutral (N) Agree Somewhat (AS), Agree (A), and Strongly Agree (SA).

#	Item	Electronic Informed Consent	Agree	Disagree
1	IC1	Select Agree or Disagree		

#	Item	Trust – Compared to my initial membership in this AFKN CoP, …	SD	D	DS	N	AS	A	SA
2	T1	My trust in other CoP members is more than I expected.							
3	T2	My belief that other CoP members have good intentions is more than I expected.							
4	T3	My belief in the reliability of other members is more than I expected.							
5	T5	My CoP's general knowledge of the subject matter is more than I expected.							
6	T6	My CoP's overall capability as an expert source of knowledge is more than I expected.							
7	T7	My trust in this CoP's ability to protect sensitive material is more than I expected.							

#	Item	Network Ties - Compared to my initial membership in this AFKN CoP, …	SD	D	DS	N	AS	A	SA
8	NT1	Members know each other more closely than I expected.							
9	NT2	Members professionally interact (in CoP activities) more closely than I expected.							
10	NT3	Members network more often than I expected.							

#	Item	Shared Language - Compared to my initial membership in this AFKN CoP, …	SD	D	DS	N	AS	A	SA
11	SL1	A common language is used to share ideas more than I expected.							
12	SL2	A common set of terms is known by members more than I expected.							
13	SL3	Members use technical terms common to all members more than I expected.							
14	SL4	My CoP developed a unique set of words to communicate ideas more than I expected.							

#	Item	Satisfaction						
		This section asks you to rate your satisfaction using different scales.						
		How do you feel about your overall experience using AFKN?						
15	ST1	Very Dissatisfied	Dissatisfied	Dissatisfied Somewhat	Neutral	Satisfied Somewhat	Satisfied	Very Satisfied

#	Item	System Quality - Compared to my initial membership in this AFKN CoP, …	SD	D	DS	N	AS	A	SA
16	SQC1	The reliability of accessing knowledge is more than I expected.							
17	SQC2	The accuracy of stored knowledge is more than I expected.							
18	SQC3	The ease of using the AFKN interface is better than I expected.							
19	SQC4	Technical support for AFKN interface is better than I expected.							

#	Item	Self-Efficacy	SD	D	DS	N	AS	A	SA
20	SE1	I can perform my job using AFKN resources without assistance from others.							
21	SE2	I can perform my job using AFKN resources if I have adequate time to complete the job.							
22	SE3	I can perform my job using AFKN using only the online help feature as a reference.							

#	Item	Facilitating Conditions	SD	D	DS	N	AS	A	SA
23	FC1	I have the necessary resources to access AFKN.							
24	FC2	I can use the AFKN whenever I need it.							
25	FC3	I have full control over my use of AFKN.							
26	FC5	Employees receive a thorough orientation of AFKN.							
27	FC6	The organization provides the time needed to participate in CoPs.							
28	FC7	My organization's leadership supports the use of CoPs.							
29	FC8	My organization encourages me to integrate the use of CoPs into regular processes.							

#	Item	Satisfaction						
		This section asks you to rate your satisfaction using different scales.						
		How do you feel about your overall experience using AFKN?						
30	ST2	Very Displeased	Displeased	Displeased Somewhat	Neutral	Pleased Somewhat	Pleased	Very Pleased

#	Item	Post-Usage Usefulness	SD	D	DS	N	AS	A	SA
31	PUU1	Being a member of this CoP will increase my productivity (e.g., completion of work is faster).							
32	PUU2	Being a member of this CoP will improve my performance (e.g., makes my work routine better).							
33	PUU3	Being a member of this CoP will make me more effective (e.g., help me make better decisions).							
34	PUU4	I find this CoP to be useful in my job.							

#	Item	KM Continued Use Intention	SD	D	DS	N	AS	A	SA
35	CI1	I intend to continue participating in this CoP in the future.							
36	CI2	My personal intentions are to continue participating in this CoP to acquire, create, store, or transfer knowledge.							
37	CI3	If permitted by my organization, I would like to continue participating in this CoP to acquire, create, store or transfer knowledge.							

#	Item	KM Continued Use Behavior
38	CB1	**Number of times you visited this AFKN CoP in the last month?** 0 |1-3|4-6|7-9|10-12| more than 12
39	CB2	**What percentage of work do you currently perform using knowledge from this AFKN CoP?** 0%|1-10%|11-20%|21-30%|31-40%| more than 40%
40	CB3	**How much time, of your weekly routine, do you spend sharing knowledge with this AFKN CoP?** Less than 1 hour |1-3|4-6|7-9|10-12| more than 12 hours

#	Item	Satisfaction						
		This section asks you to rate your satisfaction using different scales.						
		How do you feel about your overall experience using AFKN?						
41	ST3	Very Frustrated	Frustrated	Frustrated Somewhat	Neutral	Contented Somewhat	Contented	Very Contented

#	Item	Demographics
42	D2	**Is your participation in this CoP voluntary?** Yes/No
43	D3	**How many months have you been a member of your CoP?** Less than 1|1-12|13-24|25-36|37-48|49-60| more than 60
44	D5	**How would you characterize your membership in this CoP?** • Facilitator (Makes sure CoP operates smoothly) • Expert (Highly knowledgeable on the subject matter, expertise is sought by CoP members) • Leader (Supports the CoP, listens to facilitator and members to provide the CoP resources) • Beginner (New to the CoP, learning the community, intend to engage when acclimated) • Outsider (Primary affiliation is in another CoP, but this CoP is relevant to you) • Bystander (CoP member who does not engage, but uses the resources of the CoP)
45	D6	**How would you describe the purpose of this CoP?** • Organizational CoP (membership includes your entire organization) • Project Team CoP (membership is exclusive to specific project teams) • Functional Interest CoP (membership is based on interests, not team or organizational affiliation)
46	D7	**How would you characterize your CoP?** • Clearinghouse CoP (primarily a document exchange) • Interactive CoP (members interact on a regular basis) • Process CoP (contains functions that individuals use as part of their work routine)

#	Item	Comments
47	C1	**What factors, positively or negatively, affect your decision to routinely participate in your CoP using AFKN?** Please use the block below to type your comments.
48	C2	**Please provide your comments about the questionnaire for future research?**

APPENDIX D: ANOVA

One-way ANOVA: Members versus Rating

```
Source  DF       SS     MS     F      P
Rating   2    87296  43648  2.35  0.100
Error   96  1779289  18534
Total   98  1866585

S = 136.1   R-Sq = 4.68%   R-Sq(adj) = 2.69%
```

One-way ANOVA: Visitors versus Rating

```
Source  DF          SS        MS     F      P
Rating   2   183233852  91616926  1.15  0.322
Error   96  7661430462  79806567
Total   98  7844664314

S = 8933   R-Sq = 2.34%   R-Sq(adj) = 0.30%
```

One-way ANOVA: PagesViewed versus Rating

```
Source  DF         SS        MS     F      P
Rating   2   20699440  10349720  2.26  0.110
Error   96  439143066   4574407
Total   98  459842505

S = 2139   R-Sq = 4.50%   R-Sq(adj) = 2.51%
```

One-way ANOVA: DocAdded versus Rating

```
Source  DF        SS       MS     F      P
Rating   2   4340979  2170490  3.33  0.040
Error   96  62557450   651640
Total   98  66898430

S = 807.2   R-Sq = 6.49%   R-Sq(adj) = 4.54%
```

One-way ANOVA: DocsViewed versus Rating

```
Source  DF          SS         MS     F      P
Rating   2   258058573  129029287  1.44  0.243
Error   96  8630654431   89902650
Total   98  8888713004

S = 9482   R-Sq = 2.90%   R-Sq(adj) = 0.88%
```

One-way ANOVA: wiki versus Rating

```
Source  DF      SS     MS     F      P
Rating   2   0.678  0.339  1.22  0.299
Error   96  26.615  0.277
Total   98  27.293

S = 0.5265   R-Sq = 2.48%   R-Sq(adj) = 0.45%
```

One-way ANOVA: discussion forums versus Rating

```
Source  DF      SS    MS     F      P
Rating   2    7590  3795  3.23  0.044
Error   96  112943  1176
Total   98  120533

S = 34.30   R-Sq = 6.30%   R-Sq(adj) = 4.35%
```

One-way ANOVA: email versus Rating

```
Source  DF      SS    MS     F      P
Rating   2   12578  6289  2.54  0.085
Error   96  238140  2481
Total   98  250719

S = 49.81   R-Sq = 5.02%   R-Sq(adj) = 3.04%
```

APPENDIX E: K-MEANS CLUSTER ANALYSIS

Inputs	
Data	
Input data	AFKN Data Set
# Records in the input data	14769
Input variables normalized	No

Variables								
# Selected Variables	8							
Selected variables	Members	PagesViewed	DocAdded	DocsViewed	Visitors	Wiki Pages	DF Posts	Emails

Parameters/Options	
# Clusters	3
Start Option	Random Start
# Starts	10
Seed	12345
# Iterations	10
Show data summary	Yes
Show distance from each cluster	Yes

Cluster centers

Cluster	Members	PagesViewed	DocAdded	DocsViewed	Visitors	Wiki Pages	DF Posts	Emails
Cluster-1	121	586	1402145	11282545	3128309	1453	6	8
Cluster-2	426	9798	549780	1935450	739772	34	3	54
Cluster-3	3	3193	0	0	10148	0	1	

Distance between cluster centers	Cluster-1	Cluster-2	Cluster-3
Cluster-1	0	9685035	132137307
Cluster-2	9685035	0	134050917
Cluster-3	132137307	134050917	0

Data summary		
Cluster	#Obs	Average distance in cluster
Cluster-1	5	34120943
Cluster-2	14763	2138894
Cluster-3	1	0
Overall	14769	2149576

APPENDIX F: USER COMMENTS

Classification	CoP Type	User Comments: Positive
Repository Performance	Clearinghouse	Works well as a depository for related documents and policy letters
	Clearinghouse	Mainly a document store
	Clearinghouse	Best thing about it is the ability to define and share information for communities across network boundaries.
	Clearinghouse	I am not a Water and Fuel Systems Maintenance troop; I use this CoP as a technical order resource in support of my duties as a WRM Manager. I do not participate in the forums.
	Clearinghouse	It was required to gain knowledge of a program.
	Clearinghouse	Usually, everything I need is there to perform.
	Clearinghouse	CoPs in general can be a useful tool. I am in the process of developing one for my unit's customers.
	Clearinghouse	I am the CoP Owner. I maintain its content for our project community. Its role is critical in terms of sharing information.
	Clearinghouse	COP is used primarily used for sharing program data deliverables.
	Interactive	Great way to share safety related information around the base.
	Interactive	Allows commanders easy access to safety info to ensure the wing's safety message is marketed correctly.
	Interactive	Much easier to share sensitive information via a secured area in the CoP rather than using e-mail. It also saves my outlook from getting clogged up with large attachments. I don't feel I could perform my job without the CoP - it's my best friend.
	Interactive	The usefulness
	Interactive	Great medium for document exchanges.
	Process	The CoP is an excellent resource for checks and balances
	Process	Information needed to do my work
	Process	I normally use the CoP as a research/information gathering tool.
Access	Clearinghouse	Access throughout the EUCOM theater
	Clearinghouse	Access to documents, references, and resources from anywhere.
	Clearinghouse	CoP is available through the Portal so it is accessible from home with CAC enabled machine.
	Clearinghouse	Frequency of available updates. Use of alerts a key feature for advising me of posted changes. I'm a member of several CoPs and would probably not use as much if not prompted by the alerts.
	Process	This is very useful for the fact that any member can access this site from any Air Force base all over the world.
Content	Clearinghouse	Relevance of Past Experience/Material
	Clearinghouse	As a bystander / outsider, I primarily use the CoP to access metric information that is a very large file. The metrics are functionally related to my job but aren't required continuously. So I only access the CoP sporadically.
	Clearinghouse	Up to date documents.
	Interactive	I find information in the CoP that I cannot find easily with other resources.
	Interactive	Knowledge and resource sharing.
	Process	Having a repository of Nancy Parks' knowledge is tremendously useful in my role as AFFTC APDP Focal Point. I'm in a lot of CoPs, and this is one of the better ones.
	Process	Being able to share large files with people across the Air Force
	Process	The CoP has access to various documents and planning tools I used for mission planning and execution.
	Process	CoP is a good source for the knowledge needed to perform my job duties.

Classification	CoP Type	User Comments: Positive
Organizational Support	Interactive	The CoPs are an easy format to share and store information.
	Process	I feel that the use of this CoP is a good practice and hope to see improvements.
Time	Clearinghouse	If I'm notified, it's easier to get to at my own pace
Collaborative Performance	Clearinghouse	Most entertaining thing about the pages is the daily quotes.
	Interactive	Great medium for networking and information sharing
	Process	collaborating with units
	Process	The CoP is an excellent resource for net working within the fire & emergency career field
	Process	Using the CoP is helpful for geographical separated folks who share common or collaborative work. Also, reduces phone and eliminates unnecessary travel to interact.

Classification	CoP Type	User Comments: Negative
Repository Performance		
Access	Clearinghouse	Lack of awareness
	Clearinghouse	Inability to navigate to areas of interest easily
	Clearinghouse	Time is a major factor. It is one more computer program that we have to log into and more usernames and passwords to remember. It contains useful information but because computer access can be hard to come by it is difficult to effectively use this CoP.
	Clearinghouse	CAC IS REQUIRED FOR ACCESS
	Clearinghouse	Access
	Clearinghouse	Limited functionality of CoP interface as compared to a website.
	Clearinghouse	ease of use
	Clearinghouse	We can no longer access AF Portal and the CoP from home without a CAC reader. As a reservist this is a severe limiting factor in my participation and is a bit frustrating.
	Clearinghouse	My CAC card expired and I haven't been able to access the Cop for a while.
	Clearinghouse	Security affects my decision in a negative way.
	Clearinghouse	Need more awareness and participation. SharePoint offers better solution from my initial impression
	Clearinghouse	I've just gotten access back after a couple year hiatus.
	Clearinghouse	From time to time the system is unavailable or extremely slow for whatever reason. Could be AF Portal related.
	Interactive	I am a member of the Air National Guard's, so I only have access to it one weekend a month, and that time is mostly spent training, with little time to fully utilize the CoP.
	Process	My unit's limited bandwidth coupled with heavy usage on drill weekends often cause connection problems.
	Process	Availability to access
	Process	Access when not at duty station is limited. As a reservist, I think I could get more out of the CoP if I could access full time.
	Process	Occasional non-availability and latency of AFKN severs makes use a little tedious at times.
	Process	I'm new to the use of this CoP. I did not find the layout to be very intuitive
	Process	Sometime finding things on the CoP is difficult.

Classification	CoP Type	User Comments: Negative
Content	Clearinghouse	Ensure CoP is updated regularly
	Clearinghouse	Also, when logged into the CoP there are so many folders on the AFKN that it is really hard to navigate. Very time consuming and frustrating
	Clearinghouse	Currency and availability of information
	Clearinghouse	This CoP needs to be better organized so that a new person should be able to find what they need. It also needs to be better updated with more up to date files. all other files should be in a folder called legacy or archive
	Clearinghouse	Would like to be able to upload large files, such as 500 MB or even as large as 2 GB in size.
	Clearinghouse	It is extremely hard to locate specific information. Folders are not set up in a logical manner. Am working with the CoP manager to fix this.
	Clearinghouse	The owners of the referenced CoP do not keep it up to date, which is a source of frustration.
	Clearinghouse	Many documents are outdated which limits their usefulness
	Clearinghouse	Relevance of information has the largest affect of my decision to use the CoP
	Clearinghouse	Needs to be a source of additional information about current initiatives or tends, benchmarks, etc...
	Clearinghouse	If the info I need is in the CoP, I use it...if not, I look elsewhere.
	Clearinghouse	Information available
	Interactive	I have information that I think would be useful (or interesting) to others, but I don't post anything because I'm not sure that I have the authority to release the information.
	Interactive	Keeping the CoP up to date is the most important factor in determining my participation. I like knowing that the information is accurate and current.
	Interactive	This is a new community as such it must provide updated information on the changing career needs.
	Interactive	I don't think anyone uses this anymore, if they ever did. The documents are not updated. New information that's pertinent to our career field is not pushed out or posted via the COP. No one ever contacts me by virtue of my COP affiliation.
	Process	I seldom use the CoP.
	Process	much of the data is outdated
Organizational Support	Clearinghouse	Lack of leadership support of AFKN CoPs in general
	Clearinghouse	Lack of training and clear purpose
	Clearinghouse	It is the mandated repository for information.
	Clearinghouse	As above in the last question, the CoP I participate in is document exchange only. Therefore, we are 'forced' to use it to receive the documents we need.
	Clearinghouse	I do not use the CoP unless is specifically required
	Clearinghouse	only way to access AF material content that is needed to accomplish goals
	Interactive	Dynamics within the Air Force, our community, my position and priorities of the leadership regarding projects I'm responsible for or collaborating with others.

Classification	CoP Type	User Comments: Negative
Time	Clearinghouse	Time
	Clearinghouse	Time allotted to use.
	Clearinghouse	Time has the largest affect of my decision to use the CoP
	Interactive Process	time available to read and write (participate)
		Due to several factors I have never really utilized my CoP access. Maybe in the future I will have the means to do so.
Collaborative Performance	Clearinghouse	It's not a primary means of communication for the team.

APPENDIX G: PLS ANALYSIS OF COP SUBGROUPS

Comparison of Hypotheses for CoP Subgroups

	Original Analysis (N = 235)				Clearinghouse CoP (N = 126)				Interactive CoP (N = 43)				Process CoP (N = 66)			
Hypothesis	Path COS	T-Value	SPRT	R^2	Path COS	T-Value	SPRT	R^2	Path COS	T-Value	SPRT	R^2	Path COS	T-Value	SPRT	R^2
H1A	0.226**	3.11	Yes		0.250*	2.43	Yes		0.052	0.30	No		0.305*	2.27	Yes	
H1B	0.142*	2.21	Yes	0.395 (PUU)	0.150	1.89	No	0.408 (PUU)	-0.130	0.71	No	0.484 (PUU)	0.213	1.47	No	0.438 (PUU)
H1C	0.115	1.54	No	0.499 (ST)	0.183*	2.01	No	0.496 (ST)	0.284	1.57	No	0.558 (ST)	-0.165	1.11	No	0.512 (ST)
H1D	0.101	1.74	No		0.108	1.48	No		0.266	1.44	No		0.041	0.31	No	
H1E	-0.038	0.53	No		-0.070	0.79	No		0.211	1.12	No		-0.150	1.15	No	
H1F	-0.131*	2.28	Yes		-0.117	1.61	No		0.097	0.63	No		-0.234	1.47	No	
H2A	0.371***	4.61	Yes	0.137	0.235*	1.97	Yes	0.055	0.585***	4.59	Yes	0.342	0.437***	4.45	Yes	0.191
H2B	0.420***	5.02	Yes	0.395 (PUU)	0.400***	3.49	Yes	0.408 (PUU)	0.291	1.32	No	0.484 (PUU)	0.558***	4.74	Yes	0.438 (PUU)
H2C	0.619***	11.41	Yes	0.499 (ST)	0.611***	7.22	Yes	0.496 (ST)	0.586***	3.76	Yes	0.558 (ST)	0.630***	5.95	Yes	0.512 (ST)
H3A	0.633***	10.34	Yes	0.598	0.477***	5.62	Yes	0.591	0.862***	5.28	Yes	0.616	0.877***	10.67	Yes	0.693
H3B	0.244***	3.35	Yes		0.346***	3.58	Yes		0.137	0.72	No		0.033	0.26	No	
H4	0.371***	7.49	Yes	0.313	0.373***	5.58	Yes	0.329	0.349**	3.27	Yes	0.533	0.357*	2.14	Yes	0.177
H5	-0.087	1.22	No	0.598	0.003	0.03	No	0.591	-0.300	1.69	No	0.616	-0.110	0.97	No	0.693
H6	0.270***	4.24	Yes	0.313	0.285***	3.69	Yes	0.329	0.499***	5.01	Yes	0.533	0.104	0.72	No	0.177

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (two-tailed)

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