Harnessing Intellectual Capital: A Study of Organizational Knowledge Transfer

by

Terrence P. McGill

Dissertation submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy
Business Administration

Touro University International
September 2006

ABSTRACT

This study, using mixed methods, explores the relationships among types of knowledge transfer channels and the transfer of various forms/components of intellectual capital by individuals within an organization. Using a grounded theory approach and multiple linear regression, this study investigated operational descriptions of intellectual capital types and the knowledge transfer channels used to effectively transfer them, as well as relationships among them in the specific setting of a Department of Defense field activity.

Twenty-three individuals from across the organization participated in qualitative study interviews and one-hundred and thirteen individuals from the same organization completed a self-administered web-based survey for the quantitative study. Prior to this study, most knowledge transfer and intellectual capital research has been theoretical in nature, and was found to fall short of explaining the relationships between the two bodies of knowledge. This study has implications for both theory and practice, as it provides a beginning to understand the relationships among knowledge transfer mechanisms and intellectual capital types, thereby extending the two bodies of knowledge and establishing a connection between them.

Regression analyses were used to examine the hypotheses advanced from the qualitative findings. The analyses suggest that within the Federal organization the effectiveness of a knowledge transfer channel used to exchange intellectual capital between individuals within the organization is dependent on the type of intellectual capital being transferred. The analyses also suggest that the perceived effectiveness of

knowledge transfer mechanisms for exchanging intellectual capital is influenced by demographic and organizational factors, among others, signaling that solutions for addressing intellectual capital transfer within an organization should consider the diversity of the variables influencing the intellectual capital transfer process.

This research is essentially a building block for both theory and practice. Future researchers are provided with the basis for the relationship in a practical setting. Practitioners are provided with operationalized descriptions of intellectual capital types and the knowledge transfer channels used to effectively transfer them.

TOURO UNIVERSITY INTERNATIONAL
COLLEGE OF BUSINESS ADMINISTRATION
CYPRESS, CALIFORNIA 90630

HARNESSING INTELLECTUAL CAPITAL: A STUDY OF ORGANIZATIONAL KNOWLEDGE TRANSFER

This dissertation, written by

Terrence P. McGill

Submitted to the Faculty of Touro University International in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY
IN BUSINESS ADMINISTRATION

Approved by:

Dr. Yoram Neumann, Provost

Dr. Paul Watkins, Dean

Date: *September 2006*

We, the undersigned, certify that we have read this dissertation and approve it as adequate in scope and quality for the Doctor of Philosophy.

Dissertation Committee:

Dr. Stephen Fitzgerald, Chair

Dr. J.D. Eveland, Member

Dr. Judie Forbes, Member

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

OVERVIEW OF THE STUDY

Introduction

Turban and Meredith (1988) describe management as a process used to achieve certain goals through the utilization of organizational resources. Management is practiced for the purpose of achieving organizational success, and methods for measuring organizational success have traditionally focused on production outputs and financial gains. Today, the measurement of organizational success is viewed by many (e.g. Edvinsson & Sullivan, 1996; Skandia, 1994; Sveiby, 1997) to include a specific type of knowledge: intellectual capital. The purpose of this study was to examine the relationship between knowledge transfer channels and intellectual capital within an organization.

Intellectual Capital

Intellectual capital is knowledge that can be converted to value (Edvinsson & Sullivan, 1996) and researchers consider it to consist of the following components: human capital, structural capital, customer capital, and social capital (D. Cohen & Prusak, 2001). These components are briefly defined as follows:

1. Human capital includes employee knowledge, skills, and abilities (Becker, 1993);
2. Structural capital is the organization's supportive infrastructure used to meet market demands (Saint-Onge, 1996; Stewart, 1997);
3. Customer capital includes customer relationships and relationship development (Saint-Onge, 1996; Stewart, 1997);

4. Social capital[1] is essentially the trust, mutual understanding, shared values, and behaviors that connect individuals in the organization (Bourdieu, 1979; D. Cohen & Prusak, 2001).

These intellectual capital components are the intangible assets of an organization (Sullivan, 2000; Sveiby, 1997). While structural, customer, and social capital might be easily thought of as organizational assets, human capital may not be as readily accepted. For example:

> It is true that individual competence [human capital] cannot be owned by anyone or anything except that person who possesses it; when all is said and done employees are voluntary members of an organization. Nevertheless, employee competence [human capital] should be included in the balance sheet of intangible assets because it is impossible to conceive an organization without people (Sveiby, p. 10).

These components of intellectual capital are typically found in the minds of employees and within organizational structures and processes. In order to give intellectual capital a high level of attention and effectively manage an environment that helps to facilitate intellectual capital transfer, management must understand how it is transferred throughout the organization. Although specific mechanisms may not yet be

---

[1] Other definitions of social capital exist and are paraphrased as follows. Social capital is not a single entity, but a variety of different entities having two common characteristics: They all have some aspect of social structure, and they facilitate actions of individuals within that structure (Coleman, 1988). Social capital is the sum of the actual and potential resources associated with the relationships among individuals or social units (Nahapiet & Ghoshal, 1998). Social capital is the collective of an organization's employees' relationships with customers (Tsai & Ghoshal, 1998). Social capital encompasses the many aspects of the relationships among individuals that lead to mutual social benefit (Pennings, Lee, & van Witteloostuijn, 1998).

fully understood, intellectual capital is thought to be transferred from source to receiver through an exchange process called *knowledge transfer*. Knowledge transfer has been described as the transmission and receipt of knowledge from sender to recipient (Davenport & Prusak, 2000).

Knowledge Transfer Channels

Different exchange processes and/or mechanisms exist for knowledge transfer and these processes and/or mechanisms are referred to as *knowledge transfer channels* (Alavi & Leidner, 2001; W M Cohen, Florida, Randazzese, & Walsh 1998; Cowan, Soete, & Tchervonnaya, 2001; Davenport & Prusak, 2000). Nonaka and Takeuchi (1995) describe four knowledge transfer channels: (a) S*ocialization* involves face-to-face communication and is the process of sharing experiences; (b) *externalization* is the process of reflecting on what is being conveyed through article publishing, metaphors, stories, etc; (c) *combination* is the process of sorting and adding knowledge, often conceptualizing new ideas; and (d) *internalization* is the process of independent learning by doing and independent training. The importance of knowledge transfer as a basis of knowledge management and intellectual capital in terms of maintaining a competitive advantage in today's organizations is widely recognized (e.g. Alavi & Leidner, 2001; Edvinsson & Malone, 1997; Stewart, 1997; Wiig, 1999). Even though understanding of knowledge management has increased significantly over the past decade, much is still left to learn, as knowledge management is still in its formative years (Blumentritt & Johnston, 1999).

Some have examined knowledge transfer in terms of the transfer *channels* (Sveiby, Linard, & Dvorsky, 2002). Others have defined intellectual capital as

organizational knowledge and related it to knowledge management (Stewart, 1997; Sveiby, 1998). Scholars and researchers have examined knowledge transfer mechanisms and Chua (2001) and others have also studied the relationship between certain types of knowledge and the transfer channels used for sharing knowledge.

Relating Intellectual Capital to Knowledge Transfer Channels

Although existing literature addresses some aspects of knowledge transfer and transfer channels, little is said about the relationships among types of knowledge transfer channels and components of intellectual capital. For example, to date, no research was found that provides support for the assertion made by Bontis (2002b) that trust and culture drive the development of intellectual capital. Also, although intellectual capital is defined as a type of organizational knowledge, no empirical research that connects the four types of knowledge transfer channels identified by Nonaka and Takeuchi (1995) with the four components of intellectual capital previously described was found. Nor did any of the knowledge transfer research that was reviewed address the channels or mechanisms for transferring intellectual capital. Because intellectual capital development within an organization leads to competitive advantage (Ichijo, 2002; Nonaka & Takeuchi, 1995), and because it may be the last untapped sustainable source of competitive advantage (McElroy, 2000), this gap in the literature points to the need for studies that focus on the relationship between knowledge transfer channels and intellectual capital.

Statement of the Problem

Past knowledge transfer research still leaves many unanswered questions (Alavi & Leidner, 2001). This body of research does not include investigation into which

knowledge transfer channels are used to transfer each form of intellectual capital. This apparent lack of understanding of a valuable resource may result in poor management decisions, causing an organization to lose or fail to develop or maintain a competitive advantage. Organizations have neither methods nor tools to enable them to analyze their "intellectual capital stocks" and organizational learning flows (Bontis, 2002b). An understanding of the intellectual capital creation process may enable managers to identify, document and implement effective knowledge management. Research on the development of effective technical and organizational strategies for organizing, retrieving, and transmitting knowledge is needed to facilitate knowledge transfer (Alavi & Leidner, 2001).

One of the greatest challenges facing organizations today is how to make use of intellectual capital, since very few individuals understand it (Bontis, 2002a). Lack of a common understanding of knowledge management within an organization may often undermine attempts to use knowledge more effectively (De Long & Seemann, 2000). The creation of knowledge should not be left to chance (Hargreaves, 1999). The ability to visualize and measure knowledge can improve an organization's ability to manage it (Bukowitz, 1997).

Background of the Problem

Because it is important to manage knowledge development as a resource for sustainable competitive advantage (Bassi, Cheney, & Lewis, 1998; Bontis, 2001b), it is important to establish a theory, a set of related concepts in an integrated framework that can be used to explain phenomena (Strauss & Corbin, 1998), that addresses the

relationships between transfer channels and intellectual capital. Although Bontis (2002b) asserts that intellectual capital is dependent on trust and organizational culture, the literature lacks sufficient evidence to either confirm or discredit this assertion. One of the reasons for this is that prior research of intellectual capital does not appear to have addressed in depth how the components of intellectual capital are transferred within an organization.

Research on knowledge transfer channels, in terms of knowledge types, has focused only on two general forms of knowledge: tacit and explicit. These prior theories and studies will serve to provide enhanced insight (or sensitivity) to the research study (Strauss & Corbin, 1998). Existing theory can provide a set of sensitizing concepts that aid in the discovery process by focusing on the relationship between knowledge transfer channels and the various components of intellectual capital identified.

Purpose of the Study

This research addresses a practical issue that organizations are faced with today. It also provides a missing component in knowledge management research by exploring the relationships among types of knowledge transfer and the transfer of components of intellectual capital by individuals within an organization.

Since little is known about the relationship between knowledge transfer channels and intellectual capital and no specific theory has been found that explains or addresses this relationship, a research strategy that is focused on theory development seems appropriate. *Theories* are formal explanations for how and why events, relationships, or other phenomenon are related and offer an opportunity for predicting future events or

relationships (Polit & Hungler, 1991). Through this research, a theory was developed that addresses the relationship between knowledge transfer channels and intellectual capital. A mixed methods research approach, sequential exploratory strategy (Creswell, 2003), was used as a means to develop the theory through both qualitative and quantitative data collection and analysis. The grounded theory approach to qualitative research is suitable for theory development and was used for the qualitative portion of this research. Grounded theory involves a repetitive data collection and analysis process focused on developing a theory (Creswell, 1998, 2003). Sequentially, quantitative data and results were used to enhance the interpretation of the qualitative results and developed theory (Creswell, 2003).

Significance of the Study

Because intellectual capital is an important organizational resource for achieving and maintaining competitive advantage, it is important to have a better understanding of how it is created. The literature search for this dissertation did not reveal any existing theories or studies, in either the private or public sectors, which address the relationship between knowledge transfer channels and intellectual capital. What is lacking is a comprehensive understanding of effective knowledge transfer within an organization, between groups or between individuals (Goh, 2002).

Knowledge management research is fragmented and incomplete (Grover & Davenport, 2001). Despite all of the rhetoric about intellectual capital, few companies understand how to capture its power, let alone manage it (Bontis, 2001b). By generating a theory grounded in data, the comprehension of the fields of knowledge transfer and

intellectual capital are extended to include the relationship between them. This may be the first study to connect the literature on knowledge transfer channels and the literature on intellectual capital. Additionally, this study provides a basis for further understanding about knowledge management research and theory.

This research study is also important in terms of practicality. Considerable amounts of resources are spent by organizations each year trying to maintain or obtain competitive advantage. Within the Department of Defense (DOD), for example, recent budget constraints have put a higher value on resources and require more effective spending, such as concentrating dollars where they produce the best return. This point is more important when coupled with the fact that the DOD is facing a retirement-eligible wave of employees that possess a substantial portion of the organization's knowledge.

Based on a 1998 Office of Personnel Management (OPM) study, OPM projected that over one-third of the Federal workforce would be eligible for retirement in 2003 (OPM, 2002). This one-third predominately occupies most of the managerial and senior leadership positions - those possessing extensive amounts of the organization's knowledge. This figure was projected to increase through 2005 (General Accounting Office [GAO], 2001c). This means that about 34% of the Federal civilian workforce is over 54 years old today. These workers will be eligible to retire when they reach the age of 55. This does not mean that all who are eligible will retire, but the possibility does exist. Further, employee turnover due to retirement, illness, accident, or other reasons is not uncommon. In most companies such turnover takes place without the transfer of valuable knowledge to those remaining (Bates, 2003). Koca (2002) adds that the 34%

retirement eligibility figure rises to almost 50% when early retirement eligibility causes are factored in.

Although a clear need for knowledge transfer in the Federal sector exists, many agencies lack an understanding of the process. In fact, in 1999 the OPM reported that only 15% of Federal agencies had a formal plan for capturing the knowledge of those departing from employment and for transferring it to the rest of the organization (Martensson, 2001). When similarly low figures were reported in 1992 (National Academy of Public Administration, 1997), Federal oversight agencies began to call for change. Nevertheless, the implementation of a formal process for managing the retirement wave in the Federal sector has stagnated.

The GAO continued to voice concern through a series of reports released in 1999-2000. No significant change occurred in the late 1990s, spurring the release of another series of GAO reports (GAO, 2001a; 2001b; 2001c). In 2001 human capital was designated as a *high risk* in the Federal sector (GAO, 2001a) due to the lack of a plan for transitioning knowledge to future leaders. The report, GAO-01-263 *High-Risk Series: An Update* (GAO, 2001a), expressed concern for the rapidly approaching wave of retirement eligible employees, and its potential impact on leadership continuity.

Employee turnover erodes organizational knowledge (Bassi, 1997; Droege & Hoobler, 2003). The loss of intellectual capital from employee turnover can be costly, resulting in a drop of productivity due to the drop in knowledge (Stovel & Bontis, 2002). Not only is cost control prudent from a taxpayer perspective, it is necessary due to recent declines in dollars available for Federal employee training and learning. Clearly, a better

understanding of where and how to concentrate resources to capture this knowledge would be very beneficial.

Additionally, the 1997 Pentagon Defense Reform Initiative opened many DOD positions for competition that includes private industry (Ashby, 2001; Colvard, 1998; Kozaryn, 1997; Weckstein & Katz, 2003). For that reason, competitive advantage and its relationship to intellectual capital are important within the DOD, as well as within private industry. This study provides information that will be valuable not just for all DOD field activities, but also for others in both the public and private sectors.

Research Questions

The primary research question that guided this study is: What are the relationships among types of knowledge transfer channels (Nonaka, 1994) and the transfer of various forms/components of intellectual capital (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett, Sasser Jr., & Schlesinger, 1997; Skandia, 1994; Stewart, 1997) by individuals within an organization? Four types of intellectual capital are included at the outset of this study: human capital, structural capital, customer capital, and social capital. The four knowledge transfer channels included at the outset of this study are: socialization, externalization, combination, and internalization. The study also addresses four sub-questions:

1. What types of knowledge transfer channels are personnel currently using to effectively transfer knowledge?

2. What types of intellectual capital are individuals effectively transferring, and which do they feel are most vital to transfer?

3. How do the types of knowledge transfer channels that are actually in use relate to existing models and theories?

4. How do the types of intellectual capital that personnel actually transfer relate to the forms of intellectual capital specified in existing models and theories?

Sensitizing Concepts

In order to provide *sensitivity* or insight into the events and happenings in the data to be collected, it is useful to look at the conceptualization of knowledge transfer and intellectual capital in the literature (Strauss & Corbin, 1998). Although these phenomena have been studied for some time, prior to this study, no single theory was found to exist that connects them and much still remains to be learned about them individually. Instead, a number of theories have evolved that attempt to explain the two topics. Existing theories on knowledge transfer and intellectual capital, while they do not explain the relationships among types of knowledge transfer and types of intellectual capital are not without relevance. Existing knowledge transfer and intellectual capital theory and literature can, in fact, provided insight into the meanings in the research data. Two theories, the theory of knowledge transfer (Nonaka, 1994) and the theory of intellectual capital (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997), provided an appropriate basis for the source of sensitivity, or *sensitizing concepts*, in this research study.

Knowledge transfer theory is grounded in Nonaka's (1994) socialization, externalization, combination, internalization (SECI) model. The SECI model (Nonaka & Takeuchi, 1995) suggests that knowledge transfer depends upon the codifiability and

subjectiveness of the knowledge to be transferred. Nonaka and Takeuchi use the term *tacit knowledge* to describe knowledge that is subjective and less codifiable and the term *explicit knowledge* to describe knowledge that is objective and more codifiable.

The SECI model suggests that socialization will be used for knowledge transfer when the knowledge is mostly tacit and involves transfer among individuals. Externalization will be used for knowledge transfer when the knowledge is converted from tacit to explicit. It involves individuals transferring knowledge to the group. Combination will be used when the knowledge is mostly explicit and involves transfer between two groups. Internalization will be used for knowledge transfer when the knowledge is explicit and is converted to tacit knowledge through groups transferring that knowledge to individuals.

Intellectual capital theory is grounded in a derivation of the Skandia Intellectual Capital model (Skandia, 1994). In the Skandia model, intellectual capital consists of two main components: human capital and structural capital. This study uses an adaptation of the Skandia Intellectual Capital model by using an expanded definition that consists of four components. In this four component intellectual capital (FCIC) model, intellectual capital consists of: human capital, structural capital, customer capital, and social capital (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997). These four types of intellectual capital are distinctly different types of knowledge.

The two models, SECI and FCIC, provided insight into the data as well as sensitizing concepts (Strauss & Corbin, 1998). The tacitness, transfer channels, and

intellectual capital constructs were considered as a set of sensitizing concepts to aid in the generation of a theory that elucidates the relationship among types of knowledge transfer channels and components of intellectual capital.

Scope and Limitations

A mixed methods approach was used to generate a theory that clarifies the relationships among types of knowledge transfer and the transfer of components of intellectual capital by individuals within an organization. The study focuses on employees of a DOD field activity located in the western United States. These employees primarily consist of engineers, physicists, and computer scientists. The limitations involved in the study are as follows: Only the perceptions, memories, and opinions of the participants were captured. The results of the study are limited to information gathered from employees of one DOD field activity. A study of employees in other organizations may reveal different data. Prejudices, presumptions and other factors may influence individual decisions with respect to knowledge transfer and intellectual capital. The epistemology of intellectual capital, knowledge, and knowledge transfer is not argued. Instead, the study draws upon operational definitions from a review of the literature.

Overview of the Dissertation

This dissertation is organized as follows:

In Chapter 1 the research problem is identified and sensitizing concepts suggesting a relationship between knowledge transfer channels and intellectual capital are introduced. These sensitizing concepts allow for further exploration of the relationship

among types of knowledge transfer channels and various components of intellectual capital.

In Chapter 2, the theoretical literature relevant to knowledge transfer and intellectual capital is reviewed and the sensitizing concepts used in this research are defined and described.

In Chapter 3, the research methodology is described in detail including, choice of method, the measures, sample, study procedures, standards of quality, and analysis process.

In Chapter 4, qualitative and quantitative methodologies are applied to the data, data are coded and integrated, findings are presented, hypotheses analyzed, and the results are presented.

In Chapter 5, the findings in relation to the research questions are discussed and implications of the research are explained. Limitations and questions for future research presented.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

In this chapter, the current literature on knowledge, intellectual capital and knowledge transfer is reviewed. An effort is made to show how these conceptual bases are related. A discussion of knowledge transfer then follows.

A broad range of literature was reviewed for this research study. Literature from the last decade was examined most comprehensively. Earlier supporting material is included where relevant. The literature search for this research study included computer searches of several electronic databases and use of some Internet search engines including: EBSCOHost, Emerald, Education Resources Information Center (ERIC), InfoTrac OneFile, ProQuest UMI, ProQuest Digital Dissertations, and Virginia Polytechnic Institute and State University Dissertations. Through this search, no literature was found that specifically addresses the relationships among types of knowledge transfer and components of intellectual capital.

Organization of the Literature Review

The literature review begins with a discussion of knowledge, followed by a differentiation among data, information, and knowledge. A discussion of knowledge types is provided next. This discussion is followed by a detailed description of intellectual capital and its components. A review of the literature relevant to knowledge transfer and knowledge transfer channels follows. The chapter concludes with a summarization.

Knowledge

Knowledge has increasingly come to be recognized as a valuable asset within organizations. Some have suggested that it is the most meaningful resource in the workforce today (Drucker, 1993; McElroy, 2000; Roelof, 1999; Roos & Von Krogh, 1996; Stewart, 1997). Further, it forms an important basis of competitive advantage for an organization (Levinthal & March, 1993), representing a more important asset than those traditionally associated with the workforce, including production, land, and labor. Bassi (1997) and Hargreaves (1999) suggest that intellectual capital is the determinant for organizational effectiveness, not an organization's physical assets.

However, in spite of the importance that knowledge holds within organizations, unless managed effectively and efficiently, knowledge managers may fail to capitalize on existing intellectual capital or assets needed by an organization to perform competitively (Alavi, 2000). Awareness of the significance of knowledge embedded within the experiences, skills and abilities of the individuals and processes within organizations has increased. This has led to greater efforts to develop an understanding of knowledge management as a means to improve and build organizational effectiveness (Blumentritt & Johnston, 1999; De Long & Seemann, 2000; Martensson, 2001; McElroy, 2000; Roelof, 1999).

Data, Information, and Knowledge

Research involving knowledge requires a discussion of how knowledge is defined. Data, information, and knowledge are not interchangeable concepts (Alavi & Leidner, 2001; Davenport & Prusak, 2000; Grover & Davenport, 2001). Confusion and

misconceptions regarding the differences among these three concepts have led managers to spend enormous dollars on technology ventures that have yielded marginal results (Davenport & Prusak, 2000; Sveiby, 1997). If an organization plans to reap the benefits of knowledge, the distinction among these three concepts must be understood and knowledge needs to be properly categorized (McCampbell, Clare, & Glitters, 1999). If knowledge is not distinguished from data and information, then any attempts at managing knowledge in the organization will be dysfunctional (Fahey & Prusak, 1998). For instance, information management systems are clearly different from those required to manage knowledge (Blumentritt & Johnston, 1999). Using information systems to manage knowledge, and knowledge systems to manage information, may prove to be futile.

Knowledge is defined as information combined with experience, context, interpretation, and reflection (Davenport, De Long, & Beers, 1998). Allee (1997) describes knowledge as a power, emphasizing the need to share it, contrary to the obsolete tradition of hoarding power. According to Allee, knowledge is also an ever-evolving social process. Sveiby (1997) carries the definition a little further by describing it as a "capacity to act" (p. 37). This suggests the idea of action, which Nurmi (1998) includes in his definition of knowledge:

> Knowledge is something that is acted upon, that has an effect on the way things are. We are not interested in information that lies passive on shelves, in files, or in archives. A knowledge business is created when the know-how inside the firm and the needs of customers outside the firm meet (p. 26).

This definition also suggests the idea of know-how, which is not unlike the way in which Nonaka (1994) describes knowledge. Nonaka states that knowledge is a dynamic human process, distinctly different from information. Information represents "flow of messages, while knowledge is created and organized by the very flow of information, anchored on the commitment and beliefs of its holder" (p. 15).

The debate regarding the definitions of data, information, and knowledge is continuous. Various scholars, researchers, and practitioners have created differing and sometimes conflicting definitions. Understanding the three concepts is important when undertaking any research related to knowledge (Davenport & Prusak, 2000). Data are a set of discrete, objective facts about events (Davenport & Prusak). Data do not contain inherent information; they can be viewed as building blocks for information. In contrast, information is a message meant to change the way in which the receiver perceives something. Information is data that contain meaning (Davenport & Prusak). Knowledge is broader, richer, and deeper than data and information (Davenport & Prusak) and may be defined as:

> … a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms (Davenport & Prusak, p. 5).

Although distinguishing among data, information, and knowledge is important, it is more critical to understand that each represents points along a continuum of increasing value and human contribution (Davenport & Marchand, 2001). In relationship to knowledge management and knowledge transfer, it is more important to determine ways in which value can be added to existing data, information, and knowledge in order to advance knowledge. Information is perceived as more valuable than data, whereas knowledge is recognized as more valuable than information.

Better understanding knowledge and identifying and releasing it into the organization are perhaps the most important points about knowledge (Bryans & Smith, 2000). As greater emphasis and attention have been drawn to the importance of making the management of knowledge an explicit function in organizations, interest in transforming personal knowledge into organizational knowledge that can be shared and applied in improving organizational effectiveness is increasing (Bryans & Smith). Ensuring unobstructed knowledge transfer is vital to an organization's success (Davenport & Prusak, 2000).

Just as knowledge and its transfer throughout the organization have come to represent an investment in the current and future competitiveness of an organization, increasing efforts have been directed toward conceptualizing the nature of knowledge. While a discussion on the differences between data, information, and knowledge are important, as well as the value of knowledge, further clarification is needed when efforts are made to conceptualize knowledge (Martensson, 2001). Since knowledge is dynamic, ever developing, and changing over time (Allee, 1997; Nonaka, 1994; Sveiby, 1997),

delineating a conceptual basis for understanding the meaning of knowledge can be challenging, but important.

Types of Knowledge

The conceptualization of knowledge is perhaps best understood through a discussion largely based on the work of Polanyi (1966). While knowledge can take on many forms, tacit and explicit knowledge are the two generally recognized forms of knowledge (Buckman, 1998; Hedlund, 1994; Nonaka, 1994; Nonaka & Takeuchi, 1995; Polanyi, 1966; Von Krogh, Ichijo, & Nonaka, 2000).

Tacit knowledge involves both cognitive and technical elements and is based on action, experience, and involvement in a specific context (Nonaka, 1994). The cognitive element refers to an individual's mental models consisting of schemata, beliefs, paradigms, and viewpoints while the technical component consists of concrete know-how, crafts, and skills that apply to specific contexts. As suggested by Nonaka, tacit knowledge has an analog quality where individuals can continuously and in a parallel processing manner manipulate models to help define their world. Tacit knowledge represents the type of knowledge that is often embedded within the individual (Buckman, 1998). Tacit knowledge is subjective, experiential, and hard to formalize and communicate.

Explicit knowledge is articulated and codified and can be expressed in formal and systematic language (Nonaka, 1994). Explicit knowledge represents the type of knowledge that is often captured in documents, libraries, written policies and procedures,

files, manuals, and databases (Buckman, 1998). Nonaka suggests that explicit knowledge is of digital quality where the knowledge is captured in sequential manner, or series.

Borghoff and Pareschi (1998) compare tacit and explicit knowledge to the two sides of a coin as follows:

> Explicit knowledge defines the identity, the competencies, and the intellectual assets of an organization independently of its employees; thus, it is organizational knowledge par excellence, but it can grow and sustain itself only through a rich background of tacit knowledge (p. 6).

Choo (1998) helped further clarify the concepts of tacit and explicit knowledge by relating how each particular type of knowledge is evoked.

> Tacit knowledge consists of subjective know-how, insights, and intuitions that come to a person from having been immersed in an activity for an extended period of time. Explicit knowledge is frequently coded in the form of mathematical formulas, rules, specifications, and so on. It is formal knowledge that is easy to transmit (p. 8).

Knowledge has also been described as existing in the individual or the group (Nonaka, 1994). Individual knowledge is created by and is inherent within the individual, whereas social knowledge is created by and exists within the group collective. While Nonaka and others (e.g. Baumard, 1999; Nonaka & Takeuchi, 1995; Von Krogh et al., 2000) emphasize the tacit-explicit, individual-collective knowledge distinctions, Alavi and Leidner (2001) suggest that this perspective fails to provide a complete explanation

as to the interrelationships among the types of knowledge. Alavi and Leidner suggest that this failure to identify and discuss the interrelationships that may exist among knowledge types often leads to the assumption that tacit knowledge is more valuable than explicit knowledge. Rather than representing tacit and explicit knowledge as dichotomous states, some prefer to suggest that they are mutually dependent and reinforcing qualities of knowledge (Alavi, 2000; Alavi & Leidner, 2001; Nonaka & Takeuchi, 1995). In an effort to provide focus to this study of intellectual capital transfer, it is useful to first consider the linkages between knowledge and intellectual capital.

Some authors expand on Nonaka's (1994) knowledge types by further categorizing knowledge into terms that apply more directly to the notion of intangible assets, or intellectual assets of an organization (e.g. Blumentritt & Johnston, 1999; Choo, 1998; Pollard, 2000; Spender, 1992, 1996). Following the tacit-explicit, individual-collective knowledge schema, Spender argues for a four-fold epistemology that recognizes both individual and social knowledge. Choo, for example, adds a third type of knowledge, *cultural knowledge*, to Nonaka's tacit-explicit taxonomy. Cultural knowledge consists of the beliefs an organization holds to be true and justified - an underlying comprehension of how those within an organization treat truths and situations (Choo, 1998). Blumentritt and Johnston's framework for categorizing knowledge puts an emphasis on the degree of difficulty in transferring knowledge. They identify four different categories of knowledge:

1. Codified knowledge, knowledge that has been made explicit and is in a readily transferable form;

2. Common knowledge, knowledge that is accepted as standard without being formally explicit;

3. Social knowledge, knowledge about cultural and interpersonal relationships; and

4. Embodied knowledge, tacit knowledge related to the background, skills, and experience of a person.

Pollard's (2000) framework for categorizing knowledge adds *customer* and *innovated* knowledge to Nonaka's concept. Customer knowledge is the collective knowledge about, and of, an organization's customers. Innovated knowledge is the collective knowledge about as-yet undeveloped or unexploited markets, technologies, products, and operating processes (Pollard). This knowledge taxonomy is very similar to what some refer to as an *intellectual asset* or *intellectual capital* (Allee, 2000; Borghoff & Pareschi, 1998; Edvinsson & Sullivan, 1996; Harrison & Sullivan, 2001; Nahapiet & Ghoshal, 1998; Stewart, 1997; Sveiby, 1997, 1998).

Intellectual Capital

Attempts to formalize a conceptualization of intellectual capital were first advanced by economist John K. Galbraith, who coined the term when he wrote the following to economist Michael Kalecki in 1969: "I wonder if you realize how much those of us in the world around have owed to the intellectual capital you have provided over these past decades" (Sveiby, 1998, p. 1). After some time, three nearly simultaneous efforts were undertaken in an effort to advance intellectual capital. According to Sullivan (2000), these efforts were made by Hiroyuki Itarni of Japan (1980); David Teece of

California (1986, who integrated the views of a few economists (Penrose, Rumelt, Wemerfelt, and others)); and Karl-Erik Sveiby of Sweden (1986). Other scholars from Skandia, a Swedish insurance company, introduced an internal report characterizing intellectual capital in that same timeframe.

Thomas Stewart, in his groundbreaking cover story in *Fortune Magazine* (1991), is typically recognized with providing the main thrust for a new era of intellectual capitalists. Subsequently, Drucker (1993) furthered discussions on intellectual capital when he used the term to describe post-capitalist society. About this same time, Edvinsson (Edvinsson & Malone, 1997), who was working for Skandia, developed a definition of intellectual capital: "Intellectual Capital is the possession of the knowledge, applied experience, organizational technology, customer relationships and professional skills that provide Skandia [an organization] with a competitive edge in the market" (p. 44).

Other scholars focus more on the knowledge relationship. Klein and Prusak (1994) characterize intellectual capital as intellectual material that produces a higher-valued asset. Four years later, Stewart (1997), leveraging this concept, argued:

> Intelligence becomes an asset when … it is given coherent form; … when it is captured in a way that allows it to be described, shared, and exploited; … and when it is deployed to do something that could not be done if left scattered like coins in a gutter (p. 67).

Simply put, intellectual capital is packaged useful knowledge (Stewart, 1997). This definition of intellectual capital is similar to that found in most intellectual capital

management theory literature. Intellectual capital is knowledge that can be converted into value or profit (Allee, 2000; Edvinsson & Sullivan, 1996; Harrison & Sullivan, 2001; Sveiby, 1997). Although the specifics are widely debated in the intellectual capital research community, scholars are in general agreement about this simplified description. The implication from these definitions is that not all knowledge found within an organization is intellectual capital. In fact, knowledge is not intellectual capital unless it is packaged or captured in a way that allows it to be described, transferred, and leveraged (Stewart, 1997).

As early as 1991, detailed conceptualization of intellectual capital was underway at Skandia. Over time, models of intellectual capital were further developed and refined on the basis of early Skandia intellectual capital efforts (e.g. Skandia, 1994, 1995a, 1995b, 1996a, 1996b). Skandia was the first large company to make a truly logical effort at measuring knowledge assets (Bontis, 2001a; Stewart, 1994). Skandia developed its first report internally in 1985, and became the first organization to issue an intellectual capital supplement to its traditional financial report to shareholders (Stewart, 1994). Since then, many organizations have come to accept Skandia's concept of integrating both traditional measures (i.e. production outputs, financial gains) and intellectual capital assets in reporting on the bottom line value of the company (Bryans & Smith, 2000; Bukowitz, 1997; Rowley, 2000; Stewart, 1997).

Following these initiatives, Skandia, led by Leif Edvinsson, developed a model for reporting on intellectual capital. This model, called the *Navigator*, is composed of five areas of focus: financial, customer, process, renewal and development, and human

capital. The model represents a new accounting perspective. The intent of the model was to provide model users with a focused understanding of the competitive environment of the user's organization by coherently linking the areas in the company related to intellectual capital to each other (Edvinsson & Malone, 1997). Skandia's goal of linking an organization's intellectual capital areas led to this simple definition:

Intellectual Capital = Human Capital + Structural Capital (Edvinsson & Malone).

In this original Skandia model are two basic forms of intellectual capital - human capital and structural capital. For purposes of this study, these two components of intellectual capital will be referred operationally to as the *primary tier* of intellectual capital components. Thus, human capital and structural capital are the primary tier components of intellectual capital. Descriptions of these primary tier components follow.

Human Capital

Human Capital is defined as the combined knowledge, skill, experience and ability of the organization's individual employees (including managers) (Becker, 1993; Edvinsson & Malone, 1997). It also includes the organization's creativity and innovativeness. The measurement of these traits evolves dynamically as the competitive environment of the organization changes. Individuals possess human capital within an organization.

Structural Capital

Structural Capital is the proprietary software, computer programs, databases, organizational structure, patents, trademarks and similar assets that support productivity (Edvinsson & Malone, 1997; Sveiby et al., 1988). Structural capital represents assets that

are separate from the individuals within the organization. Structural capital is further divided into customer capital and organizational capital (Skandia, 1994). These two sub-components of structural capital will be operationally referred to as the *secondary tier* of intellectual capital components. Thus, customer capital and organizational capital are secondary tier components of intellectual capital. As shown later, Bontis (2002b), and Edvinsson and Malone elevate customer capital to the primary tier, and thus each offer different breakdowns of structural capital in the secondary tier. Bontis divides structural capital into innovation capital and organizational capital, whereas Edvinsson and Malone divide structural capital into three components: innovation capital, organizational capital, and process capital.

Although the Skandia definition may have been rather simple, arguably it facilitates a more concrete understanding of intellectual capital. It eventually led to more expanded definitions. Other authors (Bontis, 2002b; Saint-Onge, 1996; Stewart, 1997) have contributed to this theory and have elevated customer capital to the primary tier. Edvinsson and Malone (1997) also acknowledge this adaptation. In this evolved structure, the intellectual capital of an organization is divided into three primary forms: human capital, structural capital and customer capital.

Customer Capital

Customer Capital is defined as the value of the organization perceived by those with whom an organization conducts business (Edvinsson & Malone, 1997; Saint-Onge, 1996). This perceived value is formed by the relationships between the organization and its customers (Rudez, n.d.). This is shared knowledge among the individuals.

Social Capital

Still others add a fourth type of intellectual capital to the primary tier: social capital (D. Cohen & Prusak, 2001; Davies & Magowan, 2002). Brooking (1996) recognizes social capital in this same fashion: Even though the nomenclature of the assets differ, the concept is (a) Market (customer), (b) human-centered (human), (c) intellectual property (structural), and (d) infrastructure (social). Social capital is as real and important as other forms of capital deserving elevation to the tier of the top three (D. Cohen & Prusak, 2001; Davies & Magowan, 2002).

Social Capital is the stock of active connections among people: the trust, mutual understanding and shared values and behaviors that bind members of human networks and communities (Bourdieu, 1979; D. Cohen & Prusak, 2001).

Hall (1998) suggests that a broad spectrum of intellectual capital definitions are scattered throughout the literature. Pollard (2000), for example, is one who offers a correlation between types of knowledge and components of intellectual capital. Pollard argues, based on knowledge models (Nonaka, 1994; Saint-Onge, 1996), that an organization's knowledge consists of human capital (tacit knowledge), structural capital (explicit knowledge), customer capital (customer knowledge), and innovation capital (innovation knowledge). Pollard defines innovation knowledge as collective knowledge that is not yet developed; it is potential or unexploited capital. Pollard does not categorize customer and innovation knowledge as either tacit or explicit and implies that may be distinctly different from the latter two. While this point may be arguable, clearly, no one universal definition or formula for intellectual capital is evident in the literature. While

these ideas do not conveniently converge into a single formula, the overall basic intellectual capital thread is present: intellectual capital is useful knowledge in that it provides an organization with a competitive advantage.

Scholars agree that intellectual capital research is significant and urgency is warranted. This is not so true in the management world. The reality is that intellectual capital concepts remain misunderstood and underutilized within organizations and firms (Bontis, 1996, 1998; Pollard, 2000; Stewart, 1997, 2001; Sveiby, 1997; Szulanski & Winter, 2002). Bontis (1998) suggests that: "Intellectual capital has been considered by many, defined by some, understood by a select few, and formally valued by practically no one. Therein lies one of the greatest challenges facing business leaders and academic researchers today and tomorrow" (p. 63).

Some have further suggested that managers and investors are still slow to give credence to intellectual capital, while others only offer token attention. Organizational recognition of the importance of intellectual assets and the fact that terms like "people are our most important resource" have become colloquial indicate that significant advances have been made. Still, much is left to do (Stewart, 2001). For example, leaders cannot articulate why intellectual assets are so important or how they plan to optimize their organization's knowledge to gain competitive advantage (Pollard, 2000). While this may be true, organizational interest in intellectual capital has continued to increase as greater awareness has grown regarding knowledge as being an organization’s greatest resource. The relationship between knowledge and intellectual capital becomes more evident in understanding that as knowledge is shared among organizational members, it is

connected to the organization's history, culture, processes, and experiences. Thus, the management of intellectual capital has been identified as a critical skill for managers (Bontis, 2002a; Quinn, Anderson, & Finkelstein, 1996). Understanding the processes involved in sharing or transferring knowledge among individuals within an organization should be considered part of this skill set. The intellectual capital definitions discussed in this dissertation are summarized in Tables 1 and 2.

Table 1
Components of Intellectual Capital

Author(s)	Components of Intellectual Capital
Skandia (1994)	Human capital and structural capital make up the primary tier. On a second tier, structural capital is divided into customer capital and organizational capital.
Bontis (2002b) Edvinsson & Malone (1997) Saint-Onge (1996) Stewart (1997)	Human capital, structural capital, and customer capital. Customer capital is elevated to the primary tier.
Brooking (1996)	Human-centered, intellectual property, market, and infrastructure. Similar to: human capital, structural capital, customer capital, and social capital.
Pollard (2000)	Human capital, structural capital, customer capital, and innovation capital. Innovation capital is added to the primary tier.
D. Cohen & Prusak (2001) Davies & Magowan (2002)	Human capital, structural capital, customer capital, and social capital. Social capital is added to the primary tier.

Note. The Table is arranged in chorological order.

Table 2
Intellectual Capital Tiers

Author(s)	Primary Tier					Secondary Tier[a]			
	HC[b]	S_tC[c]	CC[d]	IC[e]	S_oC[f]	OC[g]	CC[d]	IC[e]	PC[h]
Skandia (1994)	X	X				X	X		
Saint-Onge (1996)	X	X	X						
Brooking (1996)	X	X	X		X				
Edvinsson & Malone (1997)	X	X	X			X		X	X
Stewart (1997)	X	X	X						
Pollard (2000)	X	X	X	X					
D. Cohen & Prusak (2001)	X	X	X		X				
Bontis (2002b)	X	X	X			X		X	
Davies & Magowan (2002)	X	X	X		X				

Note. Blanks indicate author did not use the component to define intellectual capital. The Table is arranged in chorological order.
[a]Some scholars further divide the secondary tier.
[b]HC=Human capital.
[c]S_tC=Structural capital.
[d]CC=Customer capital.
[e]IC=Innovation capital.
[f]S_oC=Social capital.
[g]OC=Organizational capital.
[h]PC=Process capital.

Knowledge Transfer

Many scholars have described knowledge transfer. It is more than simply making knowledge available. Knowledge that is merely sent is not transferred knowledge. Unabsorbed knowledge is not transferred knowledge.

Knowledge Transfer involves two actions, transmission and absorption and can be defined as taking place when knowledge is both transmitted by the sender *and* received (absorbed) by the receiver (Davenport & Prusak, 2000).

Davenport and Prusak (2000) suggest that knowledge transfer occurs whether or not it is managed. An unmanaged process, however, may be fragmentary (Davenport & Prusak). Knowledge transfer within an organization is a daily occurrence, and opportune, unstructured knowledge transfer is vital to an organization's success (Davenport & Prusak). Although the term "manage knowledge" may imply a formal knowledge transfer process, it is not necessarily the case. However, organizations that fail to keep track of or manage the organization's knowledge may not prosper (Davenport & Prusak). Organizations that understand the knowledge transfer process may be better able to facilitate the transfer of intellectual capital than those that do not understand it. The literature provides four main concepts of knowledge transfer: (a) Dixon's (2000) knowledge transfer model, (b) Sveiby's (2000) knowledge transfer model, (c) Szulanski's (1996) communication model, and (d) Nonaka's (1994) knowledge creation model. A description of each of these models follows:

Dixon Model

Dixon's (2000) model of five transfer methods is based on the similarity of task and context, nature of task (routine vs. non-routine), the type of knowledge being transferred (tacit or explicit) and the impact that knowledge has on the organization. The five transfers are: (a) Serial transfer: a team gains knowledge performing a task and the team subsequently uses that knowledge in a new setting; (b) near transfer: knowledge gained by a team performing a routine task is transferred to another team doing similar work; (b) far transfer: knowledge from a team performing a non-routine task is transferred to another team doing a similar task; (d) strategic transfer: collective knowledge of the organization relating to strategic initiatives of the organizations is among teams; and (e) expert transfer: third party expertise is used to support a complex and infrequent team task. Dixon's model focuses on the transfer of knowledge between teams.

Sveiby Model

Sveiby's (2000) model is based on knowledge transfers that are perceived to create value for the organization. The model is derived from Sveiby's theory of intellectual capital, which Sveiby calls intangible assets. The transfers in Sveiby's model take place among these intangible assets areas of the organization. Intangible assets consist of three parts (similar to the original Skandia (1997) model of intellectual capital), with the addition of three components in a second tier: people's competence (human capital), external structure (customer capital), and internal structure (organizational capital). Sveiby identifies nine knowledge transfers in his model as follows: (a) between

individuals, (b) from individuals to external structure, (c) from external structure to individuals, (d) from individual competence into internal structure, (e) from internal structure to individual competence, (f) within the external structure, (g) from external to internal structure, (h) from internal to external structure, and (i) within internal structure.

Szulanski Model

Szulanski's (1996) communication model depicts knowledge transfer as a process consisting of a series of stages. This transfer model focuses on the sequence of knowledge transfer between sender and receiver. The model starts with the sender (initiator) and progresses through a series of four stages as it is finally absorbed by the receiver (recipient). The four stages identified by Szulanski are: (a) initiation - all activities leading to the transfer decision, (b) implementation – knowledge begins to flow from sender, (c) ramp-up - recipient starts using transferred knowledge, and (d) integration - recipient folds knowledge into normal routines.

Nonaka Model

Nonaka's (1994) knowledge creation model, often referred to as the SECI (socialization, externalization, combination, internalization) model, describes the knowledge transfer process in terms of the tacit and/or explicit knowledge that is being transferred. In this model, knowledge transfer occurs in one of four forms: from tacit to tacit; from tacit to explicit; from explicit to explicit; or from explicit to tacit (Nonaka, 1994; Nonaka & Takeuchi, 1995). These forms are not isolated independent events. Knowledge transfer is a continuous and dynamic interaction between tacit and explicit

knowledge (Nonaka, 1994; Nonaka & Takeuchi, 1995). Nonaka's model, along with the other three knowledge transfer concepts is summarized in Table 3.

Table 3
Knowledge Transfer Mechanisms

Author	Number[a]	Forms[a]
Nonaka (1994)	4	(1) Socialization, (2) externalization, (3) combination, and (4) internalization.
Szulanski (1996)	4	Stages: (1) initiation, (2) implementation, (3) ramp-up, and (4) integration.
Dixon (2000)	5	(1) Serial transfer, (2) near transfer, (3) far transfer, (4) strategic transfer, and (5) expert transfer.
Sveiby (2000)	9	(1) Between individuals, (2) individuals to external structure, (3) external structure to individuals, (4) individual competence into internal structure, (5) internal structure to individual competence, (6) within the external structure, (7) external to internal structure, (8) internal to external structure, and (9) within internal structure.

Note. The Table is arranged in chorological order.
[a]Of knowledge transfer mechanisms proposed.

Tacit and explicit knowledge are often described as separate entities with no apparent coalescence. Given the dynamics and complexity of knowledge transfer, it is unlikely, however, that knowledge exists in discrete units that are exclusively explicit or tacit. It is more likely that knowledge will exist simultaneously in multiple forms within individuals and organizations. For example, an individual within an organization needs to know how to perform a task for the first time, while others within the organization are

experienced at performing the task. The knowledge exists in different parts of the organization in both explicit and tacit form. A new performer can obtain knowledge to perform a new function from several sources, either verbally, or through demonstration from other coworkers, from in-house books or reports, or perhaps through a combination of knowledge sources. This whole progression is dynamic and suggests that in the process of acquiring the knowledge required to execute a task, knowledge may be transferred from multiple sources in several directions.

As the SECI model illustrates, knowledge transfer depends on this interrelationship. The SECI model describes four knowledge transfer channels: *socialization* (from tacit to tacit), *externalization* (from tacit to explicit), *combination* (from explicit to explicit), and *internalization* (from explicit to tacit). This SECI model will provide the basis for the operational definition of the knowledge transfer channels used in this proposed study.

Socialization is the process of sharing experiences. An example of socialization is the apprentice learning from his or her master by mentorship, observation, imitation and practice. The socialization process is primarily a face-to-face knowledge transfer process among individuals (Nonaka & Takeuchi, 1995). Socialization implies sharing tacit knowledge among individuals, interfacing with coworkers and/or customers where time is spent together. This allows for knowledge acquisition through physical proximity, observation, and imitation rather than through written communication or direct verbal instruction. This process emphasizes spending time together (Nonaka & Konno, 1998).

Externalization is accomplished by using metaphors, analogies, concepts, hypotheses, models, and published writings that promote interaction between sender and receiver. This process is usually, but not exclusively, initiated through dialogue or reflection. The externalization process allows knowledge transfer among individuals within an organization (Nonaka & Takeuchi, 1995). Externalization is the expression of tacit knowledge and its translation into comprehensible forms that can be understood by others.

Combination involves the reconfiguration of existing knowledge through sorting, adding, and merging. Combination often involves conceptualizing new ideas. This process is usually accomplished by using media such as documents, databases, meetings, emails (and other computer communications), and telephone calls. Combination involves combining different bodies of explicit knowledge (Nonaka & Takeuchi, 1995). The combination process allows knowledge transfer among groups across organizations. Combination is a process of assembling both existing and new explicit knowledge into other knowledge.

Internalization involves independent learning through learning-by-doing, formal training, and self-paced training, such as reading manuals and watching videos. This process involves an individual understanding and absorbing explicit knowledge into tacit knowledge forms. The internalization process transfers organization and group explicit knowledge to the individual (Nonaka & Takeuchi, 1995).

Three of the knowledge transfer models, the Dixon model, the Sveiby model, and the Nonaka model, share a common theme. They emphasize knowledge transfer

channels. In contrast to these three models, the Szulanski model emphasizes the sending and receiving process.

While the four scholars of these models examine the knowledge transfer mechanisms and process, others examine the relationship between knowledge transfer channels and the knowledge that is being transferred (Chua, 2001; Murphy, 2003; US Department of Agriculture, 2002). In addition to other limitations, these studies focused on specific channels and knowledge found within the groups under study. No attempt to formulate a theoretical model for the relationship between knowledge transfer channels and intellectual capital components were made. However, these three studies support one premise of this research study: individuals prefer certain knowledge transfer channels for transferring specific types of/components of knowledge.

While the four knowledge transfer models (Dixon, Sveiby, Szulanski, and Nonaka) provide a structure for explaining knowledge transfer, knowledge transfer can take place through formal or informal circumstances (Alavi & Leidner, 2001). Just as formal knowledge transfer is important to an organization, unstructured spontaneous knowledge transfer is vital to an organization's success (Davenport & Prusak, 2000). This idea is not in conflict with the concept of knowledge management because knowledge can be managed in such a way that it allows for these types of transfers (Davenport & Prusak).

Knowledge Transfer Characteristics

Both formal and informal knowledge transfer come with advantages and disadvantages (Alavi & Leidner, 2001). Informal transfers such as unscheduled meetings,

informal seminars, or coffee break conversations do not guarantee that the knowledge will be passed accurately from one member to another (Alavi & Leidner). Formal transfers, on the other hand, such as training sessions and plant tours, may ensure greater distribution of knowledge but may inhibit creativity (Alavi & Leidner). Some knowledge transfer channels may be more effective than others. Many scholars suggest that the individuals within an organization affect knowledge transfer.

Knowledge transfer is ultimately a human process that requires dynamic interaction (Shariq, 1999). It is not surprising then, to find that the effectiveness of knowledge transfer is found to be dependent primarily on human characteristics. Values such as mutual understanding, trust, cooperation, and teamwork contribute to the effectiveness (or ease) of knowledge transfer (Roberts, 2000).

In contrast to "ease of transfer", Szulanski (1995) uses the term *stickiness* to describe the level of difficulty in transferring knowledge. The level of stickiness is dependent on the knowledge being transferred and the situation involved in the transfer process. Szulanski considers a transfer to be sticky whenever the transfer creates a level of awareness that difficulty with the transfer exists. He describes an effective transfer as being non-sticky - an unnoticed event that is costless, instantaneous, and successful.

Gupta and Govindarajan (2000) suggest that knowledge transfer depends on the following five elements: (a) value of the sender's knowledge (as perceived by others in the organization), (b) motivational disposition of the sender (the level of desire for the sender to transfer or share knowledge), (c) existence and richness of transmission channels (the presence of facilitators or absence of inhibitors), (d) motivational

disposition of the receiver (receptiveness), and (e) the absorptive capacity of the receiver (the ability to recognize and value the knowledge). These five elements weighed together determine the level of difficulty in knowledge transfer. The effect of the five elements on stickiness is further described as follows:

Characteristics of the nature of the knowledge transferred. The less speculative individuals are about the knowledge being sent, the less likely it is that this element will increase the level of stickiness (Szulanski, 1995). If the knowledge is perceived to be more ambiguous, the level of stickiness will increase. The more the sender is perceived as trustworthy or credible, the less likely it is that this element will increase the level of stickiness.

Characteristics of the source of knowledge. The more reluctant the sender is to share the knowledge, the more likely this element will increase the level of stickiness (Szulanski, 1995). The sender may be reluctant to share for fear of loss of power or relative position as compared to the receiver or to others within the organization. The sender may also be driven or left unmotivated depending on the perception of the reward or penalty for transferring the knowledge.

Characteristics of the transfer context. The closer, more convenient, and more harmonious the relationship between the sender and receiver, the less likely this element will increase stickiness (Szulanski, 1995). This element is related to the media or channel used in knowledge transfer. Cultural and social circumstances play a vital role with this element.

Characteristics of the receiver of knowledge. The less motivated the receiver is to accept knowledge from the sender, the more likely stickiness will increase (Szulanski, 1995). This depends not only on the receiver's willingness to accept, but also his or her willingness to act.

Characteristics of the absorptive capacity of the receiver of knowledge. The less likely it is that the receiver will absorb and retain knowledge, the more likely stickiness will increase (Szulanski, 1995). If the basic knowledge absorption capacity level of the receiver is low, it is likely that knowledge absorbed by the receiver will also be low.

Some consider this fifth element to be the most problematic (Alavi & Leidner, 2001). However, others consider the third element - the transmission channels involved in knowledge transfer – to be the most difficult (Gupta & Govindarajan, 2000; Szulanski, 1995).

Scholars such as Goh (2002), Cross, Parker, and Prusak (2000), and Davenport and Prusak (2000) describe similar elements or factors. For example, Goh suggests that knowledge transfer is a complex process and describes five factors that influence its effectiveness. The factors are: (a) leadership, (b) problem-solving/seeking behavior, (c) support structures, (d) knowledge sender/recipient relationship, and (e) types of knowledge. While some of these factors supplement the effective knowledge transfer influences presented by Szulanski (1995), Goh recognizes that these factors may not be all-inclusive. Knowledge transfer remains a problem for many organizations and the framework offered by Goh may provide more insight for solving this problem.

Cross, Parker, and Prusak (2000) identify four key characteristics of relationships that provide for effective knowledge transfer. They are: (a) knowledge - knowing what others know; (b) access - having access to other people's thinking; (c) engagement - having people be willing to actively engage in problem solving; and (d) safety - having a safe relationship to promote learning and creativity. A positive sender/receiver relationship is important for effective knowledge transfer (Szulanski, 1995).

According to Davenport and Prusak (2000), the following seven factors influence effective knowledge transfer: (a) relationships and trust; (b) culture; (c) availability of common meeting areas; (d) incentives or rewards based on sharing; (e) presence of absorptive capacity in recipients; (f) educating the understanding that knowledge sharing sources are all equally significant; and (g) tolerance for mistakes - no loss of status for not knowing everything. While Szulanski (1995) mainly focuses on those involved in the transfer, Davenport and Prusak broaden the scope of influence over effective knowledge transfer to include the environment in which the transfer occurs.

Information and communication technologies (ICTs) improve the transferability of knowledge (Roberts, 2000). Although ICTs play a significant role in the distribution of knowledge, ICTs cannot by themselves increase the effectiveness of knowledge transfer. ICTs' inadequacies necessitate the continuing role of human interaction. Roberts argues that the contributions of trust and culture be further investigated as contributing to knowledge transfer.

Myers and Swanborg (1998) suggest that the way in which knowledge is packaged affects knowledge transfer effectiveness. Their process essentially involves quality control of the knowledge content, the transfer channels, and the recipient. They identified six steps to promote efficient packaging of knowledge. These steps entail: (a) identifying knowledge, (b) identifying target recipients, (c) customizing the content, (d) choosing the appropriate transfer channel(s), (e) organizing the content, and (f) socializing the process.

Others suggest that care, "a feeling of interest or concern" (*Merriam-Webster's Collegiate Dictionary*, 1993, p. 173), is necessary for effective knowledge creation (Von Krogh, 1998; Von Krogh et al., 2000). The existence of care in the knowledge transfer environment has a tendency to purge the environment of attitudes that are counterproductive to knowledge transfer. Von Krogh (1998) and Von Krogh et al. (2000) identify five subcomponents of care that they consider most important in influencing effective knowledge transfer: (a) mutual trust, (b) active empathy, (c) access to help, (d) lenience in judgment, and (e) encouragement. The authors argue that when the level of care present in the sharing environment is high, the effectiveness of knowledge transfer is less likely to be inhibited. On the other hand, when care levels are low, the tendency for effective transfer will be low.

Others suggest that ties, the trust relationship between knowledge sender and potential knowledge recipient, impact the effectiveness of knowledge transfer (Hansen, 1999; Levin, Cross, & Abrams, 2002). While the proportional correlation between trust and effectiveness may be argued, the authors agree that the presence of some level of

trust is needed for effective knowledge transfer. Knowledge transfer effectiveness is briefly summarized in Table 4.

Table 4
Knowledge Transfer Effectiveness

Major Influences	Author(s)
(a) Characteristics of the nature of the knowledge transferred, (b) characteristics of the source of knowledge, (c) characteristics of the transfer context, (d) characteristics of the receiver of knowledge, and (e) characteristics of the absorptive capacity of the receiver of knowledge.	Szulanski (1995)
(a) Identifying knowledge, (b) identifying target recipients, (c) customizing the content, (d) choosing the appropriate transfer channel(s), (e) organizing the content, and (f) socializing the process.	Myers and Swanborg (1998)
(a) Mutual trust, (b) active empathy, (c) access to help, (d) lenience in judgment, and (e) encouragement.	Von Krogh (1998) Von Krogh et al. (2000)
(a) Knowledge - knowing what others know; (b) access - having access to other people's thinking; (c) engagement - having people be willing to actively engage in problem solving; and (d) safety - having a safe relationship to promote learning and creativity.	Cross, Parker, and Prusak (2000)
(a) Relationships and trust; (b) culture; (c) availability of common meeting areas; (d) incentives or rewards based on sharing; (e) presence of absorptive capacity in recipients; (f) educating the understanding that knowledge sharing sources are all equally significant; and (g) tolerance for mistakes - no loss of status for not knowing everything.	Davenport and Prusak (2000)
(a) Value of the sender's knowledge (as perceived by others in the organization), (b) motivational disposition of the sender (the level of desire for the sender to transfer or share knowledge), (c) existence and richness of transmission channels (the presence of facilitators or absence of inhibitors), (d) motivational disposition of the receiver (receptiveness), and (e) the absorptive capacity of the receiver (the ability to recognize and value the knowledge).	Gupta and Govindarajan (2000)
(a) Leadership, (b) problem-solving/seeking behavior, (c) support structures, (d) knowledge sender/recipient relationship, and (e) types of knowledge.	Goh (2002)

Note. The Table is arranged in chorological order.

Summary

The major areas of research in the field of knowledge transfer, thus far, are as follows: (a) How the transferred knowledge is utilized (e.g. W. M. Cohen & Levinthal, 1990); (b) knowledge transfer mechanisms (e.g. Alavi & Leidner, 2001; Nonaka, 1994; Nonaka & Takeuchi, 1995); (c) the context in which the knowledge is transferred (e.g. Levinson & Asahi, 1995); (d) the complexity of the transfer (e.g. Zander & Kogut, 1995); (e) influences on effectiveness of the knowledge transfer (e.g. Gupta & Govindarajan, 2000; Levin et al., 2002; Szulanski, 1995); (f) knowledge transfers within areas of the organization (e.g. Sveiby, 2000); and (g) correlation between knowledge transfer channels and the knowledge being transferred (e.g. Chua, 2001; Murphy, 2003; US Department of Agriculture, 2002). Knowledge transfer research is briefly summarized in Table 5.

Table 5
Knowledge Transfer Research

Major Area of Research	Author(s)
How the transferred knowledge is utilized.	W. M. Cohen & Levinthal (1990)
Knowledge transfer mechanisms.	Alavi & Leidner (2001) Nonaka (1994) Nonaka & Takeuchi (1995)
Context in which the knowledge is transferred.	Levinson & Asahi (1995)
The complexity of the transfer.	Zander & Kogut (1995)
Influences on the effectiveness of the knowledge transfer.	Gupta & Govindarajan (2000) Levin et al. (2002) Szulanski (1995)
Knowledge transfers within areas of the organization.	Sveiby (2000)
Correlation between knowledge transfer channels and the knowledge being transferred.	Chua (2001) Murphy (2003) USDA (2002)

Note. The Table is arranged in chorological order.

As for intellectual capital research, according to Bontis (2002a), it is rarely understood or studied. Much of intellectual capital research is focused on its definition and what makes it valuable (e.g. Bontis, 1998; Edvinsson & Malone, 1997; Skandia, 1994; Stewart, 1997; Sveiby, 2000). Other researchers have examined the impact of intellectual capital on organization performance (e.g. Tsai & Ghoshal, 1998). As previously mentioned, a review of dissertations was conducted for this research study. Of the intellectual capital related dissertations reviewed, most were found to use case study methodology (e. g. Brown, 2003). This predominant use of case study methodology indicates a lack of theory beyond the taxonomy of the components of intellectual capital. Intellectual capital research is briefly summarized in Table 6.

Table 6
Intellectual Capital Research

Major Area of Research	Author
Defining and measuring the constructs.	Edvinsson & Malone (1997) Skandia (1994) Stewart (1997) Sveiby (2000)
Business value of intellectual capital.	Bontis (1998)
Impact of intellectual capital on organization performance.	Tsai & Ghoshal (1998)

Note. The Table is arranged in chorological order.

In this chapter, the literature relevant to the proposed study on types of knowledge transfer channels and the relationship to components of intellectual capital was reviewed. Both the SECI (Socialization, Externalization, Combination, Internalization) model (Nonaka, 1994) model and the FCIC (Four Component Intellectual Capital) model (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997) were discussed. A general overview of the literature on knowledge, intellectual capital, knowledge transfer, knowledge transfer channels, and knowledge transfer effectiveness was provided. The limitations of the existing research were identified. Currently no studies have linked knowledge transfer channels with intellectual capital components. In Chapter 3, the research methods and procedures that will be used to establish a grounded theory that explains the relationship between knowledge transfer channels and various components of intellectual capital are described.

CHAPTER 3

METHODOLOGY

Introduction and Design Description

The research approach and methodology used in this study are presented in this chapter. The following topics are discussed: methodology, data collection process, sampling strategy, researcher's role, data analysis plan, standards of quality, and ethical considerations related to this study.

When contemplating the overall research approach, consideration is given to a match between the problem and the approach, the personal experiences of the researcher, and the audience (Creswell, 2003). Additionally, the research is guided by factors such as the nature of the research question, the need for a detailed view of the topic, and the need for more exploration and theory of a subject (Creswell, 1998).

Existing knowledge transfer and intellectual capital models and theories that relate the types of knowledge transfer channels and to the transfer of specific components of intellectual capital by people within an organization were not found the literature search. A mixed methods research approach, using a sequential exploratory strategy, is deemed appropriate given the nature of existing knowledge transfer and intellectual capital literature and research. The sequential exploratory strategy (Creswell, 2003) is a two phase process where priority is given to the qualitative data collection and analysis. Thus, initially, qualitative research methods, using the grounded theory approach, were used to explore the relationships among the key constructs. A quantitative data collection and analysis phase, involving statistical analysis of the key construct relationships,

follows the qualitative phase. As suggested by Creswell, the quantitative phase was used to assist in the interpretation of the qualitative findings.

Existing theories offer sensitizing concepts that provide for a path of discovery in developing theory. The literature provides a rich source of information to stimulate thinking as the grounded theory comes together. Knowing that researchers may have yet to develop a theory or model that addresses the relationship, it is appropriate to design a study that is focused on developing the theory and uses grounded theory methodology as a structured means for developing a theory. The term *theory*, in this research study, refers to a set of well-developed concepts related through statements of relationships, which collectively form a framework that can be used to predict or explain events (Strauss & Corbin, 1998, p. 15). Thus, inductive theory and sensitizing concepts, rather than existing theory, guide both the qualitative and quantitative phases of this research (Creswell, 2003; Polit & Hungler, 1991).

Sensitizing concepts for this study are taken from the SECI (Socialization, Externalization, Combination, Internalization) model (Nonaka, 1994) and the FCIC (Four Component Intellectual Capital) model (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997). A review of the research related to knowledge transfer shows that several researchers have used quantitative approaches to operationalize knowledge transfer channels using the SECI model. Although the SECI model provides a strong theoretical basis for studying knowledge transfer channels, operationalizing the model solely through quantitative methods makes it difficult to identify the diverse meanings and perceptions that individuals might attach

to a particular transfer channel because this diversity is difficult to capture in statistical format. A mixed methods study allows for the collection of these diverse data.

A review of the research related to intellectual capital shows that most researchers have used qualitative approaches focused on defining and classifying intellectual capital. They used the intellectual capital model, where intellectual capital = human capital + structural capital + customer capital (Bontis, 2002b; Saint-Onge, 1996; Stewart, 1997). A fourth component, social capital, completes the FCIC model used in this research study (D. Cohen & Prusak, 2001; Davies & Magowan, 2002). Although the FCIC model provides a strong theoretical basis for studying intellectual capital, operationalizing the model only through quantitative methods makes it difficult to identify the flow of knowledge. The use of qualitative inquiry with the FCIC model is not without precedent. In fact, the majority of intellectual capital researchers use a case study methodology. Thus, it is reasonable to employ the SECI and the FCIC models in qualitative research.

The purpose of the study was to generate a grounded theory that explores the relationships between types of knowledge transfer channels and the transfer of components of intellectual capital among individuals within an organization. The centerpiece of grounded theory research is to explain a relevant event or phenomenon (Strauss & Corbin, 1998). Grounded theory involves a repetitive data collection and analysis process focused on developing a theory (Creswell, 1998, 2003).

The Measures

Prior theory or literature may provide both insight and meaning while the data are explored (Strauss & Corbin, 1998). While this may aid in the development of grounded

theory, the existing literature is relied on only as a preliminary framework. The existence and use of sensitizing concepts are not in conflict with the lack of an existing theory. In fact, sensitizing concepts are brought into all research studies (Strauss & Corbin). While the sensitizing concepts do not explain a theory that does not exist, they provide an awareness of existing theories and perspectives in the fields of knowledge transfer and intellectual capital. This awareness assists in perceiving differences and similarities among the research data and the literature. Given the awareness of sensitizing concepts, multiple viewpoints are obtained from various participants through the sampling process. Gaining multiple viewpoints assists in maintaining objective perspective with regard to the research (Strauss & Corbin).

The key constructs of knowledge transfer channels (socialization, externalization, combination, internalization) and types of intellectual capital (human capital, structural capital, customer capital, social capital) were examined. While the SECI model provides sensitizing concepts for the knowledge transfer channel constructs and the FCIC model for the intellectual capital constructs, these are only introductory constructs. The introductory constructs are meant to provide insight into the data, as opposed to starting with a haphazard approach. The introductory constructs help establish a comparative basis with meanings from the participants. Ultimately it is through the perceptions and interpretations of the participants that the construct definitions materialize.

The Sample

In determining sample size and sampling strategy, consideration is given to the methodology selected for the research study. As a general rule, the criteria for sampling

size and strategy are different between quantitative and qualitative methodologies; the quantitative criteria are more specific than the qualitative criteria. Given that this study uses a sequential exploratory strategy, in which the qualitative research is dominant. The initial selection of sample size and sample strategy follow qualitative criteria. Quantitative sampling principles guided the quantitative data collection.

While perhaps less specific than quantitative sampling criteria, grounded theory research is not without guides; in fact it entails a very well defined methodology (Creswell, 1998). Consistent with these guides, the data were simultaneously sampled, collected, compared, and analyzed. This concurrent data collection and analysis process allowed for visual and mental integration of the data and the themes that tied related portions of the data together. A theoretical sampling strategy was used; allowing sampling to be determined during the course of the study (Strauss & Corbin, 1998). This theoretical sampling strategy along with a rigorous coding procedure guided data analysis.

Theoretical Sampling Strategy

Theoretical sampling for this study consists of three types of sampling: (a) open sampling, (b) relational and variational sampling, and (c) discriminate sampling. Sampling techniques were used initially to select two groups from the sample population, and they were also used to select participants based on information received during the interviews. These three sampling techniques, the research site and participants, and selection criteria are subsequently described in detail.

Open Sampling

In open sampling, the goal is to maintain a collection process that is receptive to all possibilities, is far reaching and thus results in eliciting the maximum number of conceptual categories related to the research questions. Open sampling is used simultaneously with an open coding process. Open sampling can entail different approaches. However, combining four techniques is the most advantageous (Strauss & Corbin, 1998). The four techniques are: (a) purposive sampling: looking for persons, sites, or events category related data can be purposefully gathered; (b) convenience sampling: using a list or circumstantial encounter to select participants from those that are willing to participate; (c) fortuitous sampling: unexpected encounter of theoretically significant events; and (d) reevaluation of previously collected data: reorganizing and reshuffling according to theoretically relevant concepts. Combinations of these four open sampling approaches are discussed next relative to the research site.

Research site and implementation of open sampling techniques.

The purposive and convenience sampling approaches were used to select the initial participants for the study. The initial sample population was selected purposively. The research was done at a DOD field activity located in the western United States. This base employs approximately 950 personnel, most of whom are civil servant engineers. As a field activity, all employees are career civil servants; none are elected or appointed government officials. For the purpose of selecting participants, the population of the base was divided into retirement eligible employees and retirement ineligible employees and two lists were made, one for each group. Additionally, the research site is managerially

divided into seven departments. In an effort to increase the likelihood of capturing data from across the organization, participants were selected from each of the departments and some participants that have served in two or more of the departments were selected.

To begin with, three participants, one from the retirement eligible group and two from the retirement ineligible group, were selected for a pilot study (Table 7). The data collected during the pilot study are included in this research study as part of the aggregate qualitative research data. The pilot study data were prepared, coded, and analyzed along with the data collected during the main study. Following the pilot study, the first sample was selected from the list containing the retirement eligible group.

Table 7
Overview of Qualitative Data Collection Process

Recruitment Phase	Number of Participants	Number of Participants Solicited	Number of Employees that Declined Interview
Pilot Study[a]	3	3	0
Open Sampling Group 1[b]	7	12	5
Open Sampling Group 2[c]	7	13	6
Relational and Variational Sampling[d]	4	6	2
Discriminate Sampling[e]	2	3	1
Total	23	37	14

[a]One participant was from the retirement eligible group and two were from the retirement ineligible group.
[b]All participants were from the retirement eligible group.
[c]All participants were from the retirement ineligible group.
[d]All participants were from the retirement eligible group.
[e]Both participants were from the retirement ineligible group.

Initially, seven participants were selected from the retirement eligible group for interviews. During their interviews, the initial seven retirement eligible employees were asked to identify, if applicable, their understudies from the retirement ineligible group. Surprisingly, only two of the seven initial retirement eligible participants identified understudies. Originally, the plan was to compile the initial retirement ineligible group of participants from the understudies identified. This compilation was considered in an effort to maximize the opportunity for finding retirement ineligible group participants with similar knowledge transfer incidents as those identified by the retirement eligible group. As an alternative to selecting the initial retirement ineligible group participants from a list of understudies, insight as a member of the organization was relied on to select participants with the likelihood that they would provide similar knowledge transfer incidents as those identified by the retirement eligible group. The initial retirement ineligible group provided similar knowledge transfer incidents as those identified by the retirement eligible group and thus the impact of having few understudies identified was negligible. Subsequent participants were not asked to identify understudies.

Following the interviews with the retirement eligible participants, an equal number of participants were selected from the retirement ineligible group. Fourteen participants were interviewed initially, plus the three pilot study participants, for an initial total of 17 participants. As later discussed, six more participants were eventually selected for a total of 23 participants for the qualitative research (Table 8). Based on theoretical sampling techniques, the final sample size of 23 was dependent on the value and variability of the information collected during initial interviews. As Creswell stipulates

for sample sizes in grounded theory research, 20-30 interviews for this grounded theory research study were expected to be conducted (1998, p. 56). Prior to conducting the initial research, a mini-pilot study, consisting of three participants was conducted to test the face validity of the interview questions. The pilot study verified the apparent validity of the questionnaire, as participants identified knowledge transfer incidents or transactions that took place within the organization.

A comparison of demographics is made between the qualitative participants and all of the employees at the research site. Twelve (52%) of the twenty-three participants for the qualitative portion of this research study are retirement eligible and eighteen (78%) are male (see Table 8). This compares to 27% and 78%, respectively, at the research site (see Table 8). As shown in Table 9, the retirement eligibility characteristics of participants are reasonably as diverse as the general population at the research site.

Table 8
Interview Participant Demographics

Demographic	Number of Participants	Number at Research Site	Percentage of Participants	Percentage at Research Site
Retirement Eligibility				
Eligible	12	249	52%	27%
Not Eligible	11	689	48%	73%
Retirement System				
CSRS[a]	8	189	35%	20%
FERS[b]	15	749	65%	80%
Gender				
Female	5	208	22%	22%
Male	18	730	78%	78%

[a]Civil Service Retirement System.
[b]Federal Employee Retirement System.

Table 9
Interview Participant Retirement Eligibility Characteristics

Demographic	Number of Participants	Number at Research Site	Percentage of Participants	Percentage at Research Site
Years of Service				
Under 5	1	258	4%	28%
5 to 9	0	98	0	10%
10 to 14	1	67	4%	7%
15 to 19	4	172	17%	19%
20 to 24	7	177	31%	18%
25 to 29	3	72	13%	8%
30 and Over	7	94	31%	10%
Age Group				
Under 40	3	320	13%	34%
40 to 44	6	198	26%	21%
45 to 49	3	138	13%	15%
50 to 54	6	124	26%	13%
55 to 59	3	98	13%	10%
60 to 61	0	19	0	2%
62 and Over	2	41	9%	4%

Fortuitous sampling and reevaluation approaches were used, as appropriate. For example, in addition to the sample population from the two retirement related groups, participants were selected based on the information received during previous interviews. As anticipated, based on the research study, participants identified knowledge transfer incidents or transactions that took place within the organization. Participants that experienced the same or similar transactions and others that experienced different transactions were sought out.

Research participants were initially recruited through electronic mailing (email) with follow-ups via telephone. A sample of the recruitment letter is in Appendix A. The possibility of biasing the selection process by inadvertently excluding members of the sample population through the use of email solicitation was considered. Communication through the use of email was implemented over 15 years ago, is a mandatory daily requirement for all employees, is commonplace, and all employees have access to the Internet. Although six solicited participants never responded to the recruitment email, all six were successfully contacted by telephone and all six acknowledged receipt of the email. During the telephone conversations, four of the six non-respondents declined to participate, indicating reasons unrelated to the recruiting method. Based on that information, it is believed that the use of email solicitation did not bias the selection process. A total of 37 employees were solicited to participate in the research study and 23 agreed to participate (Table 10). Of the 14 employees who declined interviews, four indicated schedule conflicts, four expressed uneasiness with interviewing, and the others simply declined.

Recruiting the sample was not difficult. Responses, both positive and negative, were cordial and timely. Additionally, although some employees declined interviews due to schedule conflicts, some participants expressed satisfaction with the time and location of the interview.

Table 10
Reasons for Declining Interviews

Department	Accepted Interview Invitation	Declined Due to Schedule Conflict	Declined Due to Uneasiness with Interviewing	Declined without Stating a Reason
Department A	1	0	0	0
Department B	6	1	0	0
Department C	4	1	2	1
Department D	3	0	0	2
Department E	3	0	0	1
Department F	3	1	1	0
Department G	3	1	1	2
Total	23	4	4	6

A list of possible participants was compiled using the employee database from the research site. This database includes retirement eligibility information. Prior to receiving the employee information, the signing of a non-disclosure form was required. After agreement to protect the information in accordance with the 5 United States Code 552a

("Privacy Act," 1974), was given a Microsoft Excel file containing demographic and retirement eligibility information for all employees at the research site was provided. The electronic file facilitated sorting and grouping employees according to the selection criteria. The results of the study are limited to information gathered from the employees at the research site. Employees in other locations may report different information.

Relational and Variational Sampling

Relational and variational sampling are guided by the category development that comes together during the open coding process. The basic approach used for open sampling was followed while the field was revisited and previously collected data were reviewed. The selection criteria used in choosing four more participants included the likelihood that they would provide data that would corroborate or clarify relationships among categories and subcategories. Data that confirmed, elaborated, or validated the relationships discovered during the research were sought out.

Discriminate Sampling

Discriminate sampling was used later in the research process, as sampling became very purposeful at this stage. Two new participants were chosen in an effort to maximize opportunities to validate the developing theory. These two participants were chosen in anticipation that they would provide information to help fill poorly developed categories and maximize category relationships (Creswell, 1998). The data collected from these two individuals were an indication that sufficient qualitative data had been collected for the research; as the categories had reached a point of saturation. Saturation, the point where collecting additional data seems counterproductive, as additional data do not add much to

the explanation of the theory, was the signal that enough data had been collected (Strauss & Corbin, 1998). The saturation point was reached with the data collected from these two participants and they became the final two participants. These two interviews completed sampling for the qualitative portion of this research; resulting in the final sample size of 23 for the qualitative phase.

Stratified Random Sampling

Phase 2 of the study involves quantitative methods and employs a stratified random sampling approach. In a quantitative study, the size of the target population, the desired confidence interval and level, and nature of the study are used to determine the sample size (Creative Research Systems, 2004; Polit & Hungler, 1991). The target population for generalization is the research site and this DOD field activity population is approximately 950. For a population this size, to achieve a confidence level of 95% with a confidence interval of 10, the sample should be at least 88 in order to meet the generalization criteria (Creative Research Systems). If the sample size is 143, the confidence level increases to 99%. As noted by Polit and Hungler, the nature of the study, and the anticipated sample efficiency (cost and time), and magnitude of the project are considered when selecting confidence level and interval. Considering the large scope of the qualitative phase and the understanding of the research population, a sample size of 88, yielding a confidence level of 95% with a confidence interval of 10, is deemed adequate.

For the purpose of selecting participants, 474 participants were randomly selected from the population at the research site. The population was divided into two groups;

stratifying the population according to retirement eligibility status and yielding approximately 275 in the retirement eligible group and 675 in the non-retirement eligible group. An equal percentage of participants were randomly selected from each group, yielding approximately 137 in the retirement eligible group and 337 in the non-retirement eligible group (Table 11).

One-hundred and twenty-six responses were received, yielding one-hundred and thirteen useable surveys. This response rate seems reasonable, as Trochim (2002) advises that even well-planned and structured online surveys may only yield a 10% to 30% response rate. A comparison of demographics is made between the survey participants and all of the employees at the research site. Forty (35%) of the one-hundred and thirteen participants for the quantitative portion of this research study are retirement eligible as compared to 27% at the research site. As shown in Table 12, the retirement eligibility characteristics of participants are reasonably as diverse as the general population at the research site.

Table 11
Survey Participant Demographics

Demographic	Number of Participants	Number at Research Site	Percentage of Participants	Percentage at Research Site
Retirement Eligibility				
Eligible	40	249	35%	27%
Not Eligible	73	689	65%	73%
Retirement System				
CSRS[a]	31	189	27%	20%
FERS[b]	82	749	73%	80%

[a]Civil Service Retirement System.
[b]Federal Employee Retirement System.

Table 12
Survey Participant Retirement Eligibility Characteristics

Demographic	Number of Participants	Number at Research Site	Percentage of Participants	Percentage at Research Site
Years of Service				
Under 5	20	258	18%	28%
5 to 9	14	98	12%	10%
10 to 14	7	67	6%	7%
15 to 19	22	172	20%	19%
20 to 24	19	177	17%	18%
25 to 29	15	72	13%	8%
30 and Over	16	94	14%	10%
Age Group				
Under 40	40	320	36%	34%
40 to 44	15	198	13%	21%
45 to 49	18	138	16%	15%
50 to 54	18	124	16%	13%
55 to 59	11	98	10%	10%
60 to 61	6	19	5%	2%
62 and Over	5	41	4%	4%

Qualitative Study

The data collection process emphasized by Strauss and Corbin (1998), where coding, sampling and collection are intertwined, was utilized during the qualitative phase of the research. This process is cyclic and often leads back to the field (or previously collected data) for more information. During the initial qualitative phase of the research, each participant was asked to engage in an individual, semi-structured interview of approximately one hour. The average time to conduct each of the 23 interviews was 49 minutes, with 39 minutes as the shortest and 62 minutes as the longest. The details of the interview process follow.

Interview Protocol

The literature was used to help generate the initial series of interview questions. The SECI model and the FCIC model descriptions provide an explanation or *conceptual framework* for the introductory constructs, knowledge transfer channels and types of intellectual capital (Miles & Huberman, 1994). As suggested by Miles and Huberman, the interview questions are derived from this conceptual framework.

These questions are designed to get respondents to describe the relationships that they have experienced among knowledge transfer channels and various forms/components of intellectual capital. In essence, the interviews for this study involve exploring and discovering the positive experiences and values of intellectual capital transfer through the eyes of the participants. As suggested by Cooperrider and Whitney (1999), participants were asked to tell about their best intellectual capital transfer experiences and to envision what intellectual transfer would be like in the ideal situation.

Open-ended questions with lead-ins (or introductions) were used to set the affirmative tone for both the questions and participant responses (Whitney, Cooperrider, Kaplin, & Trosten-Bloom, 2001).

Interview Process

Through a series of 23 interviews, questions were explored that assisted in advancing the understanding of the theoretical issues (Strauss & Corbin, 1998). Questions were asked (Appendix C) to sensitize and focus on data pertinent to intellectual capital and knowledge transfer. These questions were used to reveal the actors within the sample population that are involved in intellectual capital transfer and to collect data from participants relative to concepts such as intellectual capital and knowledge transfer. Questions were also asked that facilitated identifying similarities and differences among concepts. Some of these questions addressed participants' descriptions of the relationships among knowledge transfer channels and types of intellectual capital. More information, as necessary, was probed for during and after the initial interviews and over the course of the research to gauge the development of concepts and to guide participant interviews until no new data emerged.

A pilot study, using a prototype of the research instrument, was conducted prior to conducting the initial research (Appendix D). Based on feedback from the pilot study participants, minor adjustments to the interview questions were made (Appendix C). It became apparent during the pilot study that participants were confused as the questioning transitioned from one area to another. After these pilot interviews, it was decided that the sections of the interview would be numbered, the main question in section three would be

clarified through slight rewording, and that the numbers of each section would be announced during the interviews. These adjustments did not change the context of the questions; numbers were added to the research questions and a few words were replaced. Perhaps due to these small changes, no confusion was encountered during the remainder of interviews, as the discussion transitioned from one section to the next. Responses and feedback from participants during the interviews did not warrant further changes to the research instrument (Appendix C).

The interviews were used to acquire in-depth information about the process of knowledge transfer, the description of knowledge and channels, and the meaning of concepts from participants' experience in intellectual capital transfer. Prior to the interview, each interviewee completed an informed consent form. A sample consent form and the related Institutional Review Board request are in Appendices E and F, respectively.

All interviews were conducted and audio taped with participants' consent (Appendix E). A digital recorder connected to a laptop personal computer (PC) was used to record all interviews and an audio micro-cassette recorder was used as a backup. Transcriptions were made by a transcription service. Although the transcription services provided near-perfect records of the interviews, the transcription process was not without challenges. Both technology and Mother Nature challenged the success of the transcription process.

The first transcription service transcribed the initial five interviews (Table 13). The initial transcription was verified by listening to a replay of the original recording as

the transcription was read line-by-line. Subsequently, the sixth and fifteenth interviews were verified this same way. Although the transcriptions were not found to be perfect, only very minor differences between the original recordings and the transcriptions were found. As the differences were primarily grammatical with no impact on the meaning of the data, the differences were deemed insignificant. Even though the digital recording facilitated remote electronic transfer of the interview files from the transcriber, the sizes of the files were at first cumbersome. The average size of the digitally recorded files is 32 MB. Since the first transcriber did not have a high speed file upload capability, file uploading was conducted overnight to allow time for the uploading process. Coincidentally, a natural disaster resulted in a long delivery delay for one of the transcriptions and a second natural disaster put the first transcription service out of business. A second transcription service was chosen and used for the remaining 18 interviews and service was provided with only minor delays.

All of the transcriptions were typed on a PC in Microsoft Word by a transcribing service. Each file was then saved as a text file to allow for file import to N6, qualitative analytical computer software developed by QSR International. N6 was used to code and develop relationships among the data.

Table 13
Sequence of Transcription Process

Event	Recruitment Phase
First Transcription Verified Line-by-Line[a]	Pilot Study
Transcription of Interviews 2-3[a]	Pilot Study
Transcription of Interviews 4-5[a]	Open Sampling Group 1
Sixth Transcription Verified Line-by-Line[b]	Open Sampling Group 1
Transcription of Interviews 7-14[b]	Open Sampling Group 1
	Open Sampling Group 2
Fifteenth Transcription Verified Line-by-Line[b]	Relational and Variational Sampling
Transcription of Interviews 16-23[b]	Relational and Variational Sampling
	Discriminate Sampling

[a]Interview transcription completed by Transcriber Number 1.
[b]Interview transcription completed by Transcriber Number 2.

Quantitative Study

In the quantitative phase, the results of qualitative data analyses conducted during the initial phase, were used to create a survey instrument (Creswell, 2003). A new sample was randomly selected from the population and asked each new participant to complete a survey. The survey questions are designed to collect the data necessary to test the hypotheses and assist in the interpretation of the qualitative findings (Creswell) by asking respondents to identify the transfer mechanisms that deem are most effective for the transfer of various forms/components of intellectual capital. Participants were also asked

a few exploratory questions related to mentoring. During the quantitative phase of the research, each participant was asked to engage in individual, self-administered survey of approximately five minutes. The details of the survey process follow.

Hypotheses

The qualitative results yielded some reasonably distinct findings about the relationships among knowledge transfer mechanisms and intellectual capital. Hypotheses were developed from those findings to determine the extent to which they represent knowledge transfer patterns throughout the entire organization. A short survey instrument was developed in order to test the hypotheses. A brief description of four of the findings and the hypothesis derived from each of these findings are as follows:

Finding 1: The intellectual capital theme s*ubject matter expertise* was most frequently associated with the knowledge transfer theme *hands-on interaction*. This leads to the first hypothesis:

H1: Subject matter expertise (SME) is transferred most effectively through hands-on-interaction (HOI).

Finding 2: The intellectual capital theme *analysis methodology* was most frequently associated with the knowledge transfer theme *documenting*. This leads to the second hypothesis:

H2: Analysis methodology (AMY) is transferred most effectively through documenting (DOC).

Finding 3: The intellectual capital themes *protocols* and *relationships* were most frequently associated with the knowledge transfer theme *observation*. This leads to the third hypothesis:

H3: Customer protocols and relationships (CPR) are transferred most effectively through observation (OBS).

Finding 4: The intellectual capital theme *shared beliefs* was most frequently associated with the knowledge transfer theme *observation*. This leads to the fourth hypothesis:

H4: Shared beliefs (SHB) are transferred most effectively through observation (OBS).

Some interesting but unexpected findings identified during the qualitative phase concerning mentoring and the relationships between retirement eligible employees and non-retirement eligible employees were further examined.

First, the qualitative analyses suggested that knowledge transfer practice differences may exist between retirement eligible employees and non-retirement eligible employees. Survey participants were thus divided into the two groups, and retirement eligibility was used as a control variable to further explore H1-H4 to see if any differences between the two groups existed.

Second, some findings related to mentoring were further examined. The qualitative analyses suggested that the amount of knowledge transfer through mentoring that non-retirement eligible employees' desire exceeds the amount they receive. The analyses also suggested that retirement eligible employees are willing to provide more

mentoring than they currently provide. The hypotheses derived from the findings are as follows:

H5: The frequency of mentoring that employees desire to receive exceeds the amount received.

H6: The frequency of mentoring that employees are willing to provide exceeds the amount provided.

The qualitative findings suggested that at least some retirement eligible and non-retirement eligible employees consider mentoring to have an important role in knowledge transfer. For that reason, mentoring and its relationship to effective knowledge transfer within the organization were further explored. This leads to the seventh hypothesis:

H7: Perceived importance of mentoring increases directly with retirement eligibility.

Measures

Each participant was asked to engage in an individual, self-administered survey that took approximately five minutes to complete. The survey instrument in this study contains attitudinal, behavioral, and demographic questions. Prior to starting the research, consideration was given to finding and adapting a relevant survey instrument for this research. However, no such survey was found after a thorough search. Thus, the survey items are derived from rephrasing of the hypotheses.

Table 14
Hypotheses and Corresponding Survey Questions

Hypotheses	Survey Section
	Section 1
H1: Subject matter expertise (SME) is transferred most effectively through hands-on-interaction (HOI).	Subject Matter Expertise Questions 1-6
H2: Analysis methodology (AMY) is transferred most effectively through documenting (DOC).	Analysis Methodology Questions 7-12
H3: Customer protocols and relationships (CPR) are transferred most effectively through observation (OBS).	Customer Protocols and Relationships Questions 13-18
H4: Shared beliefs (SHB) are transferred most effectively through observation (OBS).	Shared Beliefs Questions 19-24
	Section 2
H5: The frequency of mentoring that employees desire to receive exceeds the amount received.	25. Within your organization, how frequently have you received mentoring related to knowledge transfer? 26. Within your organization, ideally, how frequently would you like receive mentoring related to knowledge transfer?
H6: The frequency of mentoring that employees are willing to provide exceeds the amount provided.	27. Within your organization, how frequently have you provided mentoring related to knowledge transfer? 28. Within your organization, ideally, how frequently are you willing to provide mentoring related to knowledge transfer?
H7: Perceived importance of mentoring increases directly with retirement eligibility.	29. How important is mentoring for transferring knowledge?

The survey instrument (Appendix G) is divided into three sections. Sections 1 and 2 of the survey contain the attitudinal and behavioral type questions and are made up of the twenty-nine questions that correspond to the seven hypotheses mentioned above (see Table 14).

Section 1 of the survey contains the first four questions as shown in Table 14 and was utilized to collect the data necessary to examine the relative effectiveness of knowledge transfer channels used to transfer intellectual capital. Participants were asked to compare how effective knowledge transfer mechanisms are for transferring the various types of intellectual capital. Section 1 of the survey includes items 1 through 24, which are 24 comparisons. Participants were presented with 4 separate types of intellectual capital and asked to identify the effectiveness of 4 knowledge transfer mechanisms. For each type of intellectual capital, participants were asked to identify how effective one mechanism was as compared to another, for transferring the intellectual capital (see Appendix G).

Section 2 of the survey contains the last five questions as shown in Table 14 and was used to collect the data necessary to examine the relationship between retirement eligibility and mentoring. Participants were asked two questions (25 and 26) relative to receiving mentoring (see Appendix G). They were asked to rate the frequency of mentoring they have been receiving and rate the frequency of mentoring that they desire to receive. Participants were asked two questions (27 and 28) relative to providing mentoring (see Appendix G). They were asked to rate the frequency of mentoring they have been providing and rate the frequency of mentoring that they desire to provide.

Participants were also asked (question 29) to rate the importance of mentoring for the transfer of knowledge (see Appendix G).

In Section 3 of the survey, some basic demographic data, age, years of federal service, and retirement system, were collected to allow to verification of retirement eligibility status of each participant in accordance with federal retirement eligibility criteria (Office of Personnel Management, 2005). In-turn, the calculated retirement eligibility status was used to divide the participants into two groups; retirement eligible participants and non-retirement eligible participants, and used age and years of service for regression analyses. Although in theory these items could be used to identify respondents, only aggregate data is reported and thus confidentiality is maintained.

Researcher's Role

The researcher's role, particularly in a study that uses qualitative methods, may have some effect on the data collection and analysis. The researcher must be aware of any perceptions, biases, values, and personal interests about the research topic and process (Creswell, 2003). Personal experience can increase sensitivity, but caution must be used so as not to induce bias (Strauss & Corbin, 1998). The researcher is responsible for obtaining permission to conduct the research and addressing any ethical issues. For this study, permission was obtained to conduct the research at the research site (Appendix H). Management at the research site provided a list of all employees and identified employees' retirement eligibility. The aggregate results of the research study, as presented in this paper, will be shared with the research site's management and made available to all participants as well. Following publication of this research study, all participants and

site's management will be contacted via email and offered with an electronic copy of the published research. Additionally, management will be offered an electronic slide presentation of the results as summarized using the published research material.

As an employee at the research site for the past 20 years, it would be nice to see the focal organization maintain a competitive advantage over other Federal government activities as well as private industry. Based on observations and experiences, a wealth of knowledge exists within the organization, some of which does not exist elsewhere. Through involvement in a PhD program, literature was discovered that addressed the retirement status of Federal employees. Shortly after that, retirement eligibility numbers were confirmed with human resources personnel on site. As search for a research topic began, the focus was on something related to capturing the knowledge of the potential retirees before their departure. This led to the undertaking of this research study.

Thus as an employee at the research site, a vested interest in the research study and its success exists. The livelihood of the organization may directly depend on the ability to successfully transfer knowledge from departing employees to the remainder of the workforce, thus allowing for the ability to maintain a competitive advantage. The bias that this vested interest brought into the research study may have provided additional motivation for success. As the researcher is not yet retirement eligible and desires continued employment at the research site, he has a vested interest in providing the organization with any information possible that may assist in maintaining a competitive advantage. Given my history of employment on the base, insight into finding the data that most likely would result in generating a theory explaining the relationship between

knowledge transfer channels and the transfer of intellectual capital existed. Any potential negative impact resulting from personal bias was mitigated by rigorous application of standards for quality and verification of the findings.

Additionally, not all knowledge within an organization is intellectual capital (O'Shaughnessy & Sullivan, 1998; Stewart, 1997), and thus, during the interviews and subsequently during the data analysis process, knowledge that is considered to be intellectual capital was distinguished from knowledge that is not considered to be intellectual capital. This distinction requires a clear understanding of the organization, particularity management's perception of the knowledge within the organization that provides value to the organization. In fact, intellectual capital value is determined by the organization, and is typically driven by management and strategic planners (O'Shaughnessy & Sullivan, 1998; Sullivan, 2000). While most scholars agree on who determines what knowledge within an organization is considered to be intellectual capital, no general consensus exists on how to assign value to the knowledge (e.g. Brooking, 1996; Sullivan, 2000; Sveiby, 1997).

Insight as a member of the focal organization and experience as both manager and non-manager was relied on for this research. This insight and experience provided me with sensitivity to the meanings of the data related to intellectual capital found during the study. Understanding and experience enable researchers to become sensitive to the meaning of data without forcing an explanation on data (Strauss & Corbin, 1998). Additionally, a diverse group of participants was interviewed, including some participants from management. The data from the diverse group, and the managers,

coupled with insight was used to validate the identification of intellectual capital and to validate the value assigned to it. This process was implemented to distinguish knowledge that represents intellectual capital for the organization from knowledge that does not represent intellectual capital.

Standards of Quality and Verification

Establishing the validity or trustworthiness of the research study findings is equally important in both qualitative and quantitative traditions of inquiry. Similarly, while the procedures for validation or assessment of trustworthiness vary between traditions, they are equally legitimate. Every effort was made to establish the reliability and validity for both the qualitative and quantitative findings.

Qualitative Phase

Lincoln and Guba (1985) suggest four criteria to establish the trustworthiness of qualitative data: (a) truth value: how confidence in the findings of an inquiry are established; (b) applicability: the extent to which the findings have relevance in other contexts; (c) consistency: the replicability of the findings given a repeat study of the same or similar participants in a like context; and (d) neutrality: the degree to which the findings are the true representation of the subjects or conditions of the study and are not based on the biases or motivations. According to Lincoln and Guba, these four criteria correspond to internal validity, external validity, reliability, and objectivity, which are found in quantitative research. All four criteria are used in this study, as described next in more detail.

Credibility corresponds to truth value. In order to establish credibility, the following strategies recommended by Lincoln and Guba (1985) were employed in this study:

1. *Activities that increase the probability of credible findings*. Two activities that increase the probability are: (a) prolonged engagement, which involves repeated visits to the field until the category is saturated; and (b) triangulation, which involves collecting data from multiple sources, including semi-structured interviews, review of documents, and observation. During the interviews, no participants identified documents at the base that influence the knowledge transfer process, either positively or negatively. Additionally, no awareness of any documents at the base that influence the knowledge transfer process exists. During the interviews and analysis, a compelling reason to consider the possibility of including other physical records in the research was not found. Thus information from documents were not incorporated into the study due to lack of a persuasive motive coupled with the limitations and bureaucracy surrounding public disclosure of federal government documents;

2. *Peer debriefing that involves periodic review of the study*. Through this process, an individual not directly involved in the research study acted as reviewer and proofreader of the methodology. The peer reviewer, by providing an objective assessment of the research as the study progresses, may have resulted in the exploring aspects of the study that would otherwise be overlooked without the objective perspective. As suggested by Lincoln and Guba (1985), the peer

debriefing process for this research was established with the purpose of maintaining an objective perspective throughout the research study. Two individuals were selected to provide peer debriefing; one familiar with the research site and one familiar with methodological issues. These two individuals separately and periodically reviewed and discussed the research throughout the study. Regular progress reports of the project, and posed questions regarding the research question, methodology, and other research issues have been documented and logged. The peer debriefing team role was generally consistent with that defined in the literature (Lincoln & Guba). When appropriate, the research study was updated to take into account peer debriefing comments. Comments from peer debriefings that were adapted include a recommendation to regroup some of the original categories and a recommendation to conduct a final code list review with some of the interviewees;

3. *Negative case analysis*. This involves examining and presenting any information that was found in the data that might be contradictory to the core phenomenon; and

4. *Member check*. This involves having participants review the data for accuracy, and the coding choices for accuracy, relevance, and applicability. Additionally, the final categories were taken back to three interviewees, and were asked confirm or disconfirm the categories. The three members were selected based on the enthusiasm they expressed during the interview and the perception of their willingness to participate in the check. They were asked whether or not they felt

the data were interpreted in a manner congruent with their own experiences. The three member check participants concluded that the data had been coded adequately, categories accurately represented the data, and the interpretations were representative of their own experiences.

Transferability corresponds to applicability. Lincoln and Guba (1985) emphasize that the establishment of transferability is not the responsibility of the researcher, but rather of the individual who desires generalizability. It is only the responsibility of the researcher to provide a thorough enough recording of the events and results of the study that will allow another individual to decide whether transferability may be accomplished. This is achieved in this study through *thick* description, which is comprehensive information from multiple sources organized such that it provides the reader significant detail about an event or topic (GAO, 1990).

Dependability corresponds to consistency. The process of coding in data analysis was meticulously conducted and well documented. It is the responsibility of the researcher to provide records and documentation sufficient for audit purposes (Lincoln & Guba, 1985). For this study, a complete account of all procedures of data collection and analysis was maintained through a combination of paper, audiocassette tape, CD-ROM (backup files), word processing software, and use of N6, qualitative analytical computer software developed by QSR International. All raw data are stored in accordance with Touro University International protocol.

Objectivity corresponds to neutrality. As an employee at the research site, an awareness of the potential biases that may exist due to loyalty, ownership, familiarity,

and ownership issues exists. Adherence to the grounded theory methodology described by Creswell (1998), and Strauss and Corbin (1998) guides objectivity. Objectivity exists when the appropriate methodology that provides factual, reliable, and confirmable data is used (Lincoln & Guba, 1985). It is not the objectivity of the researcher that is at stake, but rather that of the data (Lincoln & Guba).

Quantitative Phase

Since this study is not aimed at generalization to a random population or at the study of complex behaviors and attitudes, for the survey, the focus was on face validity and specific reference to the phenomena of interest. Two University professors and an individual at the research site were asked to comment on the survey. The three reviewers provided feedback by correspondence. The survey was reviewed for clarity, wording, and focus, and to provide comments regarding the effectiveness of each survey item relative to the objectives of the study (Gay & Airasian, 2003). Directions for completing the survey were verified to be easily understood. Based on the feedback from the reviewers, the survey questions were adapted to better fit the proposed methodology and the data collection objectives (see Appendix G).

Data Analyses

This mixed methods research study consists of both qualitative and quantitative data analyses. Coding is used to reduce the qualitative data by dividing it into units of analysis. Statistics are used to rank order and examine the quantitative data, and to test the hypotheses that were developed from the qualitative findings.

Qualitative Analysis

The following coding was used in this study during the qualitative phase: (a) open coding, (b) axial coding, and (c) selective coding. While the coding progresses systematically, it is not automatically sequential. The objective is to alternate between coding processes in order to form patterns around central phenomena. In developing the primary research question for this study, a set of sub-questions were established that are posed as aspects of each of the coding steps. By following this coding process, each of the sub-questions that give support to the main research question was addressed. These sub-questions are discussed below in relation to each of the coding processes. The primary research question is:

What are the relationships among types of knowledge transfer channels (Nonaka, 1994) and the transfer of various forms/components of intellectual capital (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997) by individuals within an organization?

Open Coding

Opening coding is used first in this grounded theory approach. In open coding, text data, derived from the interview transcripts, is examined and sorted into unique categories or paired with similar categories. Categories are defined as labeled units of information composed of discrete incidents, ideas, or events (Strauss & Corbin, 1998). Through this categorizing and labeling, or conceptualizing process, an initial effort to sort the data collected during the interviews was made.

Open coding allows for dividing or parsing, labeling, categorizing, comparing, and analyzing the data. Categories in open coding are concepts derived from data that represent phenomena (Strauss & Corbin). Based on the research context for this study, they represent the conditions surrounding intellectual capital transfer and the related perceptions of the participants. A start list of codes (see Appendix I) was used as an initial source for possible categories. Miles and Huberman (1994) recommend that this start list of codes be a provisional list that is derived from the conceptual framework, research questions, and key variables brought to the study. Thus the start list (Appendix I) consists primarily of the introductory constructs, knowledge transfer channels and types of intellectual capital defined by the SECI model and the FCIC model.

Once a transcribed interview was received, the transcript was read line-by-line and general areas of interest guided by the sensitizing concepts and the insight into the research site were highlighted. Categories were developed through the open coding process. In that process, the demographic information was coded separately.

Demographic data were collected for the purpose of generalizing the findings to the target population. These data were also examined for potential relationships with the categories in support of theory development. In particular, given that the practical significance of this study relates to retirement, particular attention was given to the participants' retirement related demographics.

The remaining data were then reviewed, analyzed, compared, and categorized. Initially, each transcript was read several times before salient concepts were integrated. As the saturation point was approached, less reading was necessary, as few new concepts

were found. The concepts were continually identified through subsequent analysis of transcriptions. Patterns began to emerge as similar concepts were grouped together. The purpose in open coding was to establish as many categories as possible, as such; the focus was primarily on category development, rather than on building relationships between the categories. However, during the initial coding process, the sensitizing concepts of the SECI model (Nonaka, 1994) and FCIC model (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997) were kept in mind. Even in the initial coding process, these concepts were initially compared to the Start List of codes.

When a match was found between collected data and the Start List of codes, the existing category was used. When no match was found, a new category was appropriately created. Thus a Final List of codes was created (see Appendix J). When a new category was created, it was defined and a coding memo written that reflects the rationale for creating the code. This process of refining the codes and constantly comparing the concepts and coded data with new data continued until all of the transcripts were coded.

During the coding process 22 new codes were created. Eleven of the new codes were generated from themes surrounding intellectual capital. These new codes became the sub-codes of the four existing intellectual capital codes. Eleven new knowledge transfer codes were also created. The sixteen existing knowledge transfer codes were removed. These eleven new codes became the sub-codes of the four existing knowledge transfer codes.

The two sub-questions that were addressed in the open coding process are:

What types of knowledge transfer channels are personnel currently using to effectively transfer knowledge?

What types of intellectual capital are individuals effectively transferring, and which do they feel are most vital to transfer?

Axial Coding

Axial coding is used next. In axial coding, the properties and dimensions of categories discovered during the initial coding process will be examined for similarities, differences, and relationships. Central phenomena, or main categories, are identified and related to subcategories. Central phenomena are categories that hold the most conceptual interest, appear most frequently in the interviews, and are most saturated with information (Creswell, 1998). In axial coding the categories and subcategories are systematically developed and related to each other. Data are reassembled around the axis of the category, forming dense, well-developed, and related categories (Strauss & Corbin, 1998). Axial coding is used to identify: (a) what *caused* main categories to occur, (b) what *action(s)* participants identified as a response to phenomena, (c) what *context* influenced the action(s), and (d) what *consequences* resulted from the action(s) (Creswell). As coding proceeds, the Start List, through additions, deletions, and refinement, is used to develop a "final list of codes" (Miles & Huberman, 1994). The sub-questions that are used to identify these relationships in the axial coding process are:

How do the types of knowledge transfer channels that are actually in use relate to existing models and theories?

How do the types of intellectual capital that personnel actually transfer relate to the forms of intellectual capital specified in existing models and theories?

Selective Coding

Selective coding is the third and final coding step. In selective coding, categories are interrelated through a series of stories and relationships. The data collected from the interviews provides the basis for these stories and relationships. In selective coding, the process of integrating and refining the developing theory is undertaken. Through integration, a central idea is used to relate major categories. Through refinement, poorly developed categories become saturated and any excess is removed from other categories (Strauss & Corbin, 1998). The selective coding may embody the relationships identified through axial coding. It may also transcend them in order to reveal the generic/collective/aggregate story that participants are telling. Selective coding concludes when theoretical saturation is reached.

According to Strauss and Corbin (1998), saturation occurs when: (a) no new or relevant category data emerge, (b) category properties and dimensions are thoroughly developed, and (c) category relationships are well established and validated. In order for the themes to be refined into a grounded theory, the selective coding process included checks for consistency and logic, filling in poorly developed categories, integrating similar concepts, and removing extraneous concepts (Strauss & Corbin). A few of the initial concepts that were categorized were determined to be irrelevant to the study. As the interviews and analyses progressed, some of these early concepts that had been categorized with very little data were betted understood and determination was made that

the concepts did not relate to intellectual capital and knowledge transfer. At the point when no new information occurred, the data collection process was complete and consequently no additional interviews were conducted.

Memos

Memos provide a written record of the analyses and are vital to the generation of theory. Memos provide the analytical and conceptual records used to look for patterns among the concepts, to sort out the process of coding data, and to guide theoretical sampling direction. Three types of memos are used: code notes, theoretical notes, and operational notes. Code notes contain the actual coding products and descriptions, theoretical notes contain sensitizing and summarizing information and other thoughts related to the study; and operational notes contain procedural directions, changes, and other reminders (Strauss & Corbin, 1998). After the final list of codes was established, the codes for connecting characteristics were further examined along with the memos. Sensitizing concepts, the background literature, and experience within the organization were used as a perspective for examining the data for similarities.

Computer programs, such as NUD.IST (non-numerical unstructured data indexing, searching, and theorizing) are helpful in the analysis of qualitative data collected during grounded theory research (Creswell, 1998). The latest version of the NUD.IST program, which is N6 developed by QSR International, was used in this research. NUD.IST is a theory generation program, designed for grounded theory that provides a system for storing and organizing files, searching for themes, crossing themes, diagramming, and creating a template (Creswell). The accompanying tutorial, related

manuals and Internet online support sites were used to learn N6. Microsoft Excel was used to separately code demographic information.

The N6 software permits text coding using lines, sentences, or paragraphs as the unit of text that is coded. After a trial and error period, coding at the sentence level was found to fit best with this study. Participants tended to discuss multiple incidents of knowledge transfer at once. As such, the line coding was not inclusive enough and the paragraph coded was not exclusive enough. Through the use of N6 computer-aided coding data were sorted multiple ways, serving to facilitate the visual integration of the theory as it took shape.

Differences among the themes were sought as part of the theory development with a plan of comparing and contrasting the differences during the qualitative phase with the intent of testing in the quantitative phase. N6 was used to count the number of participants that discussed each code or theme and to count the occurrences of each code or theme; called a node in the N6 program. N6 has an automatic tool for counting the number of documents that contain a particular code. Using this "per document" code counting tool, the number of times that participants discussed each theme could be quickly determined.

N6 lacks a tool to count the number of occurrences of a particular code, so the occurrences were hand-counted using the code lists generated by N6 through a process called reporting. The differences among the number of occurrences for each theme as well as across the two groups, intellectual capital themes and knowledge transfer themes were examined. Even though comparing and contrasting the number of occurrences was

useful, the statistical significance of the differences was not considered because of the small number of participants. Although the grounded theory process is nonlinear, once the final sorting and analysis were completed, the research process was concluded by writing about the results of the research and the theory supported by the data.

Audit Trail

Dependability (which corresponds to consistency or reliability), and confirmability (which corresponds to neutrality or objectivity) can be improved by creating an audit trail (Lincoln & Guba, 1985). An audit trail (Miles & Huberman, 1994), or collection of materials relevant to the data collection and analysis process, that provides sufficient information for examining the research data and research study methodology (Lincoln & Guba) was created. A database was developed containing the audit trail using the N6 version of NUD.IST and based the audit trail on the Halpern audit trail categories (Miles & Huberman) to include:

1. Raw data, including audiocassettes, any written field notes, and back-up CD-ROMs.
2. Data reduction and analysis products, including summarized notes, transcripts and parsed transcripts.
3. Data reconstruction and synthesis products, initial concepts, categories, and relationships.
4. Process notes, including methodology, quality, verification, and trustworthiness notes.

5. Materials relating to intentions and dispositions, including any other research notes not mentioned elsewhere.
6. Instrument development information, including pilot studies, schedules, and progress reports.

Quantitative Analysis

Process

The survey was designed using Microsoft Word and was formatted with Hyper Text Markup Language (*html)*. HTML was used as it optimizes text formatting and layout for Internet hosted documents. The self-administered survey was made available to participants through the Internet. S*urveymonkey.com* was used to host the surveys. The survey was initially posted for a one-week period. Reminders were sent to potential participants on the sixth day, one day before the survey was scheduled to end. The survey was kept open for three additional days past the first week, and yielded two additional participants.

All participants were contacted via email to complete the online survey. Each participant was asked to affirm consent via an electronic consent form prior to participating in the survey. The related Institutional Review Board request and the consent form are in Appendices F and G, respectively.

The host site, *surveymonkey.com*, provides a numbering system as the surveys are completed, and this was used in order to maintain an accurate return count. This numbering was also used to code the data entered into a PC database in order to manage

the data gathered and protect the anonymity of the human subjects. The database allows for easy calculations and quick comparison of all the data.

All of the data collected from the surveys were exported from the *surveymonkey.com* database as a single Microsoft Excel compatible file and downloaded to a PC. The raw survey data were then imported to Microsoft Excel and checked for missing data. A total of 126 surveys were collected, 13 (11%) of which were found to be incomplete, yielding 113 useable surveys. For the most part, all 13 of the incomplete surveys appear to be the result of participants exiting the survey before it was completed. No resource is available to determine the exact cause for the unfinished surveys. All of the data from the 13 unfinished surveys were discarded, as planned in the proposal.

Data Preparation and Analysis

Using Microsoft Excel, three data files were initially created; one containing the data collected from Section 1, one containing the data from Section 2, and one containing the Section 3 demographic data. The Section 1 data were further divided into four separate files, each file containing the data relative to four hypotheses H1-H4. The Section 2 data were maintained in a single file for the hypotheses H5-H7. Demographic data were added to all five of the hypothesis specific files. Subsequently, the five files were imported into SPSS for Microsoft Windows version 14.0 to allow for statistical analysis.

Statistical analyses were conducted to determine if the results of the quantitative study support the qualitative findings and to test the hypotheses. This allows for the comparison of the results to the previous findings and to draw inferences about

differences, if any to the general population. Descriptions of the hypothesis specific statistical tests follow.

The data collected from Section 1 of the survey were used to examine the first four hypotheses, H1-H4. Multiple regression analysis may be used when multiple independent variables are being regressed on single dependent variables (Ott & Longnecker, 2001). For that reason, for hypotheses H1-H4, multiple regression was appropriate.

Four regression analyses were conducted, one for each hypothesis about an intellectual capital type (Table 15). The general multiple regression equation for the analyses is the same for all four regressions and is modeled as:

$$Y = a + b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$$

This model is derived from hypotheses H1-H4 and relates to the four intellectual capital types (herein referred to as *Scenario*), Subject Matter Expertise (SME), Analysis Methodology (AMY), Customer Protocols and Relationships (CPR), and Shared Beliefs (SHB) identified in the four hypotheses. This model contains a single dependent variable and six independent variables (Table 15). The regression equation with the variables is modeled as:

Perceived Effectiveness Score = $a + b_1$(age) + b_2(years of service) + b_3(retirement eligibility status) + b_4(scenario) + b_5(comparison 1) + b_6(comparison 2).

The dependent variable, Perceived Effectiveness Score and the independent variables Age, Years of Service, Retirement Eligibility Status, Scenario, Comparison 1, and Comparison 2 are subsequently described in Table 15 and Table 16.

Table 15
Multiple Regression Variables for H1-H4

Hypothesis	Perceived Effectiveness Score[a] Y[a]	Constant a	Age X_1[d]	Years of Service X_2[e]	Retirement Eligibility Status X_3[f]	Scenario X_4[g]	Comparison 1 X_5[h]	Comparison 2 X_6[h]
H1	HOI[b] Score	constant	16 to 67	0 to 40	0 = Ineligible 1 = Eligible	SME[c]	HOI vs OBS	HOI vs MEN[b]
H2	DOC[b] Score	constant	16 to 67	0 to 40	0 = Ineligible 1 = Eligible	AMY[c]	DOC vs OBS	DOC vs MEN
H3	H3 OBS[b] Score	constant	16 to 67	0 to 40	0 = Ineligible 1 = Eligible	CPR[c]	OBS vs HOI	OBS vs MEN
H4	H4 OBS Score	constant	16 to 67	0 to 40	0 = Ineligible 1 = Eligible	SHB[c]	OBS vs HOI	OBS vs MEN

[a]Dependent variable. Ordinal scale with a range of 1 to 5
[b]HOI = Hands-On Interaction; DOC = Documenting; OBS = Observation; MEN = Mentoring
[c]SME = Subject Matter Expertise; AMY = Analysis Methodology; CPR = Customer Protocols & Relationships; SHB = Shared Beliefs
[d]Age is measured on a continuous scale
[e]Years of Service is measured on a continuous scale, where less than one year is coded as zero
[f]Retirement Eligibility Status is measured on a dichotomous nominal scale
[g]Scenario is a dummy variable and is coded as either 0 or 1
[h]Comparison 1 and Comparison 2 are dummy variables and are coded as either 0 or 1

Table 16
Perceived Effectiveness Score[a] for H1-H4

		Survey Choices for Each Comparison[c]					
Hypothesis		Much More Effective	Somewhat More Effective	About the Same	Much More Effective	Somewhat More Effective	
		5	4	3	2	1	Assigned[d] Score
H1	HOI[b] Score	HOI	HOI		DOC	DOC	
H2	DOC[b] Score	DOC	DOC		HOI	HOI	
H3	H3 OBS[b] Score	OBS	OBS		DOC	DOC	
H4	H4 OBS Score	OBS	OBS		DOC	DOC	

[a]After controlling for predictors, when comparing Mechanism 1 to Mechanism 2, the average perceived effectiveness of Mechanism 1 over Mechanism 2 as compared to the average perceived effectiveness of Mechanism 1 to Mechanism 3 and Mechanism 1 to Mechanism 4 combined.
[b]HOI = Hands-On Interaction; DOC = Documenting; OBS = Observation
[c]Comparison of the effectiveness of knowledge transfer mechanisms for transferring intellectual capital (Appendix G)
[d]The score assigned to each choice for regression analysis.

As noted in Table 15, for purposes of the regression analyses, the independent variable *Scenario* was transformed into dummy variables. The four possible scenarios were: (a) SME; (b) AMY; (c) CPR, or (d) SHB. One dummy variable is used for the variable, scenario, for each hypothesis; k-1= 1, where k = 2, the number of scenario categories, since this variable has two categories. For example, for hypothesis H1, the dummy variable for *Scenario* indicates whether the scenario was SME or not SME. The dummy variables act like switches in the equation, allowing an examination of the extent to which they predict the outcome (Trochim, 2002). For Hypothesis H1, when the scenario is SME, *Scenario* = 1, and when the scenario is not SME, *Scenario* = 0.

As noted in Table 15, for purposes of the regression analyses, the independent variable *Transfer Method Comparison* was also transformed into dummy variables. For purposes of the regression analyses, this variable was transformed into dummy variables. Two dummy variables are used for each hypothesis; k-1= 2, where k = 3, the number of comparisons. Keep in mind that three comparisons instead of four since one of the comparisons is *used* as the dependent variable *Perceived Effectiveness Score*. The two variables, Comparison 1 and Comparison 2 are used in the regression equation. The two possible comparisons for each hypothesis are shown in Table 17. The knowledge transfer mechanism Mentoring is not in any of the four hypotheses H1-H4. Also, hypotheses H3-H4 contained the same knowledge transfer mechanism.

Table 17
Transfer Method Comparisons for H1-H4 Variables Comparison 1 and Comparison 2

	HOI[a]	DOC[b]	OBS[c]	MEN[d]
HOI			H1	H1
DOC			H2	H2
OBS	H3, H4			H3, H4

[a]HOI = Hands-On Interaction
[b]DOC = Documenting
[c]OBS = Observation
[d]MEN = Mentoring

Multiple linear regression analysis was used to identify independent predictors of knowledge "Perceived Effectiveness Score". The regression analysis resulted in multiple correlations, which indicated how the independent variables when combined relate to the dependent variable. The regression weights showed how much each independent variable contributed to the multiple correlations. The testing was based on determining statistical significance at a two-sided alpha level of 0.05.

Statistics included calculating the means, standard deviations, and conducting one-sample *t* tests, separately for each hypothesis, comparing preferences for knowledge transfer mechanisms. A transfer preference score of 3 represents no difference in preference for the type of intellectual capital (identified in the hypothesis) over one of the other methods. The null hypothesis is that preference for a type of intellectual capital (identified in the hypothesis) over another method is 3 and the alternative hypothesis is that preference for a type of intellectual capital (identified in the hypothesis) over another

method is different than 3. The *t* tests were based on determining statistical significance at a two-sided alpha level of 0.05, as is appropriate for social or behavioral science (Creswell, 2005; Munro, 1997).

The data collected from Section 2 of the survey were used to examine the next two hypotheses, H5-H6. The hypotheses H5-H6 were analyzed by testing the difference, if any, between the frequencies of mentoring received and desired, and between the frequency of mentoring provided and frequency of mentoring that participants are willing to provide. The variables of interest in H5-H6 are as follows:

Frequency of Mentoring Received: This was measured on an ordinal scale with a range of 1 to 7. The values 1-7 represented a range of frequencies from "never" to "daily". This variable was used for hypothesis H5.

Frequency of Mentoring Desired: This was measured on an ordinal scale with a range of 1 to 7. The values 1-7 represented a range of frequencies from "never" to "daily". This variable was used for hypothesis H5.

Frequency of Mentoring Provided: This was measured on an ordinal scale with a range of 1 to 7. The values 1-7 represented a range of frequencies from "never" to "daily". This variable was used for hypothesis H6.

Frequency of Mentoring Willing to Provide: This was measured on an ordinal scale with a range of 1 to 7. The values 1-7 represented a range of frequencies from "never" to "daily". This variable was used for hypothesis H6.

A seven-point Likert scale was used for participants' responses. The paired *t* test is appropriate for the types of data (levels of measurement) that were collected and the

comparisons between single groups (Gay & Airasian, 2003). The *t* tests were based on determining statistical significance at a two-sided alpha level of 0.05.

The data collected from Section 2 of the survey were also used to examine the last hypothesis, H7. Multiple regression analysis may be used when multiple independent variables are being regressed on single dependent variables (Ott & Longnecker, 2001). Thus, for the seventh hypothesis, H7, multiple regression was appropriate.

One regression analysis was conducted for the hypothesis (Table 18). The general multiple regression equation for the analysis is modeled as:

$$Y = a + b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$$

This model is derived from hypothesis H7 and relates to the level of importance given to mentoring for facilitating knowledge transfer. This model contains a single dependent variable and six independent variables (Table 18). The regression equation with the variables is modeled as:

Level of Importance Given to Mentoring for Facilitating Knowledge Transfer = a + b_1(years of service) + b_2(retirement eligibility status) + b_3(frequency of mentoring received) + b_4(frequency of mentoring provided) + b_5(frequency of mentoring desired) + b_6(frequency of mentoring willing to provide).

The dependent variable, Level of Importance Given to Mentoring for Facilitating Knowledge Transfer (LIMKT) and the independent variables Years of Service, Retirement Eligibility Status, Scenario, frequency of mentoring received, frequency of mentoring provided, frequency of mentoring desired, and frequency of mentoring willing to provide are subsequently described in Table 18.

Table 18
Multiple Regression Variables for H7

	LIMKT[a]	Constant	Years of Service	Retirement Eligibility Status	MENR[b]	MEND[b]	MENP[c]	MENW[c]
Hypothesis	Y[b]	a	X_1[e]	X_2	X_1[d]	X_1[d]	X_1[d]	X_1[d]
H7	1 to 5	constant	0 to 40	0 = Ineligible 1 = Eligible	1 to 7	1 to 7	1 to 7	1 to 7
Scale	ordinal	constant	continuous	nominal	ordinal	ordinal	ordinal	ordinal

[a]LIMKT = Level of Importance Given to Mentoring for Facilitating Knowledge Transfer
[b]The values 1-5 represented a range of importance levels from 1 = "Not important" to 5 = "Extremely Important"
[b]MENR = Mentoring Received; MEND = Mentoring Desired
[c]MENP = Mentoring Provided; MENW = Mentoring Willing to Provide
[d]The values 1-7 represented a range of frequencies from 1 = "Never" to 7 = "Daily"
[e]Years of Service is measured on a continuous scale, where less than one year is coded as zero

Multiple linear regression analysis was used to identify independent predictors of "the importance of mentoring for knowledge transfer". The regression analysis resulted in multiple correlations, which indicated how the independent variables when combined relate to each dependent variable. The regression weights showed how much each independent variable contributed to the multiple correlations. A five-point Likert scale was used for participants' response, where 1=not important and 5=extremely important. The testing was based on determining statistical significance at a two-sided alpha level of 0.05.

Summary

A mixed methods approach was used to examine the relationship among types of knowledge transfer channels and the transfer of components of intellectual capital by individuals within an organization. The grounded theory approach and quantitative methods were used to generate a theory that reflects and explores these inter-relationships. Data collection and analysis included theoretical sampling, semi-structured interviews and surveys. Qualitative data analyses were conducted using the N6 version of NUD.IST software and included open, axial, and selective coding. Quantitative data analyses were conducted using SPSS 14.0 software and included multiple linear regression and *t* tests.

CHAPTER 4

RESULTS OF THE STUDY

Introduction

The results of the data analyses are presented in this chapter. The qualitative results include a discussion of themes supported by the integrated qualitative data and the hypotheses derived from the analyses. The quantitative results include a discussion of participant survey responses and results of statistical tests.

This research study examined the relationship between the content and channels involved in knowledge transfer among employees in the specific setting of a DOD field activity. As a result, the participants shared a range of experiences and perspectives on knowledge transfer within the organization. Consistent with grounded theory methodology, relationship themes were discovered and were used in the development of this theory. The following main research question was addressed:

What are the relationships among types of knowledge transfer channels and the transfer of various forms/components of intellectual capital by individuals within an organization? The study also addressed four sub-questions:

1. What types of knowledge transfer channels are personnel currently using to effectively transfer knowledge?

2. What types of intellectual capital are individuals effectively transferring, and which do they feel are most vital to transfer?

3. How do the types of knowledge transfer channels that are actually in use relate to existing models and theories?

4. How do the types of intellectual capital that personnel actually transfer relate to the forms of intellectual capital specified in existing models and theories?

Overview of the Analysis Process

A mixed methods approach was used to gather the data. Qualitative data were obtained through interview questions. The analysis of the qualitative data involved preparing, coding, and analyzing the data to gather a general sense of the data and to reflect on its overall meaning. After analyzing the qualitative data, the data were arranged according to common themes. Consistent with this process, the data were systematically sampled, collected, compared, and analyzed. This concurrent data collection and analysis process allowed for visual and mental integration of the data and the themes that tied related portions of the data together. The data integration facilitated gaining a better understanding of the differences and similarities among the data as related to knowledge transfer and intellectual capital. The differences and similarities that were used to group the data together were the themes or categories that began to represent the content of the data. The themes were further examined for patterns and were methodically coded with labels that represented their meanings. Relationships among these themes were established and hypotheses were developed based on those relationships. The qualitative phase was used to collect data to answer the research sub-questions, explore knowledge transfer and intellectual capital relationships, and address the main research question. The hypotheses were tested through a survey administered to a random sample of participants taken from the entire research site. The analysis of the quantitative data involved inferential and descriptive statistics. The quantitative phase was used to further explore

the qualitative findings, generalize to the focal organization, and address the main research question.

Qualitative Results

Open-ended, qualitative questions were used (Appendix C) to collect data from 23 participants relative to concepts such as intellectual capital and knowledge transfer. The common themes from the qualitative analysis, relative to the research questions, are presented. First, the findings from the study are presented relative to the first sub-question. Then, using the SECI model (Nonaka, 1994) as the theoretical basis to organize the data, the knowledge transfer themes are related to the model. Next, the findings from the study are presented relative to the second sub-question. Then, using the FCIC model (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997) as the theoretical basis to organize the data, the intellectual capital themes are related to the model. Continuing with the SECI model and FCIC model as means to organize the data, a presentation is given of the relationships between knowledge transfer channel themes and intellectual capital themes, relative to the main research question.

Knowledge Transfer Themes

First, the themes from the data connected to the two sub-questions related to knowledge transfer and associated results were examined.

Research sub-question 1: What types of knowledge transfer channels are personnel currently using to effectively transfer knowledge?

Eleven themes from the data were coded as knowledge transfer channels. The intention in developing these categories was to provide a perspective of how individuals go about transferring knowledge and capture a vivid description of those incidents. The knowledge transfer themes, along with the number of participants who described knowledge transfer incidents related to each theme are listed in Table 19.

Retrospectively, as the end of the analysis process involving knowledge transfer themes was approached, analyses was instinctively prioritized according to the number of participants that identified knowledge transfer relative to each theme, starting with the theme discussed the most. The knowledge transfer themes are arranged and presented in this same fashion. The reflections of the participants were intriguing and enlightening. Some of the participants' experiences and incidences of transfer are noted in the following discussions about the knowledge transfer channel themes. Additionally, the characteristics of the knowledge transfer channels are examined and subsequently the findings are discussed.

Table 19
Knowledge Transfer Channels in Use

Transfer Channel	Number of Participants that Identified Channel	Percentage of Participants that Identified Channel	Number of Occurrences of Channel[a]	Percentage of Occurrences of Channel
Observation	21	91%	60	24%
Hands-On Interaction	21	91%	48	20%
Mentoring	16	70%	33	14%
Purposive Encounter	13	57%	23	9%
Documenting	12	52%	28	11%
Instructed Training	12	52%	21	8%
Casual Encounter	12	52%	16	7%
Self Training	7	30%	10	4%
Story or Metaphor	2	9%	5	2%
Programming	1	4%	1	<1%
Teaching	1	4%	1	<1%

Note. The Table is arranged in descending percentage order of participants.
[a]The total number of incidents discussed by participants relative to the channel.

The number and percentage of times that participants discussed knowledge transfer incidents are shown in Table 19, relative to each knowledge transfer theme. At the high end of the range are the themes observation and hands-on interaction, both discussed by 21 participants. Although the same number of participants discussed knowledge transfer incidents related to each of these themes, observation related discussions occurred 12 more times than hands-on interaction related discussions.

Observation

This theme represents the variety of ways that participants experience knowledge transfer as they watch others interact, experience, and/or perform work functions.

Twenty-one of the participants discussed knowledge transfer through observation. Based on the knowledge transfer incidents discussed by participants, it appeared that knowledge transfer through observation occurs in a variety of locations. Participants described observation incidents around the office, at the job site, and within meetings and gatherings. One participant typifies the meaning of this theme through a description of observing the behavior of a coworker:

> I think culture is basically by observation and observation of behavior by senior people. If you are seeing somebody behave in a certain manner, what you are doing is trying to learn from that, especially if you are very close to the individual. As a management skill, it's the people skill that you need to learn. How do you motivate people? How do you get people to want to do something and succeed? That's really, to me, it's not something that's written down anywhere. I don't think you can read any book and learn that. I saw it happen and I was part of it. I think it's, again, practice and observing behavior from others.

Another participant described knowledge transfer through observation, from the sender's perspective:

> At a program meeting recently, I had some branch heads, some division heads, and other reps at the working level. They were watching how I addressed the situation and the meeting, and the points that I wanted to make stand out. Everything I say is a leadership opportunity. How do I know this? They are looking out there and saying, "Well, you really made a point about that topic and we've learned from it. It wasn't what I had said that they learned. It was the whole atmosphere they saw.

Hands-On Interaction

Participants discussed knowledge transfer incidents through direct involvement in performing duties and tasks on the job. Twenty-one of the twenty-three participants described this specifically. Based on participant discussions of knowledge transfer incidents relative to hands-on interaction it appears that some knowledge is exclusively

being transferred through this channel. Knowledge transfer is taking place through daily activities, regular routines, and first hand engagement in task execution.

The knowledge transfer theme, hands-on interaction, is described through the experiences of some participants. Hands-on interaction characterizes the first-hand and primary performance of a task or duty by a participant. One participant reported that some knowledge is only attainable on the job. The complex knowledge was not absorbed (and perhaps not available) at school:

> I think that when the schools educate engineers, they focus so heavily on specific classes like feedback control systems or calculus class. And then the engineers come here and I don't think they can put it all together, because in the work place, you have economics, you have politics, you have sociology, psychology, and the problems that you get are also usually, they are poorly defined. Sometimes, we just throw people into something and they really don't know what's going on, they're clueless, but they're thrown into it and they just learn by doing.

Several of the participants described the knowledge transfer that took place while working aboard a ship. Here a participant speaks about the importance of actually performing a task:

> I've had all that experience handed to me and given out. The very first time that I got involved when it made any sense to me and helped put together my job, it was aboard ship. That was when I went out aboard ship and watched what they do with the fire control systems. I felt more a part of my program then than I had ever felt before because now to me it was important. It really helped me to really put it together the small part I was doing at the time with the system. Awesome experience! It was an invaluable experience being there.

Another participant described how invaluable it is to actually work with the equipment. The hands-on experience provided knowledge that was not made available any other way:

> Ship riding, I found to be a critical piece of my growth as a knowledgeable analyst. The opportunity to ride ship, gave me an experience to understand what

> the analysis means and to be able to look back and say "I'm doing this work, and it has an effect on the combat system". To be able to say, "I understand that what I'm doing and measuring, how the system performs, has a direct impact on the people who are using the system. So, it took some hands-on experience to know the equipment and understand; does this look right or does this look wrong?

Mentoring

Mentoring is the third knowledge transfer channel theme of the study. Sixteen of the participants reported some type of knowledge transfer between master and apprentice. This theme portrays the master and apprentice knowledge transfer relationship. Some incidents seemed to indicate a free flowing exchange. Through participant discussions it appeared that knowledge transfer is taking place both through mentoring that is required and organizationally initiated and through mentoring that is voluntary and participant initiated. Participants expressed a level of excitement as they described their experience with mentorship:

> I had a mentor and that really helped. In the group, I had a mentor, the senior engineer. I worked with him for about two years... He taught me a great deal while he was working on his master's degree in systems engineering management. He basically taught me everything that he learned, partly because he was excited about it. He wanted to share it with somebody. So, by putting yourself under a bird's wing you start to absorb some of that.
>
> The mentoring, the sharing of the knowledge and things, was critical.

This participant reflects on one of the employees beginning a new role as a manager. The master and apprentice relationship and knowledge transfer channel existed between two managers.

> When my first branch manager that I selected came on board I threw him into it right away. But I would talk to him all of the time about my philosophies and it would be really good to talk to this person, and these are the kinds of things you

> need to say, and this is, you know, when you call someone who is out there, you know, you need to introduce yourself and describe who you are and the possibility of what you can do for that person. I would say that I mentored him. The main thing that I did was a side by side mentoring, and every time I thought that there was something he needed to learn, I would say, "This is how I've been doing it. It's worked really well for both of us.

Another participant described the value of mentoring. The value is the mode for learning certain skills that are not acquired through institutionalized education.

> In our department, I recently assigned two younger engineers that we brought on board, real smart, bright guys, to senior engineers. They've been here a few years, three or four years; I've assigned those guys as apprentices to the two other engineers. They're learning things you can't learn going to school.

Purposive Encounter

Four knowledge transfer channel themes, including purposive encounter, were described by about half of the participants. Most of the participants described knowledge transfer incidents involving this theme relative to job transitions, where at least one of the participants was entering or leaving a position. Purposive encounter is described as the process of exchanging knowledge during a meeting planned for information and knowledge dissemination. Some participants described how they gathered with coworkers and transferred knowledge between or amongst each other. This participant described how scheduled meetings took place to pass on knowledge:

> The mid-level and higher managers would sit down and just talk about things. Talk about what it means to work here. Talk about the organizational structure. Talk about the political structure.

This next participant also experienced participating in planned meetings with a predetermined goal of engaging in knowledge exchange:

> We met and discussed all of the funding issues. We discussed personnel and we also discussed personal at the other bases. Who they could talk to, who they had to watch out for, and who was on our side. We discussed all of that.

Documenting

Twelve of the participants mentioned incidents of knowledge transfer that involved cataloging and/or recording in books, folders, and on their PC. The documenting theme characterizes how participants move knowledge from the brain to a media that makes the knowledge available and useable by others. Three participants discussed documenting relative to time; the past, present, and future. One participant described the transfer in terms of how it was managed:

> I got a commitment of at least three days a week from him. He came in and what I wanted him to do was document, document everything he knew. He had thirty-some years of experience in that business line. I wanted him to document the stuff, not for publishing for his own personal use, but to transfer to the others.

This participant had transferred knowledge to several different documents:

> I have written procedures for how to manage the project. I also have a document that discusses how to propose and win a bid for a project.

A different participant talked about creating a catalog and expressed a plan to repeat the process:

> When I left I had a transition. Before I left the branch, I made a desk book with all my contacts, history, processes, how I did things, sample reports, sample sections of how I did the analysis and so that was left there for the next person to come in and use. When I retire, I will probably do the same sort of thing.

Instructed Training

Instructed training is defined as an exchange between student and teacher in an intentional education setting. Twelve participants described knowledge exchange while

participating in instructor-based education and/or training. One participant, in fact, described a flow of knowledge that was not obtainable on-the-job:

> Even though I was taking the training, the knowledge transfer happened in that formal setting not just in the conversations, but during the classes. That was very beneficial to get a different perspective from someone that was fresh.

These two participants express a similar perspective and described the benefit of the classroom setting:

> I think that one of the best things that this base ever did from a point of view of knowledge transfer was back when they did the training on *Deming*; the formal classes, the *TQM (Total Quality Management)* stuff, *Covey*, and all that stuff. You know, I felt that that had tremendous benefit to us as an organization because to me, again, it taught us as an organization, some very basic processes that allow you to be competitive in the market.
>
> I was going through the *Seven Habits of Highly Effective People* facilitator training. It was very intense. It was off-site. There were seven of us from this command, maybe five from this command and some others. I'd already read the book. I'd already been through the three-day class. The facilitator training took it to a whole different level of understanding the material.

Casual Encounter

Twelve of the participants discussed knowledge transfer through casual dialogue with others. This theme relates to situations where knowledge transfer is more of a by-product of the dialogue, as opposed to a primary objective. Participants are transferring knowledge through relaxed encounters, unplanned meetings, and daily conversation.

One participant described how proximity plays a roll in knowledge transfer. This participant indicates that physical location of a desk or office space may afford opportunities for transfer:

> That physical location is a big key too I think. I really do think so. I think that it's not unimportant to sit, it is important to sit with your group, you know, because that everyday chatter, the informal meetings that people kind of, oh, they came

> back from travel and they start talking, it's not a formal meeting, but people tend to come. If you're not there, if you're not physically seated there, you don't get to hear all these kind of things.

Two participants reported that knowledge transfer in a casual after-work-hours environment is invaluable:

> You work with them during the day you go out and have dinner with them at night. You have lots to talk about. You have common things. Careers starting out, just having young kids all that kind of stuff. Over 20 years you get a strong bond. … Go out and have a beverage with him, whatever, talk to him.

This participant described a similar atmosphere:

> And then we also tried the informal method. You know, going out for a favorite beverage or something. Not now in a un-class environment, but sit around and talk about that type of thing. And I have a strong feeling that those things work.

Self Training

Self training describes the theme that seven participants conveyed during their interviews. Self training represents transfers that participants experienced while participating in individual-based, self-taught training. Two participants discussed how they take their own initiative and study from engineering manuals and reports. Here is a participant who was also involved in the ordering process:

> I took it upon myself to take over the branch library. I ordered and read the engineering manuals on my own.

Another participant expresses the importance of acquiring knowledge by taking time to read through the details of engineering reports:

> It is making an effort to read about those areas so I could gain the different technologies, not just technologies but also terminology that was discussed. This really helped.

Story or Metaphor

Three knowledge transfer themes, story or metaphor, programming, and teaching were identified by one or two of the participants. Story or metaphor is defined as the knowledge transfers that occurred by telling of a narrative or discussing or verbalizing an image of a theme or message. Here one participant describes how a story about sailors is used in the work environment:

> I worked out there with these, I'll call them white hats these sailors, and they are young. They need help. So I told my coworkers the story. I think I've just got that attitude over the years. Being out there, seeing these guys, seeing what they are going through and their problems they have. I've had to explain that to people who've come here. Tell them my experience being out there. They just can't picture it and I can't blame them, you know.

Programming

Programming is the theme used to represent knowledge transfer from a participant to a typed computer program. This participant concludes a discussion by identifying a computer program that was written:

> Well, there's more than that. On the baseline stuff, and you don't think about it very much but it's a computer system. There is the database and there is the computer program.

Teaching

Another participant describes the wealth of knowledge that was gained as a teacher of an engineering course. The teaching theme represents participant knowledge transfer experiences in the role of a formal instructor.

> But, what I think is really amazing is how much you learn, how much I actually learned when I taught the class. You know you go attend every year, but some things don't sink in or just weren't on my mind as a student. But when I taught it, I really, no really began to grasp some of those parts.

Knowledge Transfer Characteristics

In addition to the eleven knowledge transfer themes just presented, the themes in relation to participant demographics and the characteristics of the themes were examined. First, the interesting characteristics that emerged from the findings of the data are discussed. The themes suggest a relationship with the transfer characteristics *directness* and *formality*.

In this study, two terms are used to express *directness* as related to knowledge transfer. Directness is used to depict whether or not the knowledge transfer is straight from one individual to another. A *direct* transfer is an interactive transfer from one individual to another (Sveiby, 1994). *Indirect* transfers are all other transfers. Indirect transfers include transfers that involve a medium (Sveiby), those that involve only one individual and transfers through observation. The relationships among directness and knowledge transfer themes are shown in Table 20. Six of the eleven knowledge transfer themes represent indirect transfers. The top two indirect knowledge transfer theme occurrences, observation and hands-on interaction, comprise 44% of all transfer theme occurrences, and those two themes alone outweigh the number of occurrences of all direct transfer themes, combined. As shown in Table 20, observation and mentoring are at the high end of the number of occurrences for indirect and direct transfers, respectively.

Table 20
Directness of Knowledge Transfer

Directness	Transfer Theme	Number of Participants that Identified Channel	Percentage of Participants that Identified Channel	Number of Occurrences of Channel[a]	Percentage of Occurrences of Channel
Direct					
	Mentoring	16	70%	33	14%
	Purposive Encounter	13	57%	23	9%
	Instructed Training	12	52%	21	8%
	Casual Encounter	12	52%	16	7%
	Teaching	1	4%	1	<1%
	Total			94	38%
Indirect					
	Observation	21	91%	60	24%
	Hands-On Interaction	21	91%	48	20%
	Documenting	12	52%	28	11%
	Self Training	7	30%	10	4%
	Story or Metaphor	2	9%	5	2%
	Programming	1	4%	1	<1%
	Total			152	62%

Note. The Table is arranged by directness and in descending order of total participants.
[a]The total number of incidents discussed by participants relative to the channel.

In this study, two terms are also used to express *formality* as related to knowledge transfer. Formality is used to depict whether or not the knowledge transfer involves a formal process. A *formal* transfer, as suggested by (Davenport & Prusak, 2000) consists

of transfers that are structured and purposeful from the onset. *Informal* transfers are all other transfers. Informal transfers include transfers that are more or less spontaneous and are without specific guidance, rules, and structure (Davenport & Prusak). The relationships among formality and knowledge transfer themes are shown in Table 21.

Six of the eleven knowledge transfer themes represent informal transfers. Participants identified more than twice as many occurrences of informal transfers as compared to occurrences of formal transfers. Thus far, the qualitative findings provide a portrayal of the dominance of informal knowledge transfer.

Table 21
Formality of Knowledge Transfer

Formality	Transfer Theme	Number of Participants that Identified Channel	Percentage of Participants that Identified Channel	Number of Occurrences of Channel[a]	Percentage of Occurrences of Channel
Formal					
	Purposive Encounter	13	57%	23	9%
	Documenting	12	52%	28	11%
	Instructed Training	12	52%	21	8%
	Mentoring[b]	3	13%	3	1%
	Programming	1	4%	1	<1%
	Teaching	1	4%	1	<1%
	Total			78	31%
Informal					
	Observation	21	91%	60	24%
	Hands-On Interaction	21	91%	48	20%
	Mentoring[b]	13	70%	30	12%
	Casual Encounter	12	52%	16	7%
	Self Training	7	30%	10	4%
	Story or Metaphor	2	9%	5	2%
	Total			169	69%

Note. The Table is arranged by formality and in descending order of total participants.
[a]The total number of incidents discussed by participants relative to the channel.
[b]Mentoring was distinctly identified as either formal or informal.

The themes in relation to participant demographics were also examined. First, retirement eligibility was used as a practical basis for further examining the knowledge transfer themes (Table 22). Three of the eleven themes, mentoring, purposive encounter, and self training were discussed by approximately twice as many retirement eligible participants as compared to non-retirement eligible participants (Table 22). Additionally, the knowledge transfer themes were examined relative to the other demographic variables, including those related to retirement eligibility, such as age and years of service. No apparent patterns or distinct relationships were found, perhaps due to the small sample size.

Table 22
Knowledge Transfer and Retirement Eligibility

Transfer Theme	Number of Retirement Eligible Participants that Identified Channel	Number of Non-Retirement Eligible Participants that Identified Channel
Observation	11	10
Hands-On Interaction	12	9
Mentoring	10	6
Purposive Encounter	9	4
Documenting	5	7
Instructed Training	6	6
Casual Encounter	7	5
Self Training	5	2
Story or Metaphor	2	0
Programming	1	0
Teaching	1	0

Note. The Table is arranged in descending order of total number of participants.

Knowledge Transfer Themes Compared to Existing Models and Theories

Research sub-question 3: How do the types of knowledge transfer channels that are actually in use relate to existing models and theories?

The eleven knowledge transfer themes from this study are compared with the Socialization, Externalization, Combination, and Internalization (SECI) knowledge transfer model (Nonaka, 1994). The eleven knowledge transfer themes were found to be consistent with the definitions put forth in the SECI model.

Socialization

The first comparison involves four themes; *casual encounter, mentoring, observation, and purposive encounter* which are consistent with the definition of s*ocialization* (see Table 23). These knowledge transfer themes have characteristics of social interaction involving knowledge exchange from one individual to another. Nonaka and Takeuchi (1995) describe socialization as a process of sharing experiences. These themes all relate to experience sharing through either verbal or non-verbal interaction. Observation may be construed as sharing of experience in a non-verbal fashion. This is consistent with the definition of socialization, as knowledge transfer through socialization may occur without the use of language (Nonaka & Takeuchi, p. 62).

Externalization

The second comparison involves four themes; *documenting, programming, stories or metaphors, and teaching* which are consistent with the definition of *externalization* (see Table 23). These knowledge transfer themes share characteristics of communicating through language, verbalizing or publishing. Nonaka and Takeuchi (1995) describe

externalization as a process of sharing accomplished by using metaphors, analogies, concepts, hypotheses, models, and published writings that promote interaction between sender and receiver.

Combination

The third comparison involves themes consistent with the definition of *combination* (see Table 23). Nonaka and Takeuchi's (1995) concept of c*ombination* involves the reconfiguration of existing knowledge through sorting, adding, and merging. Four participants described six incidents of knowledge transfer that involved combining or assembling knowledge into new knowledge. In three of the six combination incidents, participants described using the same transfer method, documenting, multiple times to assemble the new knowledge from existing knowledge.

This participant describes how the knowledge necessary to make use of a new piece of engineering equipment did not previously exist. The engineers created a method for use of the new equipment by combining the knowledge available for two other pieces of equipment:

> Well, what they did was nothing spectacular. If you are using Equipment A, you can read the manual for Equipment A. If you are using Equipment B, you can read the manual for B, but if you are using A and B together, here's how you make them work together, and that's not documented any place. We did it ourselves. We wrote it down and stuck it on a file server someplace and now the junior engineers have reference to that collection of tidbits whenever they need to use that type of equipment.

In the other three combination incidents, participants described using a mixture of transfer methods to assemble the new knowledge from existing knowledge. Here one

participant describes combining knowledge through the use of purposive encounters and documenting:

> I think, like, maybe one recent example, we've been (at the division level) wrestling with our budgets. It occurred to me that different branch heads are using different methods to calculate their budget. So I brought this up with the division head. He sat down and we went through, in a formula, on how to calculate a budget. Once I understood that... basically defining what all the different components are that go into the calculations and what the assumptions are; and he actually wrote it out on paper. Then I went and talked to some more engineers. I actually dragged out some of my engineering accounting books too. Then I went back to my desk again and I typed it all up in a nice little white paper. And then distributed it to the branch heads.

Another participant discusses the creation of an engineering tool and the use of mentoring and documenting as a coworker assembled knowledge:

> She worked at as an analyst and it evolved into the database thing. In order for her to turn it into a database and we sat down and discussed all of it. She combined this with her experience in analysis. She actually made the database and used all of this to turn it into a reconstruction tool.

Internalization

The fourth comparison involves three themes; *hands-on interaction*, *instructed training*, and *self training* which are consistent with the definition of *internalization* (see Table 23). These knowledge transfer themes share characteristics of internalizing and self-absorbing. Nonaka and Takeuchi (1995) describe internalization as the process of independent learning through learning-by-doing, formal training, and self training, such as reading manuals and watching videos.

As shown in Table 23 below, observation, documenting, and hands-on interaction themes are at the high end of the number of occurrences for themes related to the SECI transfer channels socialization, externalization, and internalization, respectively. These

three themes occurred twice as much as other themes related to the same SECI transfer channels. In the socialization related themes, the number of observation occurrences is 60, whereas the number of mentoring occurrences is 33. In the externalization related themes, documenting occurred more than five times as much as any other theme. Themes related to combination occurred one percent or less. In the internalization related themes, the number of hands-on interaction occurrences is 48, whereas the number of instructed training occurrences is 21.

Table 23
Knowledge Transfer as Compared to SECI

SECI Model Transfer Channel	Channels Identified by Participants	Number of Occurrences of Channel[a]	Percentage of Occurrences of Channel
Socialization	Observation	60	24%
	Mentoring	33	14%
	Purposive Encounter	23	9%
	Casual Encounter	16	7%
	Total	138	54%
Externalization	Documenting	28	11%
	Story or Metaphor	5	2%
	Programming	1	<1%
	Teaching	1	<1%
	Total	35	13%
Combination	(Multiple) Documenting	3[b]	1%
	Documenting and Purposive Encounter	2[b]	<1%
	Documenting and Mentoring	1[b]	<1%
	Total	6	1%
Internalization	Hands-on Interaction	48	20%
	Instructed Training	21	8%
	Self Training	10	4%
	Total	79	32%

Note. The Table is arranged by the SECI model and in descending order of total occurrences.
[a]The total number of incidents discussed by participants relative to the channel.
[b]The total number of combined occurrences.

Intellectual Capital Themes

Second, the themes from the data connected to the two sub-questions related to intellectual capital and associated results were examined.

Research sub-question 2: What types of intellectual capital are individuals effectively transferring, and which do they feel are most vital to transfer?

During the interviews, participants provided substantial discussion to address the second sub-question. Eleven themes were coded as intellectual capital. My intention in developing these categories was to provide a perspective of the types of intellectual capital that individuals are transferring, and to accurately describe that knowledge through thick description. The intellectual capital themes, along with the number of participants who described knowledge related to each theme, are listed in Table 24.

The approach to data assembly and analysis of intellectual capital themes was the same as the approach used for knowledge transfer themes. As such, the analyses were prioritized according to number of participants that identified intellectual capital relative to each theme, starting with the theme discussed the most. The intellectual capital themes are arranged and presented in this same fashion. Intellectual capital is clearly flowing within the organization. Participants discussed the knowledge that is important to the organization and is being transferred within the organization. The following excerpts highlight some of the intellectual capital themes. Additionally, characteristics of the intellectual capital are examined and the findings are subsequently discussed.

The number and percentage of times that participants discussed knowledge transfer incidents are shown in Table 24, relative to each intellectual capital theme. At the

high end of the range are the themes subject matter expertise and protocols, discussed by 20 and 15 participants, respectively. Although the difference in number of participants between these two themes is five, the difference in number of occurrences is 120%.

Table 24
Intellectual Capital Being Transferred

Intellectual Capital	Number of Participants that Identified IC	Percentage of Participants that Identified IC	Number of Occurrences of IC[a]	Percentage of Occurrences of IC[a]
Subject Matter Expertise	20	87%	91	33%
Protocols	15	65%	30	11%
Shared Beliefs	14	61%	28	10%
Relationships	13	57%	25	9%
Analysis Methodology	12	52%	29	11%
Trust	12	52%	13	5%
Project Management Skill	9	39%	18	7%
Mutual Understanding	8	35%	18	7%
Communication Skill	8	35%	6	2%
Analysis Tool	7	30%	7	3%
Project Management Methodology	4	17%	9	3%

Note. The Table is arranged in descending percentage order.
[a]The total number of incidents discussed by participants relative to the IC.

Subject Matter Expertise

Subject matter expertise is the theme that characterizes the knowledge that participants discussed connected to the know-how, skills, and capabilities of individuals within the organization. This theme was discussed by 20 of the 23 participants. Several of

the participants described the knowledge related to this theme as an awareness or familiarity coupled with skill.

Through their discussions, many participants associated the knowledge with particular tasks. Here a participant discussed subject matter expertise in relation to system analysis and the use of database:

> And it isn't a database, it's really a process is what it is. And I had to work with an individual, a very bright guy, a very knowledgeable person, and he was kind of the father of this whole concept, okay? And he needed to transfer that knowledge to me, but with the understanding, what they were counting was the fact that they needed somebody that could really understand the process well, could buy into it ownership-wise, and could take some of the load off of him because he was being inundated with too much work.

This participant described keeping pace with technology:

> A number of things, as new technologies come into place, the people that are willing to go and stay up with technology. When we both came in, the typewriter was a very popular item and going through the carbon copies of things was the way to do business. During that time, he shared his knowledge, his experience, and his expertise very openly with me.

And this participant described subject matter expertise in relation to plan and report writing:

> For the first portion of it, when we first started this, everyone knew that he was retiring and possibly I would be taking over for him. He was the lead on this project and I was basically the assistant. He had me actually write the data management analysis plan and he would go over it and if there were any corrections to be made, he would put it down on there. I would have to explain why I think, the corrections he made, even on the final reports. I would take one of his old reports, look over it, because that's the form that it had to be in, and since the ship was different, all the information changes. We repeated this process over and over. He was telling me how to do it right.

Protocols

Protocols characterize the knowledge participants described related to formalities and procedures in customer relations. Fifteen participants discussed knowledge associated with the official and unofficial ways to properly interact with a customer. Two participants discussed the importance of understanding the politics of doing business with a customer:

> We discussed who they could talk to, who they had to watch out for, who was on our side. We discussed all of that. I passed that information to them and said, This manager, as long as you are doing this he is very happy. Don't do this. There were certain reports they wanted. They wanted them one way and they wanted it on this date. Get it to them by that time and you're going to be on their good side.
>
> It is a bit of trial and error but after a while you have a sense of what you can say and what you shouldn't say at various meetings. I guess it comes out of the folks of the branch are gaining first hand knowledge day-to-day of what we need to do in there to support the customer. Even some of the younger people, even though they are new they show signs that they will be able to handle the political parts of the job and the difficult parts of the job.

As described by this participant, protocol knowledge may be the difference between maintaining and losing business:

> Somebody with less experience will either miss those steps or not know those steps. Tasks would take much longer to get done. Quality could be suspect. Relationships could be hurt just because of that. And it is very difficult to take somebody who is a technical expert and have somebody who is a journeyman, you know, expect them to do the same things the same way in the same timeframe. And that could be an impact on how well we do business.

Shared Beliefs

Fourteen of the participants described knowledge related to the theme shared value. This theme portrays knowledge that depicts main values, principles, ethics, and

morals related to the organization. This participant described the importance of encouraging truth telling:

> The culture of telling the truth is natural in an organization. You don't have to do anything to develop it. You do things to destroy it. My boss called me in and I had no consequence to that, no personal consequence. He said, "You were absolutely right. Don't worry about it. People are rattling sabers. You did the right thing." Now he could have just pushed the blame down like most managers do. If he had done that, first off, I probably wouldn't have been here long. Secondly, I would have never told the truth again. Managers shut down that in a flash. It only takes one bad one.

Many of the participants discussed knowing the main purpose of performing a particular analysis task. Here two participants describe the motive for work:

> I think I've just got that attitude over the years. Being out there, seeing these guys, seeing what they are going through and their problems they have. Yet, believe it or not, I've had to explain that to people who've come here. You'll learn more by being out there with these people.

> I've always heard that. Our number one job always, our main effort is to protect our sailors. Not to please the program office because they are the ones that are paying us, but to protect the sailors. When I do my job, I'm not doing this like, "Well, the program office is paying me to do this. I had better do this." I do it to make sure the sailors are not in harms way when they are going on a deployment.

Relationships

Participants spoke of the rapport and connection that existed with customers. This theme characterizes the connecting bond between participants and the customers. Thirteen of the participants discussed knowledge related to this theme. One participant described the value of the connection his mentor had with the customer:

> He let me know and watched over me if there was something really sensitive that needed to be done. I did call on him one time. I had full confidence in my capabilities, but I wanted his credibility along with mine. I felt that was one of the key things that a mentor knowledge-sharing arrangement needs to have... when you have that credible person as your mentor that the connection remains so that

> person can be called upon to stand in and provide that extra bit of authority, or approval, in cases that may require that.

Several participants described how important it was to have a high comfort level relationship with the customer. Here a participant describes the importance of familiarity:

> They all eventually meet the customers. They attend meetings after they've gone with the senior person project lead for some time, they attend the meetings. A lot of times if the project lead is available they will also attend the meetings. There are times when the project lead can't go and then a junior person will go but, that junior person will know the people in the room that are going to be at the meeting. We will have already met all of them already. It is like they know that face. They don't know, maybe not quite as well, but they know that's the person that they deal with all the time.

Analysis Methodology

Analysis methodology knowledge themes were discussed by 12 of the participants. The analysis methodology theme portrays the knowledge related to processes used to analyze and assess systems. This participant reflects on the significance of developing a particular analysis process:

> It was the analysis process, which did not exist before I started working that effort. Now, I can look and see that is in place and that I was a key person in developing that effort.

Here two participants discuss the importance of understanding a particular analysis process:

> And now, at that time, I remember the sheets went right along with it. They handed me one. I did not know the process, but still, I was exposed to it, right. I did a lot of cross-training to learn the process. It was important to understand how it needed to be done.
>
> And it was taught by a very experienced analyst. We had slides and classes. It was about learning the way to do analysis. You had to do it a certain way. That was valuable, because right away you're applying the skills that you were just hearing about.

Trust

Trust describes the theme that 12 participants spoke of during their interviews. Trust represents the theme associated with knowledge related to confidence and assurance levels between individuals. One participant describes the difference between a relationship that is effective and one that is not effective:

> I'm not sure that I can identify why. They've just got the right combination of personnel. They've always done really well at working as team and transferring knowledge rather than keeping it close to their chest. This worked better and was opposite what I had witnessed elsewhere. I've been involved in other branches where there is a mind set that anything you know makes you more important so you keep it to yourself and that doesn't work at all.

Similarly, this participant describes trust as a key element for success in completing an assignment or task; suggesting that the process requires more than just technical skill:

> It's not so bad. We just need to make sure we raise it so we can fix the process." It takes it from a negative meaning to a much more positive one. I've even already seen the feedback." Wow, you know what? If you do not have trust, I don't care how smart you are, you will fail.

Project Management Skill

Another knowledge theme is project management skills. Nine participants described knowledge related to this theme. Project management skill is defined as the know-how to allocate, utilize, and balance resources in relationship to tasks. This participant distinguishes between supervisory duties and resource allocation skills. A sense of importance is conveyed:

> It was knowledge, all informal, of customer interactions, funding, and that sort of thing because I'd been involved in projects before. I certainly didn't have to keep track of people's time keeping and all of the other stuff that goes with the management duties, but I did have to keep track of it. I

> did have to figure out what I was going to do with my resources as the project lead.

This participant expresses the relative importance of engineering and project management skills:

> It was a mixture of systems engineering and program management.
> I felt, has been critical in my interactions with sponsors. It also led, what I feel, to a very successful interaction.

Mutual Understanding

Mutual understanding characterizes the knowledge theme discussed by eight of the participants. Mutual understanding depicts knowledge related to perceptiveness, and comprehension between individuals. Participants' descriptions suggest a common social interaction, somewhat culture-like. This participant describes this understanding as a vision:

> I did it both ways. Sat down and tried to help them understand where I was going with this. What I wanted them to do is I wanted them to understand the vision. I wanted them to understand the process that was involved, but I wanted them to understand it well enough that they took ownership of it, and that they would be able to do it without me having to manage them through that entire thing.

Here a participant discusses social interaction within the group. This participant describes similar mindsets and common tasks:

> I think it's not communication skills so much as social skills. Building off of each other, hands on experimentation in the lab, seeing what works and what didn't, but mostly building off each other. They all got into that mindset and started doing the same thing and sharing within the group.

Communication Skill

Eight of the participants described knowledge characterized by the theme communication skill. This theme depicts knowledge that participants discussed related to

the interrelation, discourse, and exchange between individuals. Here two participants, in different ways, express the importance of communication. The first participant relates to the messenger's perception of the audience:

> Well the thing that became obvious to me several years back giving briefs to sponsors and captains and things like that is people will actually understand the communication different ways. Some people are very audible. They can pick up. You can talk to them. They are just great with it. Others are more visual and I've briefed people and I've had bosses that were very, very visual.

The second participant emphasizes knowing how to handle a difficult situation:

> If you have engineers who do not know how to communicate, they will not be a success. How you act or react, sometimes even in a difficult situation, is important.

Analysis Tool

This theme characterizes the variety of knowledge that seven participants discussed related to computer programs or software used for system analysis. These participants discussed the significance of knowing how to use various analysis tools and some emphasized the importance of the know-how.

One participant described analysis videos. The video was actually the end result of the analysis that was conducted using a suite of programs. This participant laments over lost knowledge and expresses hope with the current situation:

> We lost the capability to produce the analysis videos. He knew the tool and no one else was trained. He used to make these videos for us and when he left, we lost that capability completely. There's nobody here. And we had been saying, for years, that we should train somebody to train somebody to take his place. We completely lost that capability. Now we are trying to get it back.

Another participant expressed the importance in terms of length of time:

> The biggest part there is learning with your other cohorts, learning the tools, the analysis tools. You can't do analysis without learning the tools, without knowing

> the tools you can't do the work. It took basically a year and a half to learn the tools and how the tools work and applied it from there.

Project Management Methodology

Four of the participants discussed knowledge centered on the theme project management methodology. This theme characterizes knowledge related to structured resource management processes. Both of these participants describe the written process that is followed. Here the participant identifies a project sheet:

> That's right. I was basically given the project. Now, that I have some understanding of some of these projects, and being the branch head, I have a more structured approach to dealing with things. And what I do, is every project I assign to somebody, I write up a project sheet.

This participant describes the knowledge as a flowchart:

> Right. I was the only person there so it took a while to develop the contacts for the, what their requirements for security were, where I could set up work stations, how do I get into their network if I needed to and the restrictions, how to process security agreements and things like that, and once I got that part of it done, I flow charted it all. I documented what needs to be done.

Intellectual Capital Characteristics

In addition to the eleven intellectual capital themes just presented, the themes in relation to participant demographics and the characteristics of the themes were also examined. First, the interesting characteristics that emerged from the findings of the data are discussed. The themes suggest a relationship with the intellectual capital characteristic, *commercializability*.

In this study, two terms are used to express commercializability as related to intellectual capital. Commercializability is used to depict whether or not the intellectual capital is directly marketable or sellable. Commercializable intellectual capital is

knowledge that is capable of directly finding its way into the business or technology marketplace (Sullivan, 1998, p. 175). Sullivan's definition of commercializable includes intellectual technical assets or technical know-how, and thus includes subject matter expertise. The relationships among the commercializability and the intellectual capital themes are shown in Table 25. Five of the eleven intellectual capital themes represent commercializable knowledge. The other six intellectual capital themes represent non-commercializable knowledge. The top two commercializable intellectual capital theme occurrences, subject matter expertise and analysis methodology comprise 43.5% of all intellectual capital theme occurrences, and those two themes alone nearly equal the number of occurrences of all intellectual capital themes combined.

Table 25
Commercializability of Intellectual Capital

Characteristic	Intellectual Capital	Number of Participants that Identified IC	Percentage of Participants that Identified IC	Number of Occurrences of IC[a]	Percentage of Occurrences IC
Commercializable					
	Subject Matter Expertise	20	87%	91	33%
	Analysis Methodology	12	52%	29	10.5%
	Project Management Skill	9	39%	18	7%
	Analysis Tool	7	30%	7	2.5%
	Project Management Methodology	4	17%	9	3%
	Total			154	56%
Non-Commercializable					
	Protocols	15	65%	30	11%
	Shared Beliefs	14	61%	28	10%
	Relationships	13	57%	25	9%
	Trust	12	43%	13	5%
	Communication Skill	8	35%	6	2%
	Mutual Understanding	8	35%	18	7%
	Total			120	44%

Note. The Table is arranged in descending percentage order of participants.
[a]The total number of incidents discussed by participants relative to the IC.

Themes in relation to participant demographics were also examined. First, retirement eligibility was used as a practical basis for further examining the intellectual capital themes. Two of the eleven themes, analysis tool, and project management methodology were discussed by more than twice as many retirement eligible participants as compared to non-retirement eligible participants (Table 26). Additionally, the intellectual capital themes were examined relative to the other demographic variables, including those related to retirement eligibility, such as age and years of service. No distinct patterns or relationships were found, perhaps due to the small sample size.

Table 26
Intellectual Capital and Retirement Eligibility

IC Theme	Number of Retirement Eligible Participants that Identified IC	Number of Non-Retirement Eligible Participants that Identified IC
Subject Matter Expertise	12	8
Analysis Methodology	6	6
Project Management Skill	5	4
Analysis Tool	6	1
Project Management Methodology	3	1
Protocols	9	6
Shared Beliefs	9	5
Relationships	8	5
Trust	5	7
Communication Skill	3	5
Mutual Understanding	4	4

Note. The Table is arranged in descending order of total number of participants.

Intellectual Capital Themes Compared to Existing Models and Theories

Research sub-question 4: How do the types of intellectual capital that personnel actually transfer relate to the forms of intellectual capital specified in existing models and theories?

The eleven intellectual capital themes from this study are compared with the Four Component Intellectual Capital model consisting of human, structural, customer, and social capital (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997). The eleven intellectual capital themes were found to be consistent with the definitions put forth in the FCIC model.

The first comparison involves four themes; *communication skill*, *project management skill*, and *subject matter expertise* which are consistent with the definition of human capital (see Table 27). These intellectual capital themes have characteristics of individual knowledge, skills, and abilities and relate to information dissemination, resource management, and capability. In the FCIC model, *human capital* is defined as the combined knowledge, skill, experience and ability of the organization's individual employees (including managers) (Becker, 1993; Edvinsson & Malone, 1997).

The second comparison involves four themes; *analysis methodology*, *analysis tool*, and *project management methodology* which are consistent with the definition of structural capital (see Table 27). These intellectual capital themes have characteristics of engineering processes, organization policies, proprietary processes and software, and task procedures. In the FCIC model, *structural capital* is defined as the proprietary software,

computer programs, databases, organizational structure, patents, trademarks and similar assets that support productivity (Edvinsson & Malone, 1997; Sveiby et al., 1988).

The third comparison involves two themes; *protocols*, and *relationships*. These intellectual capital themes have characteristics of rapport with customers and interaction procedures. In the FCIC model, c*ustomer capital* is defined as the value of the organization perceived by those with whom an organization conducts business (Edvinsson & Malone, 1997; Saint-Onge, 1996).

The fourth comparison involves three themes; *mutual understanding*, *shared beliefs*, and *trust*. These intellectual capital themes have characteristics of connecting social behavior. In the FCIC model, *social capital* is defined as the stock of active connections among people: the trust, mutual understanding and shared values and behaviors that bind members of human networks and communities (Bourdieu, 1979; D. Cohen & Prusak, 2001).

As shown in Table 27 below, subject matter expertise, analysis methodology, protocols, and shared value themes are at the high end of the number of occurrences for themes related to the FCIC intellectual capital components, human capital, structural capital, customer capital, and social capital, respectively. The themes subject matter expertise and analysis methodology occurred more than three times as frequently as other themes related to the same FCIC components. In fact, in the human capital related themes, the number of subject matter expertise occurrences is 91, whereas the number of occurrences of the other two human capital related themes is 15, combined. In the structural capital related themes, analysis methodology occurred 29 times, whereas the

number of the other two structural capital themes is 16, combined. On the other hand, the difference in the number of occurrences with the themes related to customer capital, protocols and relationships was much less, with a difference of 5 occurrences. In the social capital related themes, the number of shared value occurrences is 28, whereas the number of mutual understanding, and trust occurrences are 18 and 13, respectively.

Table 27
Intellectual Capital as Compared to FCIC

Model Intellectual Capital	IC Identified by Participants	Number of Occurrences of IC[a]	Percentage of Occurrences of IC
Human Capital	Subject Matter Expertise	91	33%
	Project Management Skill	9	3%
	Communication Skill	6	2%
Structural Capital	Analysis Methodology	29	11%
	Project Management Methodology	9	3%
	Analysis Tool	7	3%
Customer Capital	Protocols	30	11%
	Relationships	25	9%
Social Capital	Shared Beliefs	28	10%
	Mutual Understanding	18	7%
	Trust	13	5%

Note. The Table is arranged by the FCIC model and in descending order of total occurrences.
[a]The total number of incidents discussed by participants relative to the IC.

Intellectual Capital and Knowledge Transfer Relationship Findings

Next, the main research question is discussed and the relationships between intellectual capital and knowledge transfer are examined. The discussion includes a presentation of the data relative to the main research question, the findings from the qualitative data analyses, and the hypotheses derived from the findings.

Main research question: What are the relationships among types of knowledge transfer channels and the transfer of various forms/components of intellectual capital by individuals within an organization?

It was clear from the participants' responses that they make great use of indirect and informal knowledge transfer channels in order to exchange intellectual capital. In particular, hands-on interaction and observation were both identified by 21 of the participants as means to transfer knowledge. In fact, participants described 48 different knowledge transfer incidents involving hands-on interaction and 60 involving observation. Participants' descriptions of these and other knowledge transfer incidents included discussions about the types of intellectual capital transferred during these incidents. Since the purpose of this study is to develop a theory that explores the relationship between knowledge transfer methods and intellectual capital, it is useful to look at the knowledge transfer incidents through an examination of the results of the analyses in terms of the themes from the qualitative study.

The analyses of the qualitative data showed that the knowledge transfer themes are consistent with the SECI model (Nonaka, 1994) and that the intellectual capital

themes are consistent with the FCIC model (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997). Hence, the models are being revisited as a means to organize the data and discuss the relationships among the knowledge transfer and intellectual capital themes. During the research itself, the sensitizing concepts of the SECI and FCIC models were kept in mind. Concurrently, the sensitivity was balanced with objectivity. As Strauss and Corbin (1998) suggest, objectivity was maintained by thinking comparatively, obtaining multiple viewpoints, examining the practically of the themes, using comparative analyses, and by following the grounded theory methodology. The interwoven data collection and analyses process using multiple participants, combined with practical experience at the research site, provided the means to maintain objectivity. Eleven knowledge transfer themes and eleven intellectual capital themes were identified from the data collected from participants.

The eleven intellectual capital themes, consistent with the meanings and definitions of the FCIC model (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997) relate to the four types of intellectual capital in the model, as previously discussed, and shown in Table 27. In the next series of Tables, 28 through 31, the four types of intellectual capital, human capital, structural capital, customer capital, and social capital, from the FCIC model are used as a convenient means to organize the findings of the analyses into the four tables. As such, the eleven intellectual capital themes are divided among the four tables, consistent with the definitions of the four intellectual capital types in the FCIC model. In each of the four tables, the intellectual capital themes are compared to the knowledge transfer themes.

First, the three intellectual capital themes, *communication skill*, *project management skill*, and *subject matter expertise,* which are consistent with the FCIC human capitol definition, are compared with the knowledge transfer themes (see Table 28). As shown in Table 28, participants reported knowledge transfer incidents involving these three intellectual capital themes and eight of the eleven knowledge transfer themes. Of these eight themes, participants discussed 39 occurrences of human capital related knowledge transfer incidents involving hands-on interaction. Also, participants discussed 22 occurrences of human capital related knowledge transfer incidents involving mentoring. This makes sense, as hands-on interaction and mentoring are two of the three knowledge transfer themes most frequently discussed by participants. Mentoring was the most frequently discussed *direct* knowledge transfer theme that participants discussed and hands-on interaction was the second most frequently discussed *indirect* knowledge transfer theme. This leads to the first hypothesis which is derived from the relationships among the human capital themes and knowledge transfer themes.

H1: Subject matter expertise (SME) is transferred most effectively through hands-on-interaction (HOI).

Table 28
Frequency and Number of Reported Knowledge Transfer Incidents Involving Human Capital

	Communication Skill		Project Management Skill		Subject Matter Expertise		
Transfer Theme[a]	Number of Participants that Identified IC	Number of Occurrences of IC	Number of Participants that Identified IC	Number of Occurrences of IC	Number of Participants that Identified IC	Number of Occurrences of IC	Total Number of Occurrences
Hands-on Interaction	2	2	4	5	15	32	39
Mentoring	1	1	2	3	12	18	22
Observation	1	1	2	2	12	12	15
Instructed Training	2	2	4	5	5	7	14
Casual Encounter	0	0	2	2	7	8	10
Self Training	0	0	1	1	5	6	7
Purposive Encounter	0	0	0	0	5	5	5
Documenting	0	0	0	0	3	3	3

Note. The Table is arranged in descending order of total occurrences.
[a]Only 8 of 11 knowledge transfer themes relate to human capital themes.

Second, the three intellectual capital themes, *analysis methodology, analysis tool,* and *project management methodology*, which are consistent with the FCIC structural capital definition, are compared with the knowledge transfer themes (see Table 29). As shown in Table 29, participants reported knowledge transfer incidents involving these three intellectual capital themes and nine of the eleven knowledge transfer themes. Of these nine themes, participants discussed 19 occurrences of structural capital related knowledge transfer incidents involving documenting. Participants discussed this theme in relation to structural capital nearly four times more often (19) than the next most frequently occurring knowledge transfer theme (5). As we saw, documenting was one of the five knowledge transfer themes most frequently discussed by participants. These findings are also consistent with the analyses related to formality, as documenting was also the most frequently discussed *formal* knowledge transfer theme that participants discussed. This leads to the second hypothesis which is derived from the relationships among the structural capital themes and knowledge transfer themes.

H2: Analysis methodology (AMY) is transferred most effectively through documenting (DOC).

Table 29
Frequency and Number of Reported Knowledge Transfer Incidents Involving Structural Capital

	Analysis Methodology		Analysis Tool		Project Management Methodology		
Transfer Theme[a]	Number of Participants that Identified IC	Number of Occurrences of IC	Number of Participants that Identified IC	Number of Occurrences of IC	Number of Participants that Identified IC	Number of Occurrences of IC	Total Number of Occurrences
Documenting	9	13	1	1	3	5	19
Hands-on Interaction	1	1	1	3	1	1	5
Instructed Training	2	4	0	0	1	1	5
Observation	2	2	0	0	1	2	4
Purposive Encounter	3	3	0	0	0	0	3
Self Training	3	3	0	0	0	0	3
Mentoring	1	1	1	1	0	0	2
Programming	0	0	1	1	0	0	1
Teaching	0	0	1	1	0	0	1

Note. The Table is arranged in descending order of total occurrences.
[a]Only 9 of 11 knowledge transfer themes relate to structural capital themes.

Third, the two intellectual capital themes, *protocols*, and *relationships*, which are consistent with the FCIC customer capitol definition, are compared with the knowledge transfer themes (see Table 30). As shown in Table 30, participants reported knowledge transfer incidents involving these two intellectual capital themes and six of the eleven knowledge transfer themes. Participants predominately discussed 32 occurrences of structural capital related knowledge transfer incidents involving observation. Participants discussed this theme in relation to customer capital four times more often (32) than the next most frequently occurring knowledge transfer theme (8). In fact, the 32 observation occurrences exceeds the aggregate occurrences of the five other knowledge transfer themes in relation to customer capital. This makes sense, as observation was one of the knowledge transfer themes most frequently discussed by participants. Observation was also the most frequently discussed *informal* and most discussed *indirect* knowledge transfer theme by participants. This leads to the third hypothesis which is derived from the relationships among the customer capital themes and knowledge transfer themes.

H3: Customer protocols and relationships (CPR) are transferred most effectively through observation (OBS).

Table 30
Frequency and Number of Reported Knowledge Transfer Incidents Involving Customer Capital

	Protocols		Relationships		
Transfer Theme[a]	Number of Participants that Identified IC	Number of Occurrences of IC	Number of Participants that Identified IC	Number of Occurrences of IC	Total Number of Occurrences
Observation	9	18	9	14	32
Purposive Encounter	4	6	2	2	8
Mentoring	2	2	5	5	7
Hands-on Interaction	2	2	2	2	4
Casual Encounter	1	1	1	1	2
Instructed Training	1	1	1	1	2

Note. The Table is arranged in descending order of total occurrences.
[a]Only 6 of 11 knowledge transfer themes relate to customer capital themes.

Fourth, the three intellectual capital themes, *mutual understanding, shared beliefs,* and *trust*, which are consistent with the FCIC social capitol definition, are compared with the knowledge transfer themes (see Table 31). As shown in Table 31, participants reported knowledge transfer incidents involving these three intellectual capital themes and eight of the eleven knowledge transfer themes. Participants discussed 31 occurrences of social capital related knowledge transfer incidents involving observation. Participants discussed this theme in relation to social capital more than four times more often (31) than the next most frequently occurring knowledge transfer theme (7). This makes sense, as observation was one of the knowledge transfer theme most frequently discussed by participants. Observation was also the most frequently discussed *informal* and most discussed *indirect* knowledge transfer theme by participants. This leads to the fourth hypothesis which is derived from the relationships among the social capital themes and knowledge transfer themes.

H4: Shared beliefs (SHB) are transferred most effectively through observation (OBS).

Table 31
Frequency and Number of Reported Knowledge Transfer Incidents Involving Social Capital

	Mutual Understanding		Shared Beliefs		Trust		
Transfer Theme[a]	Number of Participants that Identified IC	Number of Occurrences of IC	Number of Participants that Identified IC	Number of Occurrences of IC	Number of Participants that Identified IC	Number of Occurrences of IC	Total Number of Occurrences
Observation	6	8	10	15	6	8	31
Mentoring	2	2	3	3	2	2	7
Purposive Encounter	1	3	2	2	2	2	7
Casual Encounter	2	2	1	1	2	2	5
Story or Metaphor	0	0	2	5	0	0	5
Hands-on Interaction	1	1	1	1	1	1	3
Instructed Training	1	1	1	1	0	0	2
Documenting	1	1	0	0	0	0	1

Note. The Table is arranged in descending order of total occurrences.
[a]Only 8 of 11 knowledge transfer themes relate to social capital themes.

Mentoring Related Findings

Since the practical significance of this study addresses eroding budgets coupled with a vastly increasing retirement eligible workforce, it is useful to examine the results of the analyses in terms of the themes from the qualitative study relative to the retirement eligibility status. It was clear from the participants' responses that the 12 retirement eligible participants discussed some of the knowledge transfer and intellectual capital themes more frequently than the 11 non-retirement eligible participants. In particular, mentoring, purposive encounter, and self training were identified by nearly twice as many retirement eligible participants as means to transfer knowledge as compared to the non-retirement eligible group. Also, intellectual capital related to the themes analysis tool and project management methodology were identified by nearly twice as many retirement eligible participants as compared to the non-retirement eligible group. The qualitative analysis suggests that differences between the two groups may exist in the relationship between intellectual capital and knowledge transfer.

This research study was not designed to address the possible influences associated with employment longevity, experience, or retirement eligibility and the preference for using a particular knowledge transfer channel. However, given the practical issues associated with the growing Federal retirement eligible workforce, the vested interest in the research site, and the potential usefulness of the findings, it seems sensible to further investigate some of the differences and interesting nuances among the retirement eligible and non-retirement eligible participants, in terms of knowledge transfer and intellectual capital.

Some interesting but unexpected findings identified during the qualitative phase concerning mentoring and the relationships between retirement eligible employees and non-retirement eligible employees were also further examined.

First, the qualitative analyses suggested that knowledge transfer practice differences may exist between retirement eligible employees and non-retirement eligible employees. Survey participants were thus divided into the two groups, and retirement eligibility was used as a control variable to further explore H1-H4 to see if any differences between the two groups existed.

Second, some findings related to mentoring were further examined. The qualitative analyses suggested that the amount of knowledge transfer through mentoring that non-retirement eligible employees' desire may exceed the amount they receive. The analyses also suggested that retirement eligible employees may be willing to provide more mentoring than they currently provide.

One of the non-retirement eligible participants suggests that the amount of knowledge transfer between retirement eligible employees and non-retirement eligible employees is somewhat less than ideal. Here the participant identifies the disparity:

> Maybe like, you know, since this organization has a bathtub affect. A lot of retirees, the middle-aged people who are here for or years, and then you have our new hire category, the knowledge transfer between the middle-aged people and the new hires sometimes is better than the subject matter expert because they have their own set ways. In my particular group, it would be nice if our subject matter expert would teach a class or something. We know he knows a lot. He is basically the only person who knows so much about how the system evolved. I wish there was a little more mentoring involved. Not to say that he doesn't teach us, but he doesn't offer as much mentorship as some of the other people.

Some of the non-retirement eligible participants expressed a desire for more mentoring. Here one participant expresses frustration with a haphazard mentoring process:

> Mentorship I like a lot. We don't have that. We kind of had an informal mentorship where I guess everyone was your mentor, and there was a sometime or you know, someone actually assigned but it didn't really work out. It was kind of still informal, but basically everyone is a mentor.

Another non-retirement eligible participants expresses a desire for more mentoring:

> I guess I would say that when someone with a lot of information is approaching retirement age, it would be useful to actually have them take protégés or whatever to meet with some of the folks that I may not normally have access to and shake hands and meet them and understand what their function is.

Some of the retirement eligible participants expressed a desire and willingness to provide more mentoring. Here the participant addresses the issue:

> I think what I would do and maybe it is because I'm old but, I would look to the senior people who have been here, who have done that and try and get them to train. Maybe not train is the right word but to give a lot of their experience, if it is possible, to the newer people. Because, that is where I think we've got to bring the new people into the area that we've been in for years.

This retirement eligible participant discusses bringing the two groups together for mentoring:

> You want to bring us in. Let some of our guys go down there and sit with one of the senior guys, one with a lot of experience or whatever. Bring them in there and let them share – at least get exposed to it. Believe me; I've always felt that the more the troops know, the better off the guy sitting at the top is. If we did that as a command, everybody would be so valuable.

This leads to the fifth, sixth, and seventh hypotheses which are derived from nuances observed in the qualitative data related to retirement eligible status and mentoring. The hypotheses derived from the findings are as follows:

H5: The frequency of mentoring that employees desire to receive exceeds the amount received.

H6: The frequency of mentoring that employees are willing to provide exceeds the amount provided.

The qualitative findings suggested that at least some retirement eligible and non-retirement eligible employees consider mentoring to have an important role in knowledge transfer. For that reason, mentoring and its relationship to effective knowledge transfer within the organization were further explored. This leads to the seventh hypothesis:

H7: Perceived importance of mentoring increases directly with retirement eligibility.

Toward a Grounded Theory of Relationships among Knowledge Transfer Channels and Intellectual Capital Types

Generation of a grounded theory, according to Creswell (1998, p. 56), may be described as the process of collecting primarily qualitative data, developing and interrelating categories of information, and articulating a theory through a narrative, picture, propositions, or hypotheses. Participants discussed incidents of knowledge transfer that revealed eleven knowledge transfer themes and eleven intellectual capital themes. Various relationships were identified among these themes. The grounded theory from this study is represented by these relationships and is advanced by the seven hypotheses (Creswell, 2005, p. 409).

Quantitative Results

A self-administered survey (Appendix G) was used to collect data from 113 participants related to effective knowledge transfer and mentoring. The statistical results are presented relative to each hypothesis. The survey data were analyzed using descriptive and inferential statistics, and the data results provided pertinent information to enable the analysis of the data and testing of the hypotheses.

Analyses of the quantitative data were essentially grouped into three tasks; an approach to examine hypotheses H1-H4, an approach to examine hypotheses H5-H6, and finally an approach to examine hypothesis H7. The primary statistical tools used to analyze the data from this research were multiple linear regression (H1-H4, H7) and paired *t* tests (H5-H6).

Hypotheses H1-H4 Quantitative Results

The data collected from Section 1 of the survey were used to examine each of the first four hypotheses, H1-H4. Participants were presented with four scenarios; each scenario described one of the four types of intellectual capital: (a) Subject Mater Expertise (SME), (b) Analysis Methodology (AMY), (c) Customer Protocols and Relationships (CPR), and (d) Shared Beliefs (SHB). Under each scenario, participants were asked to compare the effectiveness of four knowledge Transfer Mechanisms, (a) Hands-On Interaction (HOI), (b) Documenting (DOC), (c) Observation (OBS), and (d) Mentoring (MEN), against each other; resulting in six comparisons.

Participants were asked to assess the effectiveness of the four different mechanisms for transferring each of the four intellectual capital types. A brief scenario was presented to help paint a general picture of the intellectual capital (knowledge) and to get the respondent to think about real life situations. Each scenario (SME, AMY, CPR, and SHB) was followed by six comparisons asking participants to rate the effectiveness of the knowledge transfer mechanisms as compared to each other (Appendix G).

Multiple linear regression analysis was used to identify independent predictors of the dependent variable, that is, to determine the extent to which independent variables interact to explain the variance observed in the dependent variable. Data from all 113 survey participants were used over the four intellectual capital scenarios in the survey (Appendix G) for each of the four hypotheses H1-H4. With six comparisons each (24 x 113), all 1356 observations contributed to the analysis. One regression analysis was conducted for each hypothesis: (a) H1 about the intellectual capital type, Subject Matter

Expertise (SME), (b) H2 about the intellectual capital type, Analysis Methodology (AMY), (c) H3 about the intellectual capital type, Customer Protocols and Procedures, and (d) H4 about the intellectual capital type, Shared Beliefs (Table 32).

This model contains a single dependent variable and six independent variables as shown in Table 32 and is modeled as:

$$Y = a + b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$$

Heteroscedasticity of the model was tested through visual inspection of the scatter plots. Residuals were found to be predominately uniform. Normality was tested through inspection of the normal p plots. A normal distribution was observed.

Multicollinearity of the independent variables in the general equation used for hypotheses H1-H4 was diagnosed using eigenvalues and condition indices. Table 32 shows that the eigenvalues for Comparison 1 and Comparison 2 were close to 0, which gives some indication of a multicollinearity problem. However, only Comparison 2 had a condition index which was greater than 15, indicating that dropping this variable might be beneficial. However, the correlation between Comparison 1 and Comparison 2 was only -0.50, indicating only a moderately strong correlation. Thus, all of the independent variables were retained in the model and multicollinearity was not considered to be a severe problem.

Table 32
Multiple Regression Variables and Collinearity Diagnostics Predictor Variables for H1-H4

	Perceived Effectiveness Score[a]	Constant	Age	Years of Service	Retirement Eligibility Status	Scenario	Comparison 1	Comparison 2
	Y[a]	a	X_1[d]	X_2[e]	X_3[f]	X_4[g]	X_5[h]	X_6[h]
H1	HOI[b] Score	constant	16 to 67	0 to 40	0 = Ineligible 1 = Eligible	SME[c]	HOI vs OBS	HOI vs MEN[b]
H2	DOC[b] Score	constant	16 to 67	0 to 40	0 = Ineligible 1 = Eligible	AMY[c]	DOC vs OBS	DOC vs MEN
H3	H3 OBS[b] Score	constant	16 to 67	0 to 40	0 = Ineligible 1 = Eligible	CPR[c]	OBS vs HOI	OBS vs MEN
H4	H4 OBS Score	constant	16 to 67	0 to 40	0 = Ineligible 1 = Eligible	SHB[c]	OBS vs HOI	OBS vs MEN
Eigenvalue		4.347	1.000	0.767	0.545	0.227	0.101	0.014
Condition Index		1.000	2.085	2.381	2.824	4.376	6.560	17.684

[a]Dependent Variable. Range 1 to 5.
[b]HOI = Hands-On Interaction; DOC = Documenting; OBS = Observation; MEN = Mentoring
[c]SME = Subject Matter Expertise; AMY = Analysis Methodology; CPR = Customer Protocols & Relationships; SHB = Shared Beliefs
[d]Age is measured on a continuous scale
[e]Years of Service is measured on a continuous scale, where less than one year is coded as zero
[f]Retirement Eligibility Status is measured on a dichotomous nominal scale
[g]Scenario is a dummy variable and is coded as either 0 or 1
[h]Comparison 1 and Comparison 2 are dummy variables and are coded as either 0 or 1

Hypothesis H1-H4 Descriptive Statistics

Table 33 and Table 34 provide descriptive statistics for the hypotheses H1-H4 variables: (a) Perceived Effectiveness Score (dependent variable), (b) Age, (c) Years of Service, and (d) Retirement Eligibility Status.

Table 33
Descriptive Statistics for H1-H4 Dependent Variable, Age, and Years of Service

n=1356
Valid=1365
Missing=0

	Mean	Std. Deviation	Minimum	Maximum
Perceived Effectiveness Score[a]	3.53	1.335	1	5
Age	44.04	11.722	16	67
Years of Service	17.15	10.688	0	40

[a]For H1: Score=HOI Score, for H2: Score=DOC Score
[a]For H3: Score=OBS Score, for H4: Score=OBS Score

Table 34
Descriptive Statistics for H1-H4 Retirement Eligibility Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Ineligible	876	64.6	64.6	64.6
	Eligible	480	35.4	35.4	100.0
	Total	1356	100.0	100.0	

Table 35 and Table 36 provide the Perceived Effectiveness Score means and standard deviation for the four intellectual capital scenarios and the three knowledge Transfer Mechanism comparisons per scenario. The results for the one-sample *t* tests are also included in the tables. As shown in Table 35 and Table 36, the null hypotheses for H1, H3, and H4 are not rejected. Looking at the descriptive statistics, partial support for

each of the hypothesis H1, H3, and H4 is found. Since, the research hypotheses H1-H4 were framed as expected findings, no evidence was found to support hypothesis H2. The multiple linear regression results for hypotheses H1-H4 follow Table 36.

Table 35
Descriptive Statistics for H1-H2 Comparison Scores

n=113 Valid=113 Missing=0			Max=5 Min=1		One-sample *t* test	
Hypothesis	Knowledge Scenario	Comparison	Mean	Std. Deviation	Sig. 2-tail	t
H1	SME	HOI versus DOC	4.35	0.980	0.000	14.592
		HOI versus OBS	4.37	0.804	0.000	18.137
		HOI versus MEN	3.10	1.329	0.438	0.778
H1	AMC	HOI versus DOC	3.44	1.356		
		HOI versus OBS	4.18	0.879		
		HOI versus MEN	3.15	1.290		
H1	CPR	HOI versus DOC	3.55	1.376		
		HOI versus OBS	3.55	1.289		
		HOI versus MEN	2.99	1.285		
H1	SHB	HOI versus DOC	3.97	1.161		
		HOI versus OBS	3.12	1.341		
		HOI versus MEN	2.58	1.354		
H2	SME	DOC versus HOI	1.65	0.980		
		DOC versus OBS	2.88	1.324		
		DOC versus MEN	2.09	1.130		
H2	AMC	DOC versus HOI	2.56	1.356	0.001	-3.469
		DOC versus OBS	3.27	1.255	0.022	2.323
		DOC versus MEN	2.64	1.211	0.002	-3.186
H2	CPR	DOC versus HOI	2.45	1.376		
		DOC versus OBS	3.04	1.410		
		DOC versus MEN	2.58	1.287		
H2	SHB	DOC versus HOI	2.03	1.161		
		DOC versus OBS	2.43	1.315		
		DOC versus MEN	1.91	0.960		

Table 36
Descriptive Statistics for H3-H4 Comparison Scores

n=113 Valid=113 Missing=0			Max=5 Min=1		One-sample *t* test	
Hypothesis	Knowledge Scenario	Comparison	Mean	Std. Deviation	Sig. 2-tail	t
H3	SME	OBS versus HOI	1.63	0.804		
		OBS versus DOC	3.12	1.324		
		OBS versus MEN	2.18	1.151		
H3	AMC	OBS versus HOI	1.82	0.879		
		OBS versus DOC	2.73	1.255		
		OBS versus MEN	2.36	1.173		
H3	CPR	OBS versus HOI	2.45	1.289	0.000	-4.526
		OBS versus DOC	2.96	1.410	0.739	-0.334
		OBS versus MEN	2.52	1.166	0.000	-4.358
H3	SHB	OBS versus HOI	2.88	1.341		
		OBS versus DOC	3.57	1.315		
		OBS versus MEN	2.65	1.202		
H4	SME	OBS versus HOI	1.63	0.804		
		OBS versus DOC	3.12	1.324		
		OBS versus MEN	2.18	1.151		
H4	AMC	OBS versus HOI	1.82	0.879		
		OBS versus DOC	2.73	1.255		
		OBS versus MEN	2.36	1.173		
H4	CPR	OBS versus HOI	2.45	1.289		
		OBS versus DOC	2.96	1.410		
		OBS versus MEN	2.52	1.166		
H4	SHB	OBS versus HOI	2.88	1.341	0.364	-0.912
		OBS versus DOC	3.57	1.315	0.000	4.577
		OBS versus MEN	2.65	1.202	0.002	-3.130

Hypothesis H1 Multiple Linear Regression

H1: Subject matter expertise (SME) is transferred most effectively through hands-on-interaction (HOI).

Table 37 shows that the adjusted R-square value for the model is 0.14. This means that all of the independent variables taken together explain 14% of the total variance in the dependent variable. The model was significantly better at predicting the dependent variable than the intercept-only (i.e. null) model, F=36.7; df=6, 1349, P<0.001.

Table 37 shows the coefficients of the regression line. All of the independent variables except Age (P=0.057) and "Comparison HOI versus OBS" (P=0.768) were significant predictors of HOI Score. However, a more appropriate test of the statistical significance of dummy variables Comparison HOI versus OBS and Comparison HOI versus MEN is the change in R-square attributed to the set of dummy variables Comparison HOI versus OBS and Comparison HOI versus MEN. Table 38 shows that the set of dummy variables Comparison HOI versus OBS and Comparison HOI versus MEN made a significant contribution to the model. The change in R-square attributed to Comparison HOI versus OBS and Comparison HOI versus MEN was 0.092, F=72.4; df=2, 1349; P<0.001. Although not significant, Age was retained in the model for purposes of presenting and interpreting the coefficients for all of the independent variables. The equation of the line, modeled as:

$y = a + b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$, is:

HOI Score = 3.388 + (0.009*Age) + (–0.013*SER) + (0.319*RET) + (0.546*SME) + (– 0.024*(Comparison HOI versus OBS)) + (–0.872*(Comparison HOI versus MEN)).

Table 37
Hypothesis H1 Regression Model Coefficients[a], Significance, and Adjusted R-square

Adj. R-square=0.145 F=29.697 df=6, 1349 P<0.001		Unstandardized Coefficients		Standardized Coefficients		
Mode	Variable	B	Std. Error	Beta	t	Sig.
1	(Constant)	3.388	.179		18.971	.000
1	AGE	.009	.005	.083	1.902	.057
1	SER	-.013	.005	-.106	-2.765	.006
1	RET	.319	.108	.114	2.950	.003
1	Scenario SME	.546	.078	.177	7.016	.000
1	Comparison HOI vs OBS	-.024	.083	-.009	-.295	.768
1	Comparison HOI vs MEN	-.872	.083	-.308	-10.566	.000

[a]Dependent Variable: Perceived Effectiveness Score (HOI Score).

Table 38
Hypothesis H1 Regression Model Dummy Variable *t* Test Analysis

						Change Statistics			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.219[a]	.048	.045	1.304	.048	17.056	4	1351	.000
2	.375[b]	.140	.137	1.240	.092	72.403	2	1349	.000

[a]Predictors: (Constant), Age, Years of Service, Retirement Eligibility Status, Scenario SME.
[b]Predictors: (Constant), Age, Years of Service, Retirement Eligibility Status, Scenario SME, Comparison HOI versus OBS, and Comparison HOI versus MEN

The regression model shows a positive association between HOI Score and: (a) Scenario SME, and (b) Retirement Eligibility Status (RET).

When controlling for all independent variables except Scenario SME, the average HOI Score is expected to be 0.546 points higher under scenario SME compared to the other scenarios. Under scenario SME, employees tend to prefer transfer method HOI more than when under the other scenarios.

When controlling for all independent variables except RET, the average HOI Score is expected to be 0.319 points higher for those who are eligible for retirement compared to those who are ineligible. Employees who are eligible for retirement tend to prefer transfer method HOI more than those who are ineligible for retirement.

A negative association between HOI Score and: (a) Comparison HOI versus MEN, (b) Comparison HOI versus OBS, and (c) Years of Service (SER) existed.

When controlling for all other variables except Comparison HOI versus MEN, the average HOI Score is expected to be 0.872 points lower for Comparison HOI versus MEN versus the other comparisons. The perceived effectiveness for HOI over MEN tends to be less than for HOI over the other methods.

When controlling for all independent variables except Comparison HOI versus OBS, the average HOI Score is expected to be 0.024 points lower for Comparison HOI versus OBS versus the other comparisons. The perceived effectiveness for HOI over OBS tends to be less than for HOI over the other methods.

When controlling for all independent variables except SER, the average HOI Score is expected to decrease by 0.013 points for every one-year increase in years of service. Employees with more years of service tend to prefer transfer method HOI less than those with fewer years of service.

Hypothesis H2 Multiple Linear Regression Results

H2: Analysis methodology (AMY) is transferred most effectively through documenting (DOC).

Table 39 shows that the adjusted R-square value for the model is 0.091. This means that all of the independent variables taken together explain 9.1% of the total variance in the dependent variable. The model was significantly better at predicting the dependent variable than the intercept-only (i.e. null) model, F=23.7; df=6, 1349, P<0.001.

Table 39 shows the coefficients of the regression line. All of the independent variables except RET (P=0.063) and "Comparison DOC versus MEN" (P=0.112) were significant predictors of DOC Score. However, a more appropriate test of the statistical significance of dummy variables Comparison DOC versus OBS and Comparison DOC versus MEN is the change in R-square attributed to the set of dummy variables Comparison DOC versus OBS and Comparison DOC versus MEN. Table 40 shows that the set of dummy variables Comparison DOC versus OBS and Comparison DOC versus MEN made a significant contribution to the model. The change in R-square attributed to Comparison DOC versus OBS and Comparison DOC versus MEN was 0.059, F=44.0; df=2, 1349; P<0.001. Although not significant, RET was retained in the model for purposes of presenting and interpreting the coefficients for all of the independent variables. The equation of the line, modeled as:

$y = a + b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$, is:

DOC Score = 1.799 + (0.011*Age) + (-0.017*SER) + (0.203*RET) + (0.482*AMY) + (0.735*(Comparison DOC versus OBS)) + (0.133*(Comparison DOC versus MEN)).

Table 39
Hypothesis H2 Multiple Regression Coefficients[a], Significance, and R-square

Adj. R-square=0.096 F=23.744 df=6, 1349 P<0.001		Unstandardized Coefficients		Standardized Coefficients		
Mode	Variable	B	Std. Error	Beta	t	Sig.
1	(Constant)	1.799	.181		9.963	.000
1	AGE	.011	.005	.094	2.106	.035
1	SER	-.017	.005	-.135	-3.440	.001
1	RET	.203	.109	.074	1.860	.063
1	Scenario AMY	.482	.079	.159	6.127	.000
1	Comparison DOC vs OBS	.735	.083	.263	8.806	.000
1	Comparison DOC vs MEN	.133	.083	.048	1.591	.112

[a]Dependent Variable: Perceived Effectiveness Score (DOC Score).

Table 40
Hypothesis H2 Regression Model Dummy Variable *t* Test Analysis

						Change Statistics			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.191[a]	.036	.034	1.293	.036	12.779	4	1351	.000
2	.309[b]	.091	.091	1.254	.059	44.045	2	1349	.000

[a]Predictors: (Constant), Age, Years of Service, Retirement Eligibility Status, Scenario AMY.
[b]Predictors: (Constant), Age, Years of Service, Retirement Eligibility Status, Scenario AMY, Comparison DOC versus OBS, and Comparison DOC versus MEN

The regression model shows a positive association between DOC Score and: (a) Comparison DOC versus OBS, (b) Scenario AMY, (c) Comparison DOC versus MEN, and (d) Age.

When controlling for all variables except Comparison DOC versus OBS, the average DOC Score is expected to be 0.735 points higher for comparison DOC versus OBS versus the other comparisons. The perceived effectiveness for DOC over OBS tends to be more than for DOC over the other methods.

When controlling for all variables except scenario AMY, the average DOC Score is expected to be 0.482 points higher under scenario AMY compared to the other scenarios. Under scenario AMY, employees tend to prefer transfer method DOC more than when under the other scenarios.

When controlling for all variables except DOC versus MEN, the average DOC Score is expected to be 0.133 points higher for comparison DOC versus MEN versus the other comparisons. Perceived effectiveness for DOC over MEN tends to be less than for DOC over the other methods.

When controlling for all variables except Age, the average DOC Score is expected to increase by 0.011 points for every one-year increase in age. Older employees tend to prefer transfer method DOC more than younger ones.

There was a negative association between DOC Score and Years of Service. When controlling for all variables except years of service, the average DOC Score is expected to decrease by 0.017 points for every one-year increase in years of service.

Employees with more years of service tend to prefer transfer method DOC less than those with fewer years of service.

Hypothesis H3 Multiple Linear Regression Results

H3: Customer protocols and relationships (CPR) are transferred most effectively through observation (OBS).

Table 41 shows that the adjusted R-square value for the model is 0.087. This means that all of the independent variables taken together explain 8.7% of the total variance in the dependent variable. The model was significantly better at predicting the dependent variable than the intercept-only (i.e. null) model, F=22.48; df=6, 1349, P<0.001.

Table 41 shows the coefficients of the regression line. Two of the independent variables "Comparison OBS versus HOI (P<0.001) and "Comparison OBS versus MEN" (P=0.006) were significant predictors of H3 OBS Score. However, a more appropriate test of the statistical significance of dummy variables Comparison OBS versus HOI and Comparison OBS versus MEN is the change in R-square attributed to the set of dummy variables Comparison OBS versus HOI and Comparison OBS versus MEN. Table 42 shows that the set of dummy variables Comparison OBS versus HOI and Comparison OBS versus MEN made a significant contribution to the model. The change in R-square attributed to Comparison OBS versus HOI and Comparison OBS versus MEN was 0.084, F=62.6; df=2, 1349; P<0.001. Although not significant, the other variables were retained in the model for purposes of presenting and interpreting the coefficients for all of the independent variables. The equation of the line, modeled as:

$y = a + b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$, is:

H3 OBS Score = 2.479 + (-0.008*Age) + (0.006*SER) + (-0.109*RET) + (0.094*CPR) + (0.896*(Comparison OBS versus HOI)) + (0.230*(Comparison OBS versus MEN)).

Table 41
Hypothesis H3 Multiple Regression Coefficients[a], Significance, and Adjusted R-square

Adj. R-square=0.087 F=22.480 df=6, 1349 P<0.001		Unstandardized Coefficients		Standardized Coefficients		
Mode	Variable	B	Std. Error	Beta	t	Sig.
1	(Constant)	2.479	.180		13.775	.000
1	AGE	-.008	.005	-.076	-1.689	.091
1	SER	.006	.005	.047	1.195	.232
1	RET	-.089	.109	-.033	-.816	.414
1	Scenario CPR	.094	.078	.031	1.204	.229
1	Comparison OBS vs HOI	.896	.083	.323	10.778	.000
1	Comparison OBS vs MEN	.230	.083	.083	2.768	.006

[a]Dependent Variable: Perceived Effectiveness Score (H3 OBS Score).

Table 42
Hypothesis H3 Regression Model Dummy Variable *t* Test Analysis

						Change Statistics			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.080[a]	.006	.004	1.306	.006	2.191	4	1351	.068
2	.301[b]	.087	.087	1.250	.084	62.659	2	1349	.000

[a]Predictors: (Constant), Age, Years of Service, Retirement Eligibility Status, Scenario CPR.
[b]Predictors: (Constant), Age, Years of Service, Retirement Eligibility Status, Scenario CPR, Comparison OBS versus HOI, and Comparison OBS versus MEN

The regression model shows a positive association between H3 OBS Score and: (a) Comparison OBS versus HOI, and (b) Comparison OBS versus MEN.

When controlling for all variables except Comparison OBS versus HOI, the average H3 OBS Score is expected to be 0.896 points higher for comparison OBS versus HOI versus the other comparisons. The perceived effectiveness for OBS over HOI tends to be more than for OBS over the other methods.

When controlling for all variables except Comparison OBS versus MEN, the average H3 OBS Score is expected to be 0.230 points higher for comparison OBS versus MEN versus the other comparisons. The perceived effectiveness for OBS over MEN tends to be more than for OBS over the other methods.

Hypothesis H4 Multiple Linear Regression Results

H4: Shared beliefs (SHB) are transferred most effectively through observation (OBS).

Table 43 shows that the adjusted R-square value for the model is 0.127. This means that all of the independent variables taken together explain 12.7% of the total

variance in the dependent variable. The model was significantly better at predicting the dependent variable than the intercept-only (i.e. null) model, F=33.95; df=6, 1349, P<0.001.

Table 43 shows the coefficients of the regression line. Three of the independent variables Age (P=0.084), SER (P=0.222), and RET (P=0.404) were not significant predictors of H4 OBS Score. However, a more appropriate test of the statistical significance of dummy variables Comparison OBS versus HOI and Comparison OBS versus MEN is the change in R-square attributed to the set of dummy variables Comparison OBS versus HOI and Comparison OBS versus MEN. Table 44 shows that the set of dummy variables Comparison OBS versus HOI and Comparison OBS versus MEN made a significant contribution to the model. The change in R-square attributed to Comparison OBS versus HOI and Comparison OBS versus MEN was 0.084, F=65.5; df=2, 1349; P<0.001. Although not significant, Age, SER, and RET were retained in the model for purposes of presenting and interpreting the coefficients for all of the independent variables. The equation of the line, modeled as:

$y = a + b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$, is:

H4 OBS Score = 2.349 + (-0.008*Age) + (0.006*SER) + (-0.089*RET) + (0.614*SHB) + (0.896*(Comparison OBS versus HOI)) + (0.230*(Comparison OBS versus MEN)).

Table 43
Hypothesis H4 Multiple Regression Coefficients[a], Significance, Adjusted R-square

Adj. R-square=0.127 F=33.957 df=6, 1349 P<0.001		Unstandardized Coefficients		Standardized Coefficients		
Mode	Variable	B	Std. Error	Beta	t	Sig.
1	(Constant)	2.349	.176		13.353	.000
1	AGE	-.008	.005	-.076	-1.728	.084
1	SER	.006	.005	.047	1.223	.222
1	RET	-.089	.107	-.033	-.835	.404
1	Scenario SHB	.614	.077	.203	8.007	.000
1	Comparison OBS vs HOI	.896	.081	.323	11.025	.000
1	Comparison OBS vs MEN	.230	.081	.083	2.831	.005

[a]Dependent Variable: Perceived Effectiveness Score (H4 OBS Score).

Table 44
Hypothesis H4 Regression Model Dummy Variable *t* Test Analysis

						Change Statistics			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.216[a]	.047	.044	1.279	.047	16.569	4	1351	.000
2	.362[b]	.131	.127	1.222	.084	65.566	2	1349	.000

[a]Predictors: (Constant), Age, Years of Service, Retirement Eligibility Status, Scenario SHB.
[b]Predictors: (Constant), Age, Years of Service, Retirement Eligibility Status, Scenario SHB, Comparison HOI versus OBS, and Comparison HOI versus MEN

The regression model shows that a positive association between H4 OBS Score and: (a) Comparison OBS versus HOI, (b) Scenario SHB, and (c) Comparison OBS versus MEN.

When controlling for all other variables except Comparison OBS versus HOI, the average H4 OBS Score is expected to be 0.896 points higher for Comparison OBS versus HOI versus the other comparisons. The perceived effectiveness for OBS over HOI tends to be more than for OBS over the other methods.

When controlling for all other variables except scenario SHB, the average H4 OBS Score is expected to be 0.614 points higher under scenario SHB compared to the other scenarios. Under scenario SHB, employees tend to prefer transfer method OBS more than when under the other scenarios.

When controlling for all other variables except Comparison OBS versus MEN, the average H4 OBS Score is expected to be 0.230 points higher for comparison OBS versus MEN versus the other comparisons. The perceived effectiveness for OBS over MEN tends to be more than for OBS over the other methods.

Hypotheses H5-H6 Paired Sample t Tests Results

The data collected from Section 2 of the survey were used to examine each of the hypotheses, H5-H6. Participants were asked four questions pertinent to these two hypotheses. In two separate questions, participants were asked to identify how frequently they received mentoring (MENR) and how frequently they desired to receive mentoring (MEND). In the other two questions, participants were asked to identify how frequently they provided mentoring (MENP) and to identify how frequently they willing to provide mentoring (MENW). A seven-point scale was used for participants' response to each of the four questions, where 1 = never, 2 = less than annually, 3 = annually, 4 = quarterly, 5 = monthly, 6 = weekly, and 7 = daily.

Hypothesis H5 Results

H5: The frequency of mentoring that employees desire to receive exceeds the amount received.

Paired sample t test results.

Table 45 and Table 46 show a significant difference in the average frequency of mentoring desired compared to the average frequency of mentoring received. The research hypothesis was framed as an expected finding. The null hypothesis and the alternative hypothesis are as follows:

H_0: There is no difference in the desired frequency of receiving mentoring and the existing frequency of receiving mentoring.

H_a: There is a difference in the desired frequency of receiving mentoring and the existing frequency of receiving mentoring.

The average (SD) frequency of mentoring was 3.65 (1.73) versus 5.05 (1.39) for Received and Desired respectively, t= -10.49; df=112; P<0.001. Thus, the null hypothesis was rejected.

Table 45
Hypothesis H5 Paired Samples Statistics

		N	Mean	Std. Deviation
Pair 1	Mentoring Received	113	3.65	1.731
Pair 1	Mentoring Desired	113	5.05	1.388

Table 46
Hypothesis H5 Paired Samples Test

		t	df	Sig. (2-tailed)
Pair 1	Mentoring Received - Mentoring Desired	-10.485	112	.000

Hypothesis H6 Results

H6: The frequency of mentoring that employees are willing to provide exceeds the amount provided.

Paired sample t test results.

Tables 47 and Table 48 show a significant difference in the average frequency of mentoring provided compared to the average frequency of mentoring subjects were willing to provide. The research hypothesis was framed as an expected finding. The null hypothesis and the alternative hypothesis are as follows:

H_0: There is no difference in the frequency of mentoring provided and the frequency of mentoring employees are willing to provide.

H_a: There is a difference in the frequency of mentoring provided and the frequency of mentoring employees are willing to provide.

The average (SD) frequency of mentoring was 4.74 (1.68) versus 5.79 (1.19) for "provided" and "willing to provide" respectively, t= -8.42; df=112; P<0.001. Thus, the null hypothesis was rejected.

Table 47
Hypothesis H6 Paired Samples Statistics

		N	Mean	Std. Deviation
Pair 1	Mentoring Provided	113	4.74	1.684
Pair 1	Mentoring Willing to Provide	113	5.79	1.191

Table 48

Hypothesis H6 Paired Samples Test

		t	df	Sig. (2-tailed)
Pair 1	Mentoring Provided - Mentoring Willing to Provide	-8.417	112	.000

Hypothesis H7 Multiple Linear Regression Results

The data collected from Section 2 of the survey were also used to examine the hypotheses H7. In addition to the four mentoring questions, previously mentioned, participants were asked one other question pertinent to this hypothesis.

H7: Perceived importance of mentoring increases directly with retirement eligibility.

Hypothesis 7 was tested using the data collected from all five questions in Section 2 of the survey (Appendix G). In addition to the four mentoring preference related questions, participants were also asked to identify the "Level of Importance Given to Mentoring for Facilitating Knowledge Transfer" (LIMKT). A five-point scale was used for participants' response, where 1 = not important, 2 = somewhat important, 3 = moderately important, 4 = very important, and 5 = extremely important. The analyses of the data used to explore hypothesis H7 follow.

Heteroscedasticity of the model was tested through visual inspection of the scatter plot. Residuals were found to be predominately uniform.. Normality was tested through inspection of the normal p plot. A normal distribution was observed.

Multicollinearity of the independent variables in the equation used for hypotheses H7 was diagnosed using eigenvalues and condition indices. Table 49 shows that several of the eigenvalues were close to 0, which gives some indication of a multicollinearity problem. However, only retirement eligibility status had a condition index that was significantly greater than 15. Nonetheless, the correlation between years of service and retirement eligibility status was only 0.65, indicating only a moderately strong correlation. Thus, all of the independent variables were retained in the model and multicollinearity was not considered to be a severe problem.

Multiple linear regression analysis was used to identify independent predictors of the dependent variable "Level of Importance Given to Mentoring for Facilitating Knowledge Transfer", that is, to determine the extent to which independent variables interact to explain the variance observed in the dependent variable. Data from all 113 survey participants contributed to the analysis. One regression analysis was conducted for hypothesis H7. This model contains a single dependent variable and six independent variables as shown in Table 49 and is modeled as:

$$Y = a + b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$$

Table 49
Multiple Regression Variables and Collinearity Diagnostics Predictor Variables for H7

	LIMKT[a]	Constant	Years of Service	Retirement Eligibility Status	MENR[b]	MEND[b]	MENP[c]	MENW[c]
	Y[b]	a	X_1[e]	X_2	X_1[d]	X_1[d]	X_1[d]	X_1[d]
H7	1 to 5	constant	0 to 40	0 = Ineligible 1 = Eligible	1 to 7	1 to 7	1 to 7	1 to 7
Scale	ordinal	constant	continuous	nominal	ordinal	ordinal	ordinal	ordinal
Eigenvalue		5.931	0.026	0.012	0.735	0.154	0.076	0.065
Condition Index		1.000	15.082	21.866	2.840	6.198	8.824	9.537

[a]LIMKT = Level of Importance Given to Mentoring for Facilitating Knowledge Transfer
[b]The values 1-5 represented a range of importance levels from 1 = "Not important" to 5 = "Extremely Important"
[b]MENR = Mentoring Received; MEND = Mentoring Desired
[c]MENP = Mentoring Provided; MENW = Mentoring Willing to Provide
[d]The values 1-7 represented a range of frequencies from 1 = "Never" to 7 = "Daily"
[e]Years of Service is measured on a continuous scale, where less than one year is coded as zero

Table 50 shows that the adjusted R-square value for the model is 0.37. This means that all of the independent variables taken together explain 37% of the total variance in the dependent variable. The model was significantly better at predicting the dependent variable than the intercept-only (i.e. null) model, F=12.15; df=6,106, P<0.001.

Table 50 shows the coefficients of the regression line. All of the independent variables except "Mentoring Received (P=0.46) were significant predictors of LIMKT. However, "Mentoring Received" was retained in the model for purposes of presenting and interpreting the coefficients for all of the independent variables. The equation of the line, modeled as:

$y = a + b_1X_1+b_2X_2+b_3X_3+b_4X_4+b_5X_5+b_6X_6$, is:

LIMKT = 2.23 + (–0.036*MENR) + (0.22*MEND) + (–0.11*MENP) + (0.32*MENW) + (–0.023*SER) + (0.36*RET).

Table 50
Hypothesis H7 Multiple Regression Coefficients[a], Significance, Adjusted R-square

Mode	Variable	Adj. R-square=0.374 F=12.151 df=6, 106 P<0.001 Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	2.233	.333		6.709	.000
1	SER	-.023	.008	-.289	-2.849	.005
1	RET	.364	.174	.208	2.088	.039
1	Mentoring Received	-.036	.048	-.074	-.750	.455
1	Mentoring Desired	.222	.067	.365	3.288	.001
1	Mentoring Provided	-.112	.050	-.224	-2.257	.026
1	Mentoring Willing to Provide	.316	.083	.447	3.819	.000

[a]Dependent Variable: Importance of Mentoring.

The regression model shows a positive association between LIMKT score and: (a) Retirement eligibility status, (b) Mentoring Willing to Provide, and (c) Mentoring Desired.

When controlling for all other variables except retirement eligibility status, the average LIMKT score is expected to be 0.36 points higher for subjects who are eligible for retirement compared to subjects who are ineligible for retirement. On average, those employees who are eligible for retirement tend to attribute more importance to mentoring than those who are ineligible for retirement.

When controlling for all other variables except Mentoring Willing to Provide, the average LIMKT score is expected to increase by 0.32 points for each 1-point increase in Mentoring Willing to Provide. On average those employees who were willing to provide

more mentoring tend to attribute more importance to mentoring than those who were less willing to provide mentoring.

When controlling for all other variables except Mentoring Desired, the average LIMKT score is expected to increase by 0.22 points for each 1-point increase in Mentoring Desired. On average those employees who desired more mentoring tend to attribute more importance to mentoring than those who desired less mentoring.

A negative association between LIMKT score and: (a) Mentoring Provided, and (b) Years of Service exists.

When controlling for all other variables except Mentoring Provided, the average LIMKT score is expected to decrease by 0.11 points for each 1-point increase in Mentoring Provided. On average those employees who provided more mentoring tend to attribute less importance to mentoring than those who provided less mentoring.

When controlling for all other variables except Years of Service, the average LIMKT score is expected to decrease by 0.023 points for each additional year of service. On average those employees with more years of service tend to attribute less importance to mentoring than those with fewer years of service.

Significant evidence exists to show that even after controlling for Years of Service and amount of Mentoring Received, Desired, Provided and Willing to Provide, those who are eligible for retirement place more importance on mentoring than those who are ineligible for retirement. The research hypothesis was framed as an expected finding. The null hypothesis and the alternative hypothesis are as follows:

H_0: There is no difference in the perceived importance given to mentoring between those who are eligible versus ineligible for retirement.

H_a: There is a difference in the perceived importance given to mentoring between those who are eligible versus ineligible for retirement.

In that case, the results of the analysis for H7 indicate that the null hypothesis was rejected.

Summary

The findings from both the qualitative and quantitative research were presented. The eleven knowledge transfer themes and eleven intellectual capital themes identified from the qualitative data were discussed in detail. Several relationships among the two types of themes were also presented and discussed. In particular, seven findings were advanced as hypotheses and further examined during the quantitative phase. Subsequently, the findings and results of the quantitative analyses were discussed in detail.

As the qualitative findings were advanced by seven hypotheses, it is appropriate to conclude with a synopsis of the results for these seven hypotheses, starting with the hypotheses most strongly supported. For both hypotheses H5 and H6, the null hypothesis was rejected. Thus, the hypothesis that employees desire more mentoring than they currently receive and the hypothesis that employees are willing to provide more mentoring than they currently provide, are both supported.

The null for hypothesis H7 was also rejected. This hypothesis was supported by the finding that the perceived importance of mentoring increases with retirement

eligibility. Also, to note, the perceived importance of mentoring increases with the desire to receive more mentoring and the willingness to provide more mentoring.

Hypotheses H1–H4 were partially supported. As subsequently discussed in Chapter 5, for each of these four hypotheses, the regression analyses show that under certain conditions (i.e. given predictors) there is partial support for each hypothesis. Additionally, keeping in mind that the four hypotheses were framed as expected findings, for hypotheses H1, H3, and H4, two of the three subset hypotheses were rejected and for hypothesis H2, one of the three subset hypotheses was rejected.

In this mixed-method research study, the findings from the qualitative results from the interviews led to seven hypotheses. These seven hypotheses were examined through the quantitative results from the surveys. The implications of both the qualitative and quantitative results, in relation to the original research questions are discussed in Chapter 5.

CHAPTER 5

DISCUSSION AND IMPLICATIONS OF THE RESEARCH

This research study set out to explore the relationships among types of intellectual capital and the mechanisms through which they are transferred among individuals within an organization. Qualitative data were gathered though interviews from 23 participants at the research site and quantitative data were collected through a survey from 113 participants at the research site.

The importance of this research is highlighted by both the theoretical implications and the practical ones. The need to further understand both the theoretical and practical aspects of the relationship among intellectual capital types and knowledge transfer and the gap in literature is well established. This study narrows that gap and provides insight into defining the relationships. The findings from this study suggest that types of intellectual capital may be more effectively transferred, between individuals within an organization, using specific knowledge transfer channels, as opposed to others.

In this chapter, the qualitative and quantitative findings of the mixed-method research addressing the relationship among types of knowledge transfer channels and types of intellectual capital are integrated and presented with implications of the research. The discussion starts with the four research sub-questions, followed by the main research question and the hypotheses. The discussion focuses on the addition to the body of knowledge regarding intellectual capital and knowledge transfer. This is followed by implications for theory and practice, and subsequently limitations, and questions for future research.

Interpretation of the Findings

Prior to this study, a link connecting knowledge transfer theory and intellectual capital theory was not found. Knowledge transfer has received considerable attention from knowledge management researchers. This interest in knowledge transfer is driven by organizations' desires to maintain or obtain competitive advantage. Knowledge is perhaps one of the most valuable components of today's organization, and it exists largely in the heads of the employees. Thus, management must give proper attention to what knowledge is being transferred and how it is being transferred.

Most processes for transferring vital knowledge among employees are informal and random, and are often poorly understood. Rather than leaving the transfer of knowledge to chance, managers have strong incentives to better understand and facilitate knowledge transfer among employees. Employee turnover due to retirement, illness, accident, or other reasons is not uncommon and often occurs without the transfer of valuable knowledge to those remaining.

This research study is a mixed methods investigation of the relationship between the content and channels involved in knowledge transfer among employees in the specific setting of a Department of Defense field activity. From this mixed methods research of 23 qualitative study participants and 113 quantitative study participants, a theory was generated that addresses the research question:

What are the relationships among types of knowledge transfer channels and the transfer of various forms/components of intellectual capital by individuals within an organization?

This study suggests that the effectiveness of a knowledge transfer channel used to exchange intellectual capital between individuals within an organization is dependent on the type of intellectual capital being transferred. The study has implications for both theory and practice, in that is provides a theory grounded in the data, thereby extending the two bodies of knowledge and establishing a connection between them. This research is essentially a building block for both theory and practice. Future researchers are provided with the basis for the relationship in a practical setting. Practitioners are provided with operationalized descriptions of intellectual capital types and the knowledge transfer channels used to effectively transfer them.

Finally, the findings from this study suggest that the perceived effectiveness of knowledge transfer mechanisms for exchanging intellectual capital is influenced by demographic and organizational factors, among others, signaling that any solution for addressing intellectual capital transfer within an organization should consider the diversity of the variables influencing the intellectual capital transfer process.

The presentation of the interpretation of the findings discussion is structured much like the research study. Thus, it is deemed worthwhile to recap the research study process to provide an understanding of where and how the qualitative and quantitative results apply to the research questions and provide the reader with a mindset of how the interpretation discussion is arraigned.

This research study ultimately began with the discovery that over 1/3 of the Federal workforce was eligible for retirement and very few Federal agencies had a plan for capturing the intellectual capital from the retirement eligible employees before their

departure (Bates, 2003; Martensson, 2001). Intuitively, with these alarming figures, finding out the process for transferring intellectual capital and subsequently applying this process to the Federal workforce made sense. This intuition led to the main research question of this study:

What are the relationships among types of knowledge transfer channels (Nonaka, 1994) and the transfer of various forms/components of intellectual capital (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997) by individuals within an organization?

Armed with this practical significance and an earlier version of the main research question, the literature review and discovery process began. A review of existing literature left many unanswered questions. Although ample literature is available regarding knowledge transfer theory and intellectual capital theory, none was found connecting the two. In fact, the literature indicated that more research was needed to better understand how to effectively manage, analyze, and exchange intellectual capital (Alavi & Leidner, 2001; Bontis, 2001b). This discovery helped solidified the main research question. Further review of the literature led to the realization that universal definitions of intellectual capital existed and that intellectual capital is, in-part, defined and determined by the organization that the intellectual capital lies within (Stewart, 1997). This led the research process to back to the literature, looking for models or theories that applied definitions of intellectual capital to the Federal workforce. Again, broad discussions were found. None defined intellectual capital in a way that could be directly operationalized and applied to Federal organizations. Nor were any literature

found that defined the knowledge transfer channels used to exchange intellectual capital, let alone the relationship between knowledge transfer channels and types of intellectual capital.

Additionally, existing theories and research on the two bodies of knowledge offered descriptions of knowledge transfer and intellectual capital mostly from a theoretical sense. When descriptions of intellectual capital and knowledge transfer channels were found in the literature to be practical, instead of theoretical, they did not appear to be directly applicable to Federal organizations. At about this same time in the discovery process, an appropriate research site was found. As discussed in previous Chapters, the research site is a DOD field activity with a large portion of the workforce eligible for retirement, thus potentially departing with a large amount of intellectual capital.

Subsequently, the research study led back to the main research question and to contemplation about the best methodology to address the question. Guided by the nature of the research question and the gap in the literature, a sequential exploratory strategy was deemed appropriate for this research (Creswell, 1998, 2003). In order to answer the main research question, relating the types of intellectual capital to knowledge transfer channels, and no discovery of existing models or theories relating the two bodies of knowledge, additional research questions were derived from the main research question.

It seemed to make sense that if the main research question was to be addressed then the types of intellectual capital and types of knowledge transfer channels within the

research site would have to first be known. This led to the first two research sub-questions:

What types of knowledge transfer channels are personnel currently using to effectively transfer knowledge?

What types of intellectual capital are individuals effectively transferring, and which do they feel are most vital to transfer?

Although no literature was found that answered these questions, existing theories and models from the separate bodies of knowledge were found to exist. As recommended by Strauss and Corbin (1998), sensitizing concepts were taken from existing intellectual capital and knowledge transfer theories to provide a discovery path for addressing the research questions. These sensitizing concepts led to the third and fourth research sub-questions:

How do the types of knowledge transfer channels that are actually in use relate to existing models and theories?

How do the types of intellectual capital that personnel actually transfer relate to the forms of intellectual capital specified in existing models and theories?

Given the nature of the questions and exploratory goals of the research, qualitative data were determined to be the best choice for addressing these four research sub-questions (Creswell, 2003; Strauss & Corbin, 1998).

Data were collected from the research site through a series of 23 interviews and subsequently analyzed guided by grounded theory methodology. The results of the qualitative findings in relation to the four research sub-questions were presented in

Chapter 4. Seven key findings from the qualitative study were advanced by seven hypotheses derived from those findings. Keeping with the mixed methodology, a quantitative study was designed to collect data to address the hypotheses (Creswell, 2003). Through a self-administered web-based survey, data were collected from 113 participants at the same research site. The quantitative data were analyzed using a combination of multiple linear regression and *t* tests. The results of the quantitative findings in relation to the hypotheses were presented in Chapter 4. Subsequently, later in Chapter 5, the qualitative findings and the quantitative findings are combined to address the main research question.

Thus, the pattern for addressing the research questions closely follows the approach to the research study, in terms of research questions in relation to qualitative and quantitative data. First, each of the four research questions is addressed based on the qualitative findings. Then, in support of addressing the main research question, each of the seven key findings from the qualitative study is discussed, and then paired with the matching hypothesis and relative discussion based on the quantitative findings. This is followed by a summarization of the research study findings, and implications to the findings, both theoretical and practical. Finally, the limitations of this research study are summarized, and followed by questions for future research and a conclusion. Guided by this pattern, the discussion starts with the four research sub-questions:

Research Sub-Question One: What types of knowledge transfer channels are personnel currently using to effectively transfer knowledge?

The answers to this research sub-question were meant to be a step towards answering the main research question by providing the parameters for one side of the knowledge transfer and intellectual capital relationship. Since the answers were not found to exist in the literature, the research turned to the focal organization looking for insight to the answers through qualitative exploration and discovery. Also, the answers were meant to add depth to the body of knowledge surrounding knowledge transfer, particularly in the Federal sector.

Through the qualitative study, descriptions of the effective knowledge transfer channels were identified, thus contributing to addressing the main research question. In fact, eleven themes from the qualitative data were coded as knowledge transfer channels. Clearly, these eleven knowledge transfer channels do not fill the gap in the literature regarding effective knowledge transfer channels in use in the Federal sector. It is, however, a starting point. With the realization that this research study was an exploration, it made sense to consider scoping the number of knowledge transfer channels as they were advanced to address the main research question.

The four knowledge transfer channels effectively in use, (a) hands-on interaction, (b) documenting, (c) observation, and (d) mentoring were most frequently discussed by over 50% of the participants and advanced to address the main research question. The four channels are discussed as follows:

1) Hands-on Interaction represents knowledge transfer via direct involvement in performing duties and tasks on the job. Participants (91%) distinguished this transfer from others by describing the primarily solitary interaction with the task at-hand. This knowledge transfer was essentially learning by doing.

2) Documenting is another way that participants (52%) reported transferring knowledge effectively. Participants described how they transferred knowledge held within their minds to a tangible media, making the knowledge available and useable by others such as cataloging and/or recording in books, folders, and on their PC. Participants also discussed effectively absorbing the knowledge from various media types.

3) Observation represents the variety of ways that participants (91%) experience knowledge transfer as they watch co-workers interact, experience, and/or perform work functions individually and in groups. Participants reported that they effectively used this channel in two ways. First, by escorting or shadowing co-workers, observers received a wealth of knowledge at meetings, informal gatherings and during the work day. The escorts or shadows, purposely attended the events or observed task execution, but remained in the background and reported that they did not receive direct interaction with those that they observed. This role allowed the observers to focus on absorbing knowledge from various sources. Observation also took place during the daily work routine. This assimilation of knowledge was primarily achieved by watching interactions and listening to dialogue between coworkers, or among coworkers and individuals external to the organization.

4) Mentoring involves professional development support and/or guidance provided by another within the organization. It may be provided formally or informally. As discussed by participants (70%), this knowledge exchange was not limited by a particular location or situation. Quite often this was described as an informal relationship where camaraderie, rather than the organization facilitated the exchange.

As discussed later in Chapter 5, some aspects of mentoring were further explored in the quantitative study. Consequently, it is appropriate to deviate slightly from the discussion pattern and interject some dialogue related to quantitative results. Taken together, the results of the qualitative and quantitative analyses suggest that employees do not receive mentoring as frequently as they would like to, and that they are willing to mentor others more frequently than they do. Further, both analyses suggest that a difference may exist between the average importance that retirement eligible employees and non-retirement eligible employees associate with mentoring for the purpose of knowledge transfer. Retirement eligible employees seem to regard mentoring for this purpose as more important. These perceived disparities were deemed to be potentially important aspects of knowledge transfer through mentoring.

The knowledge transfer channels identified in this research study by no means fill the gap in the literature regarding effective knowledge transfer channels in the Federal sector. Nor are they without merit. Four of the channels were used to address the main research question and all eleven channels may be used for further research. These knowledge transfer channels are derived from the perceptions of employees at the

research site. As such, the channels should be considered a starting point for understanding not an end to the understanding.

Research Sub-Question Two: What types of intellectual capital are individuals effectively transferring, and which do they feel are most vital to transfer?

The answers to this research sub-question, like the first sub-question, were meant to be a step towards answering the main research question by providing the parameters for the other side of the knowledge transfer and intellectual capital relationship. Since even less insight was found to exist in the literature, as compared to the first sub-question, the research again turned to the focal organization looking for insight to the answers through qualitative exploration and discovery. These answers too were meant to add depth to a body of knowledge, the one surrounding intellectual capital, particularly in the Federal sector.

During the qualitative study, participants discussed and described some of the types of intellectual capital transferred within the organization. These descriptions were further used to address the main research question. Eleven themes from the qualitative data were coded as intellectual capital types. This was the same number of knowledge transfer themes identified from the data and this equal number may raise a curiosity as to how or why the qualitative research arrived at an equal number of intellectual capital types. No conscious effort was made to arrive at an equal numbers of themes. As described in Chapter 4, through the coding process, the data were simultaneously sampled, collected, compared, and analyzed. This concurrent data collection and analysis process allowed for visual and mental integration of the data and the themes that tied

related portions of the data together. Coincidentally, the sorting and coding resulted in the eleven intellectual capital themes. Much like the knowledge transfer channels, the intellectual capital types do not fill the gap in the literature regarding intellectual capital in the Federal sector. Again, this is a starting point.

The decision to advance a limited number of intellectual capital types in an effort to address the main research question was a conscious choice. The nature of the study and the resources available to undertake the study guided the decision to advance a subset of themes. The four intellectual capital types that over 50% of the participants most frequently described and that they perceived as being effectively transferred are; (a) subject matter expertise, (b) analysis methodology, and (c) customer protocols and relationships, and (d) shared value (or beliefs).

1) Subject matter expertise was described most frequently by participants (87%). This is the knowledge that connects to the know-how, skills, and capabilities of individuals within the organization. It is not the building blocks of know-how; rather it is the upper tier in the sense of block building. These are the skills that distinguish average skilled employees from expert skilled employees. Subject matter expertise was considered by participants to be one of the most important knowledge types that offered the focal organization a competitive advantage.

2) Customer protocols and procedures, not surprisingly emerged as an intellectual capital type, as the focal organization interfaces with a plethora of customers and sponsors. Sponsors are described as external organizations that essentially task the organization to perform certain functions; as compared to customers that essentially

purchase services or deliverables. For the purpose of this research and as described by participants, sponsors and customers were considered the same and are herein referred to as "customer". Customer protocols and relationships represent the knowledge participants (>65%) described related to formalities and procedures in customer relations; characterizing the connection between participants and customers. Participants described these connections as the edge necessary to maintain or obtain a successful relationship with a particular customer, allowing for a competitive advantage over other organizations that do not share these bonds or understand them.

3) Shared beliefs are the main values, principles, ethics, and morals related to the organization. Participants (61%) described these as the guiding principles that are inherent to the organization, bind it together, and are part of the culture. As described by participants, this knowledge takes on the form of intellectual capital by providing the competitive advantage to make decisions and judgments in a direction that is beneficial to the organization and perceived by the customers as an incentive to conduct business with the focal organization.

4) Analysis methodology is the knowledge related to processes used to analyze and assess systems. It was not surprising to find this type of intellectual capital in the data, as the focal organization primarily consists of engineers engaged in what may fundamentally be described as systems engineering. For the most part, the focal organization's delivered products consist of reports that assess the reliability and performance of systems, or components of systems. As such, the processes followed to make these engineering assessments may impact the quality and customer acceptance of

the products. A such it made sense that participants' (52%) descriptions of the analysis methodology depicted a unique, almost proprietary way that engineering assessments were made by the focal organization. And it made sense that these methodologies were perceived as being knowledge that is vital to the success of the organization.

Although these intellectual capital types and their vivid descriptions provided by participants may contribute to the body of knowledge related to intellectual capital, they are not definitive. More exploration is left to be done. Just as the four knowledge transfer channels were advanced in this research to address the main research question, these four intellectual capital types were also used in the same way. However, all eleven knowledge transfer channels and all eleven intellectual capital types were analyzed in relationship to existing models and theories answer research sub-questions three and four, discussed next.

Research Sub-Question Three: How do the types of knowledge transfer channels that are actually in use relate to existing models and theories?

The answers to this research question were meant to provide a comparison of the knowledge transfer channels from the qualitative study with existing models and theories found in the literature.

The detailed comparison of the knowledge transfer channels with existing knowledge transfer models and theories were provided in Chapter 4 (Table 19, p. 108). Although abundant literature on knowledge transfer theory exists, none relates transfer channels to intellectual capital. So, sensitizing concepts for this study were taken from

the SECI (Socialization, Externalization, Combination, Internalization) model (Nonaka, 1994). This model was the basis for comparison with the knowledge transfer channels from the qualitative data.

The analysis of the comparisons among the knowledge transfer channels and the model do not reveal any inconsistencies. In-fact, as delineated in Chapter 4, the knowledge transfer channels are compatible with the overarching concepts of the SECI model. This is not surprising, as Nonaka's (1994) theory is well substantiated.

As discussed earlier, the comparison of knowledge transfer channels with existing models and theories was deemed a necessary and sensible step in this research, given the exploratory origin of the knowledge transfer channels used in this study and the goal of addressing the main research question.

Finding consistency with existing models does not signal that the qualitative portion of the study could have been skipped, nor does it mean that further exploration is unnecessary. First, as discussed in Chapter 4, the knowledge transfer channels, while they were found to be consistent with SECI model, were not an exact match. That is, the descriptions and definitions provided by the SECI model are very theoretical in nature. Finding practical definitions and descriptions that had a better chance of being understood by research participants made sense. Second, sufficient literature to connect the SECI model to the Federal sector and specifically organizations of similar type to the focal organization were not found. At the same time, this may be some of the first research to connect the SECI model in such a way and thus warrants further investigation.

Research Sub-Question Four: How do the types of intellectual capital that personnel actually transfer relate to the forms of intellectual capital specified in existing models and theories?

The answers to this research question were meant to provide a comparison of the intellectual capital types from the qualitative study with existing models and theories found in the literature. In Chapter 4, a detailed comparison of intellectual capital types and the FCIC (Four Component Intellectual Capital) model (D. Cohen & Prusak, 2001; Edvinsson & Malone, 1997; Heskett et al., 1997; Skandia, 1994; Stewart, 1997) was provided (Table 24, p. 129). The sensitizing concepts for this research were taken from the FCIC model. Substantial literature is available regarding intellectual capital and it corroborates the intellectual capital types from this study. This makes sense, as the theories and literature contributing to the FCIC model are well established.

Finding consistency among the eleven types of intellectual capital and the FCIC with existing models does not indicate that the qualitative portion of the study could have been skipped, nor does it mean that further exploration is unnecessary. First, as delineated in Chapter 4, the intellectual capital types, while they were found to be consistent with FCIC model, they were not an exact match. That is, the descriptions and definitions provide by the FCIC model are very theoretical in nature. Finding practical definitions and descriptions that had a better chance of being understood by research participants made sense. Second, sufficient literature to connect the FCIC model to the Federal sector and specifically organizations of similar type to the focal organization were not found. At

the same time, this may be some of the first research to connect the FCIC model in such a way and thus warrants further investigation.

Main Research Question: What are the relationships among types of knowledge transfer channels and the transfer of various forms/components of intellectual capital by individuals within an organization?

The main research question is addressed by discussing both qualitative and quantitative findings from the research. Seven qualitative findings were advanced in this study in support of addressing the main research question. The seven hypotheses derived from these findings were analyzed in the quantitative portion of this study in support of addressing the main research question. The interpretation of the seven qualitative findings and the results of the hypotheses testing are discussed to address the main research question. Each of the seven findings and the associated hypothesis are subsequently discussed in numerical order, as a logical association exists between each qualitative finding and related hypothesis. Following all of these discussions the interpretations of both the qualitative and quantitative findings that are used to address the main research question are summarized.

The qualitative results yielded some reasonably distinct findings about the relationships among knowledge transfer channels and intellectual capital types. As described in Chapter 4, in the qualitative study, the relationships among the knowledge transfer channels and intellectual capital types were examined in relation to the two theoretical models that were used to provide sensitizing concepts for this research study. Given the results of the research sub-question analyses and following the guiding

principles put forth by Strauss and Corbin (1998) with respect to sensitizing concepts, this approach seemed reasonable. Through these analyses of the relationships among knowledge transfer channels and intellectual capital types, several findings were identified. Of those findings, seven were further explored and advanced through hypotheses for use in the quantitative study.

Consideration was given to the exploratory nature of this research study and the resources available for the study, in determining a reasonable number of findings to further advance. Although this research study does not delineate additional findings, future researchers should be aware that other relationships may exist within the qualitative data. This fact is also an indication that this research study was exploratory in nature, and should be approached accordingly. That is, the seven findings and associated hypotheses used to address the main research question were not the only possible approach. Four of the seven findings were selected for advancement as described in Chapter 4, because the relationships advanced by these four findings were among some of the most frequently discussed by participants. These are identified as findings 1-4. Also, as three interesting but unexpected findings concerning mentoring were advanced as findings 5-7. A discussion of the findings and associated hypotheses in relation to addressing the main research question follow.

Finding 1: During the qualitative study, participants discussed 115 knowledge transfer incidents involving three intellectual capital themes, *communication skill*, *project management skill*, and *subject matter expertise,* in relation to the knowledge transfer themes. They were determined to be most closely associated with the human capital

component of the FCIC model. Of these three themes, participants discussed 91 occurrences of subject matter expertise related knowledge transfer incidents. Also, the most frequently discussed knowledge transfer mechanism, in relation to the 91 subject matter expertise related knowledge transfer incidents, was hands-on interaction (35%, n=32), as compared to the next two most frequently discussed mechanisms, mentoring (20%, n=18) and observation (13%, n=12); where 'n' is the number of occurrences. This relationship was further investigated through the first hypothesis:

H1: Subject matter expertise (SME) is transferred most effectively through hands-on-interaction (HOI).

This hypothesis was partly supported from the results of the quantitative study. Multiple linear regression was used to analyze the hypothesis.

The results of the regression analyses were presented in Chapter 4 along with delineation of the controlling variables for each regression. Here the results of the analyses in relation to all of the variables are discussed with consideration of the regression controls in mind. Five of the six relationships achieved significance ($p<0.05$): Comparison HOI versus MEN, Scenario SME, Retirement Eligibility Status, Years of Service, and Comparison HOI versus OBS. The first four had substantial (standardized beta > 0.10) effects, with standardized beta values at 0.31, 0.18, 0.11, and 0.11, respectively.

The regression analyses offer insight into the conditions, and demographics that may influence the perceived effectiveness of transferring Subject Matter Expertise through Hands-On Interaction. First we look at the demographics, Retirement Eligibility

which had a positive relationship with the dependent variable and Years of Service, which had an inverse relationship. Although the effect size for each of these variables is nearly the same, their direction of influence on the dependent variable are opposite. Intuitively, it would seem that these two demographics would have the same directional influence. However, these demographics are not necessarily correlated. In fact, 31% of the participants eligible for retirement had less years of service than 10% of participants not eligible for retirement. Thus, for this data set, it is reasonable that RET is positive and SER is negative, since 1/3 of the retirement eligible participants had so few years of service.

Scenario SME is an interesting condition to discuss. This variable has a positive influence on the dependent variable. This suggests that employees may find Hands-On interaction is more effective for transferring Subject Matter Expertise as compared to transferring Analysis Methodology, Customer Protocols and Relationships, or Shared Beliefs. This finding provides partial support for the hypothesis.

The one-sample *t* tests suggest that employees may find that Hands-On Interaction is more effective than Documenting (4.35 (0.98), t=14.59; df=112; P<0.001) and more effective than Observation (4.37 (0.80), t=18.14; df=112; P<0.001) for transferring Subject Matter Expertise. However, the difference in employees' perceived effectiveness of Hands-On Interaction for transferring Subject Matter Expertise as compared to Mentoring (P=0.44) was not a significant. These results provide partial support for the hypothesis.

Finding 2: During the qualitative study participants discussed 43 knowledge transfer incidents that involved three intellectual capital themes, *analysis methodology, analysis tool,* and *project management methodology*, in relation to the knowledge transfer themes and determined to be most closely associated with the structural capital component of the FCIC model. Of these three intellectual capital themes, participants discussed 27 occurrences of analysis methodology related knowledge transfer incidents. Also, the most frequently discussed knowledge transfer mechanism, in relation to the 27 analysis methodology related knowledge transfer incidents, was documenting (48%, n=13), as compared to the next most frequently discussed mechanism, instructed training (15%, n=4). This relationship was further investigated through the second hypothesis:

H2: Analysis methodology (AMY) is transferred most effectively through documenting (DOC).

This hypothesis was partly supported from the results of the quantitative study. Multiple linear regression was used to analyze the hypothesis.

The results of the regression analyses were presented in Chapter 4 along with delineation of the controlling variables for each regression. Here the results of the analyses in relation to all of the variables are discussed with consideration of the regression controls in mind. Five of the six relationships achieved significance ($p<0.05$): Comparison DOC versus OBS, Scenario AMY, Years of Service, Age and Comparison DOC versus MEN. The first three had substantial (standardized beta > 0.10) effects, with standardized beta values at 0.26, 0.16, and 0.14, respectively. Age had an effect size of 0.094.

First the two demographic variables are discussed. Although Age had a small effect size, Age was found to have a positive relationship with the dependent variable. Years of Service was found to have an inverse relationship with the dependent variable. The reason for the opposite affect is not apparent. However, 9 of the participants over the age of 55 had less years of service than 22% of the participants 50 years younger or less.

Condition Scenario AMY had a positive relationship with dependent variable. This suggests that employees may find that Documentation is more effective for transferring Analysis Methodology as compared to transferring Subject Matter Expertise, Customer Protocols and Relationships, or Shared Beliefs.

The one-sample *t* tests suggest that employees may find that Documenting is more effective than Observation (2.56 (1.356), t=-3.469; df=112; P=0.001) for transferring Analysis Methodology. Employees also may find that Documenting is less effective than Hands-On Interaction (3.27 (1.255), t=2.323; df=112; P=0.022) and less effective than Mentoring (2.64 (1.211), t=-3.186; df=112; P=0.002) for transferring Analysis Methodology. Thus, the null hypothesis 2b was rejected. The null hypothesis for hypotheses 2a and 2c were rejected, but not in the direction expected. However, DOC was significantly less preferred over methods HOI (mean = 2.56) and MEN (mean = 2.64). The research hypothesis was framed as an expected finding. Therefore, this only partly supports the hypothesis.

Finding 3: During the qualitative study participants discussed 55 knowledge transfer incidents involving two intellectual capital themes, *protocol* and *relationship* in relation to the knowledge transfer themes and determined to be most closely associated

with the customer capital component of the FCIC model. The most frequently discussed knowledge transfer mechanism, in relation to these 55 knowledge transfer incidents, was observation (58%, n=32), as compared to the next most frequently discussed mechanism, purposive encounter (15%, n=8). This relationship was further investigated through the third hypothesis:

H3: Customer protocols and relationships (CPR) are transferred most effectively through observation (OBS).

Not enough evidence was found to support this hypothesis from the results of the quantitative study. Multiple linear regression was used to analyze the hypothesis.

The results of the regression analyses were presented in Chapter 4 along with delineation of the controlling variables for each regression. Here the results of the analyses in relation to all of the variables are discussed with consideration of the regression controls in mind. Two of the six relationships achieved significance ($p<0.05$): Comparison OBS versus HOI, and Comparison OBS versus MEN. The first one had substantial (standardized beta > 0.10) effects, with standardized beta value at 0.32.

Here it may be worth noting that none of the demographic variables were found to be significant, nor was Scenario CPR. Although little may be concluded from variables that do not reach significance, something may be said about the absence of the significance. When it comes to asking employees about the perceived effectiveness of Observation as compared to the other three transfer methods, these results suggest that the influence of the demographic variables Age, Years of Service, and Retirement Eligibility Status should be carefully examined with respect to relevance in future studies.

The conditions Comparison OBS versus HOI, and Comparison OBS versus MEN, suggesting that given other choices as comparisons, situations may exist where Observation is perceived to be more effective in one comparison as compared to another comparison. This does not say that Observation is perceived to be more effective than HOI or MEN; (i.e. only OBS versus HOI as compared to OBS versus another mechanism).

The one-sample *t* tests suggest that employees may find that Observation is less effective than Hands-On Interaction (2.45 (1.28), t=-4.52; df=112; P<0.001) and less effective than Mentoring (2.52 (1.16), t=-4.35; df=112; P<0.001) for transferring Customer Protocols and Relationships. However, a significant difference in employees' perceived effectiveness of Observation for transferring Customer Protocols and Relationships as compared to Documenting (P=0.739) was not found. However, OBS was significantly less preferred over methods HOI (mean = 2.45) and MEN (mean = 2.52). The research hypothesis was framed as an expected finding. Hence, does not support the hypothesis.

Finding 4: During the qualitative study participants discussed 61 knowledge transfer incidents involving three intellectual capital themes, *mutual understanding, shared value,* and *trust,* in relation to the knowledge transfer themes and determined to be most closely associated with the social capital component of the FCIC model. These three themes represent the shared beliefs or binding ties within the organization. The most frequently discussed knowledge transfer mechanism in relation to these 61 knowledge transfer incidents was observation (51%, n=31), as compared to the next two most

frequently discussed mechanisms, mentoring (11%, n=7) and purposive encounter (11 %, n=7). This relationship was further investigated through the fourth hypothesis:

H4: Shared beliefs (SHB) are transferred most effectively through observation (OBS).

This hypothesis was partly supported from the results of the quantitative study. Multiple linear regression was used to analyze the hypothesis.

The results of the regression analyses were presented in Chapter 4 along with delineation of the controlling variables for each regression. Here the results of the analyses in relation to all of the variables are discussed with consideration of the regression controls in mind. Three of the six relationships achieved significance ($p<0.05$): Comparison OBS versus HOI, Comparison OBS versus MEN, Scenario SHB. All three had low effects, with standardized beta values of less than 0.1.

The regression results for this hypothesis are very similar to those for hypothesis H3. That similarity was expected; both hypotheses contain Observation as the knowledge transfer channel. For that reason, the difference (condition Scenario SHB) is discussed. Employees, under scenario SHB, may perceive Observation to be more effective for transferring Shared Beliefs than when given the choice of Observation under the other scenarios.

The one-sample *t* tests suggest that employees may find that Observation is more effective than Documenting (3.57 (1.32), t=4.57; df=112; P<0.001) for transferring Customer Protocols and Relationships. Employees may also find that Observation is less effective than Mentoring (2.65 (1.20), t=-3.13; df=112; P=0.002) for transferring

Customer Protocols and Relationships. However, no significant difference in employees' perceived effectiveness of Observation for transferring Customer Protocols and Relationships as compared to Hands-On Interaction (P=0.364) was found. These results partially support the hypothesis.

Finding 5: During the qualitative study some of the participants discussed the amount of mentoring that they were receiving relative to knowledge transfer. The qualitative data suggest that a disparity may exist between the frequency at which employees receive mentoring and the frequency at which that employees desire to receive mentoring. This finding was further investigated through the fifth hypothesis:

H5: The frequency of mentoring that employees desire to receive exceeds the amount received.

The findings support this hypothesis. The results of the paired *t* test show a significant ($p<0.01$) difference in the average frequency of mentoring desired (mean = 5.05) compared to the average frequency of mentoring received (mean = 3.65). This suggests that employees may want to be mentored more frequently for the purpose of knowledge transfer. Employees indicated that, on average, they were being mentored less than quarterly on an annual basis. The findings suggest that employees may desire to be mentored, for the purpose of knowledge transfer, no less than monthly. The overall results suggest that on average subjects may desire more frequent mentoring as compared to the existing frequency.

Finding 6: During the qualitative study some of the participants discussed the amount of mentoring that they were providing relative to knowledge transfer. The

qualitative data suggest that employees are willing to provide mentoring more frequently than they currently provide mentoring. This finding was further investigated through the sixth hypothesis.

H6: The frequency of mentoring that employees are willing to provide exceeds the amount provided.

The findings support this hypothesis. The results of the paired *t* test show a significant ($p<0.01$) difference in the average frequency at which mentoring is provided (mean = 4.74) and the frequency at which participants are willing to provide mentoring (mean = 5.79). The results suggest that employees are willing to provide mentoring, for the purpose of knowledge transfer, more frequently than they currently provide. Employees, on average, indicated that they provide mentoring more frequently than quarterly and less than monthly. The results suggest that employees may be willing to provide mentoring, for the purpose of knowledge transfer, no less than monthly and almost as frequent as weekly. The overall results suggest that on average subjects are willing to provide mentoring more frequently as compared to the existing frequency.

Finding 7: The qualitative findings also suggested that some retirement eligible and non-retirement eligible employees consider mentoring to have an important role in knowledge transfer. Subtle indications from the qualitative data suggest that the level of importance retirement eligible employees give to mentoring for the purpose of knowledge transfer may be higher than that given the level of importance by non-retirement eligible employees. This finding was further investigated through the seventh hypothesis.

H7: Perceived importance of mentoring increases directly with retirement eligibility.

The findings support this hypothesis. The results of the regression analyses were presented in Chapter 4 along with delineation of the controlling variables for each regression. Here the results of the analyses in relation to all of the variables are discussed with consideration of the regression controls in mind. Five of the six relationships achieved significance ($p<0.05$): Mentoring Willing to Provide, Mentoring Desired, Years of Service, Mentoring Provided, and Retirement Eligibility Status. All six had substantial (standardized beta > 0.10) effects, with standardized beta values at 0.44, 0.37, 0.29, 0.22, and 0.21, respectively.

Employees that are more willing to provide mentoring more frequently may perceive that mentoring is more important than those employees that are not willing to provide mentoring as frequently. Employees with more years of service may perceive that mentoring for the purpose of transferring knowledge is less important than those employees with fewer years of service. Employees that are retirement eligible may perceive that mentoring for the purpose of knowledge transfer is more important than those employees who are ineligible for retirement.

The results suggest that employees that are eligible for retirement may place more importance on mentoring for the purpose of knowledge transfer than those who are ineligible for retirement. The results also suggest that there may be a difference in level of importance between those who are eligible versus ineligible. In fact, on average, those

who are eligible may tend to place more importance on mentoring than those who are ineligible.

Significant ($p<0.001$) evidence to show that even after controlling for years of service and amount of mentoring received, desired, provided and willing to provide, those who are eligible for retirement may place more importance on mentoring than those who are ineligible for retirement exists.

Both quantitative and qualitative findings addressed the relationship among intellectual capital types and the knowledge mechanisms used to effectively transfer them. The interview data from the qualitative study captured the perceptions and opinions of participants regarding the transfer of knowledge that is vital to the success of the organization. Specifically, the qualitative results provide operationalized definitions of intellectual capital types and knowledge transfer mechanisms applicable to the focal Federal organization. These definitions answered the first two of four research sub-questions and were found to be consistent with existing theories and models, thus answering the last two research sub-questions. The qualitative findings also addressed the main research question through seven findings that describe seven relationships among intellectual capital types and knowledge transfer mechanisms.

The quantitative findings stem from the statistical analyses of the seven hypotheses that were derived from the seven key qualitative findings. All seven hypotheses were at least partially supported by the quantitative findings. Quantitative evidence supports the qualitative findings that perceived effectiveness of one knowledge transfer mechanism as compared to another may differ, depending on the type of

intellectual capital that is being transferred. The quantitative findings also suggest the strengths and weaknesses of some variables may influence the perception. And since the variables used in the study only explained a small variance, the findings suggest that other variables also influence perceived effectiveness. The quantitative findings were also used to address the main research question. Finally, both the qualitative and quantitative findings taken together provide implications for both theory and practice.

Implications for Theory

The theory generated from this study is that the effectiveness of a knowledge transfer channel used to exchange intellectual capital between individuals within an organization is dependent on the type of intellectual capital being transferred. Participants, during both the qualitative and quantitative portions of the research, suggested that an effectiveness hierarchy may exist among knowledge transfer channels used to move intellectual capital. The exactness of that hierarchy calls for future exploration.

The importance of this research is highlighted by the fact that no study was found that has examined knowledge transfer channels in relation to intellectual capital. Specifically, this study identified relationships among knowledge transfer channels and types of intellectual capital. This is important since prior to undertaking this study, the relationship among knowledge transfer channels and intellectual capital types was unknown as no research was found that addressed the relationship.

This research adds to the theoretical body of knowledge surrounding intellectual capital and knowledge transfer theories by establishing that this relationship may exist,

allowing researchers to further explore and understand the dynamics of the relationship. This research is essentially a building block to a theory that provides further explanation. Seven key findings were found during the qualitative study and were carried forward to the quantitative study. The quantitative study provided support for three of the seven findings and partial support for the other four.

This research also contributed the research surrounding the variables that influence effective knowledge transfer. Although this research established that a relationship among knowledge transfer channels and intellectual capital types may exist, it only begins to explain the predictors of that relationship. While the findings examined through the hypotheses were partially supported, the variance explained was small. The lack of better understanding of the knowledge transfer and intellectual capital relationship leaves researchers and practitioners without the necessary tools to effectively address the conservation of intellectual capital that may result from large waves of employees retiring from organizations.

Implications for Practice

Of practical importance is resource allocation within organizations used to maintain or obtain competitive advantage. Intellectual capital provides a key competitive advantage. This research tells practitioners that knowledge transfer channels may not universally effective for exchanging intellectual capital. Organizations should consider allocating resources to facilitate the transfer of intellectual capital accordingly.

Additionally, mentoring for the purpose of knowledge transfer is an underutilized resource. This certainly is true at the focal organization and should be taken under consideration at organizations with similar characteristics.

The number of retirement eligible employees within the Federal government continues to increase at a steady rate. The near future does not hold any relief, except through exodus. Here are steps that can be taken by practitioners now:

First, understand that the various type of intellectual capital that are required for obtaining or maintaining a competitive advantage may be more effectively transferred by one knowledge transfer channel as opposed to another. Practitioners should consider providing the resources and environments to allow for the transfer channels identified in this study; particularity those with similar characteristics to the focal organization.

Second, recognize that age, longevity, retirement eligibility, other demographic and organizational factors may affect intellectual capital transfer decisions. Although future research is warranted to understand the exactness of some of the influences, practitioners today should recognize that differences may exist. Thus, today's knowledge solutions should consider the generalities of these variables, realizing that "*one size does not fit all*".

Third, participants indicated a strong desire to exchange knowledge and noted a desire to make knowledge transfer a more focal issue. The participants also indicated a strong willingness to be part of the knowledge transfer solution. At the same time, they indicated that the resources required to facilitate knowledge transfer were not available. Although resource allocations solutions were not sought through this research, removing

knowledge transfer barriers is an important task for knowledge transfer and thus organization success (Davenport & Prusak, 2000). As such, the focal organization should consider knowledge transfer solution inputs from the employees.

Fourth, participants identified the intellectual capital that they perceived was vital to the success of the organization. This may provide practitioners, particularly at the focal organization with a further understanding of the practical aspect of intellectual capital and the intellectual capital descriptions from this research should be folded into current strategies for managing knowledge.

Finally, in a very practical sense, mentoring for the purpose of knowledge transfer may not be taking place frequently enough. Participants indicated that they desired to be mentored more frequently and are willing to provide more mentoring, both for the purpose of transfer knowledge and vital to the success of the organization. This seems to be a clear message about mentoring, but it may say more. The employees at the focal organization seem to have a strong desire to exchange knowledge throughout the organization and seem to be seeking the wherewithal to help make it happen.

Limitations

Future studies on this subject should be conducted within diverse populations. As this study consisted primarily of Federal government engineers at a field activity, a number of issues arise, including those related to education level, education field of study, socioeconomic status, governing regulations, and motivating factors. Studies that include more diverse populations, such as private industry, non-engineering organizations, and organizations with both larger and smaller populations may serve to

enhance our understanding of the influences on the effectiveness of the mechanisms used to transfer knowledge.

Participants would like to be mentored, for the purpose of knowledge transfer, no less than monthly. Although this defined the periodicity of the mentoring desired, descriptions of the duration and depth were not collected, nor were many other variables that may influence mentoring decisions.

Only the perceptions, memories, and opinions of the participants were captured. While the sample size was deemed appropriate for the research study, a larger sample may have provided other contributions.

Questions for Future Research

When considering that the study of knowledge transfer is somewhat recent with respect to Federal employees, this presents are a multitude of opportunities for further study. In the most general sense, additional studies that attempt to further explain the variance in knowledge transfer mechanism effectiveness, given a particular type of intellectual capital seem appropriate. Organizations in general, as they strive to maintain or obtain a competitive advantage, consciously or subconsciously strive to obtain or maintain the intellectual capital to do so. Understanding how to go about focusing resources to keep a hold or get a hold of this intellectual capital, this valuable knowledge, only makes sense. Further understanding the mechanisms involved in transferring this knowledge effectively is open to future study.

In similar context, future research should seek to answer the questions provoked by this research. For example, what other variables influence the effectiveness of the

mechanisms used to transfer a particular type of intellectual capital? Szulanski (1995) asserted that the motivation of the sender and the receiver influence the effectiveness of knowledge transfer, in general. Further, Gupta and Govindarajan (2000) suggest that knowledge transfer depends on the perceptions of the sender and receiver with regard to each other. These are some examples, as other studies address knowledge transfer effectiveness, as well.

Second, how did the sampling during the qualitative study affect the qualitative findings? Purposive and convenience sampling approaches were used in this study. While these techniques fit the grounded theory approach, they are not without limitations (Creswell, 1998). Researchers should consider a study that fit a random sample approach. A sequential explanatory strategy may be one appropriate choice.

Third, knowledge transfer is affected by the structure of the organization (Nonaka & Takeuchi, 1995). For example, an engineering oriented government activity may very well have a distinctly different knowledge management infrastructure as compared to one in private industry. Since this study examined effective knowledge transfer, future research should consider examining the perceived effectiveness in relation to the knowledge management infrastructure to determine its impact on the perceptions.

Lastly, this research attempted to define knowledge transfer channels and intellectual capital in a theoretical, yet very practical sense. Research that further pursues the practical definitions would be of great benefit to knowledge management practitioners (Bontis, 2002a). Ultimately, for knowledge transfer and intellectual capital

theories to be of practical use, they must be put in the hands of practitioners who understand how to operationalize and apply the theories.

Summary and Conclusion

The theory that emerges from this study is that the effectiveness of a knowledge transfer channel used to exchange intellectual capital between individuals within an organization is dependent on the type of intellectual capital being transferred. This research study set out to contribute to both the theoretical and practical aspects of understanding the transfer of intellectual capital between individuals within an organization. Continued attention to this topic will serve to further benefit the knowledge transfer and intellectual capital fields, and knowledge driven organizations, particular ones within the Department of Defense, where retirement eligibility continues to pose a threat to competitive advantage.

REFERENCES

Alavi, M. (2000). Managing organizational knowledge. In R. W. Zmud (Ed.), *Framing the domains of IT management: Projecting the future through the past* (pp. 15-28). Cincinnati: Pinnaflex Education Resources.

Alavi, M., & Leidner, D. (2001). Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues [Electronic version]. *MIS Quarterly, 25*(1), 107-133.

Allee, V. (1997). 12 Principles of knowledge management [Electronic version]. *Training & Development, 51*(11), 71-74.

Allee, V. (2000). The value evolution: Addressing larger implications of an intellectual capital and intangibles perspective [Electronic version]. *Journal of Intellectual Capital, 1*(1), 17-32.

Ashby, B. (2001). *Federal triangle: Public-private competition*. Retrieved October 26, 2003, from http://www.industrialheating.com/

Bassi, L. J. (1997). Harnessing the power of intellectual capital [Electronic version]. *Training & Development, 51*(12), 25-30.

Bassi, L. J., Cheney, S., & Lewis, E. (1998). Trends in workplace learning: Supply and demand in interesting times [Electronic version]. *Training & Development, 52*(11), 51-75.

Bates, S. (2003). Think tank warns of impending brain drain [Electronic version]. *HRMagazine, 48*(5), 10-12.

Baumard, P. (1999). *Tacit knowledge in organizations* (S. Wauchope, Trans.). Thousand Oaks, CA: Sage Publications.

Becker, G. S. (1993). *Human capital* (3rd ed.). Chicago: The University of Chicago Press.

Blumentritt, R., & Johnston, R. (1999). Towards a strategy for knowledge management [Electronic version]. *Technology Analysis & Strategic Management, 11*(3), 287-300.

Bontis, N. (1996). There's a price on your head: Managing intellectual capital strategically [Electronic version]. *Business Quarterly, Summer 60*(4), 40-47.

Bontis, N. (1998). Intellectual capital: An exploratory study that develops measures and models [Electronic version]. *Management Decision, 36*(2), 63–76.

Bontis, N. (2001a). Assessing knowledge assets: A review of the models used to measure intellectual capital [Electronic version]. *International Journal of Management Reviews, 3*(1), 41-60.

Bontis, N. (2001b). CKO wanted - Evangelical skills necessary: A review of the chief knowledge officer position [Electronic version]. *Knowledge and Process Management, 8*(1), 29-38.

Bontis, N. (2002a). The rising star of the chief knowledge officer [Electronic version]. *Ivey Business Journal, 66*(4), 20-26.

Bontis, N. (2002b). Managing organizational knowledge by diagnosing intellectual capital: Framing and advancing the state of the field. In C. W. Choo & N. Bontis (Eds.), *The strategic management of intellectual capital and organizational knowledge* (pp. 621-642). New York: Oxford University Press.

Borghoff, M., & Pareschi, R. (1998). *Information technology for knowledge management*. Berlin, Germany: Springer-Verlag.

Bourdieu, P. (1979). *Distinction: A social critique of the judgment of taste* (R. Nice, Trans.). Boston: Harvard University Press.

Brooking, A. (1996). *Intellectual capital: Core assets for the third millennium enterprise*. London: International Thomson Business Press.

Brown, J. P., Jr. (2003). *Evaluating a technical support knowledge base: A case study in strategy, methods, and organizational change.* Dissertation Abstracts International, 64 (07), 2294A, (UMI No. 3097375).

Bryans, P., & Smith, R. (2000). Beyond training: Reconceptualizing learning at work [Electronic version]. *Journal of Workplace Learning, 12*(6), 228-235.

Buckman, R. H. (1998). Knowledge sharing at Buckman Labs [Electronic version]. *Journal of Business Strategy, 19*(1), 1l-15.

Bukowitz, W. (1997). Visualizing, measuring and managing knowledge [Electronic version]. *Research Technology Management, 40*(4), 24-31.

Choo, C. W. (1998). *The knowing organization. How organizations use information to construct meaning, create knowledge, and make decisions*. New York: Oxford University Press.

Chua, A. (2001). Relationship between the types of knowledge shared and types of communication channels used [Electronic version]. *Journal of Knowledge Management Practice, October*.

Cohen, D., & Prusak, L. (2001). *In good company: How social capital makes organizations work*. Boston: Harvard Business School Press.

Cohen, W. M., Florida, R., Randazzese, L., & Walsh , J. (1998). Industry and the Academy: Uneasy partners in the cause of technological advance. In R. G. Noll (Ed.), *Challenges to Research Universities* (pp. 171-200). Washington, DC: Brookings Institute Press.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation [Electronic version]. *Administrative Science Quarterly, 35*(1), 128-152.

Coleman, J. S. (1988). Social capital in the creation of human capital [Electronic version]. *American Journal of Sociology, 94*, S95-S120.

Colvard, J. (1998). *Savings can have a high price*. Retrieved October 26, 2003, from http://www.govexec.com/features/1198/1198defense.htm

Cooperrider, D. L., & Whitney, D. (1999). *Collaborating for Change: Appreciative Inquiry*. San Francisco: Berrett-Koehler Publishers.

Cowan, R., Soete, L., & Tchervonnaya, O. (2001). *Knowledge transfer and the services sector in the context of the new economy*. Maastricht, The Netherlands: Maastricht Economic Research Institute on Innovation and Technology.

Creative Research Systems. (2004). *Sample Size Calculator*. Retrieved October 31, 2004, from http://www.surveysystem.com/sscalc.htm

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage Publications.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Creswell, J. W. (2005). *Educational research. Planning, conducting, and evaluating quantitative and qualitative research.* (2nd ed.). Upper Saddle River, NJ: Pearson Education.

Cross, R., Parker, A., & Prusak, L. (2000). *Knowing what we know: Supporting knowledge creation and sharing in social networks*. Cambridge, MA: IBM Institute for Knowledge Management.

Davenport, T. H., De Long, D. W., & Beers, M. C. (1998). Successful knowledge management projects [Electronic version]. *Sloan Management Review, 39*(2), 43-57.

Davenport, T. H., & Marchand, D. (2001). *Is KM just good information management? Data, information and knowledge are points along a continuum*. Retrieved July 1, 2003, from http://www.nationalpost.com/features/fpmastering/

Davenport, T. H., & Prusak, L. (2000). *Working knowledge: How organizations manage what they know*. Boston: Harvard Business School Press.

Davies, C. A., & Magowan, J. (2002). An examination of the transfer of intellectual capital across cultures. In N. Bontis (Ed.), *World Congress on intellectual capital readings* (pp. 356-373). Boston: Butterworth-Heinemann.

De Long, D. W., & Seemann, P. (2000). Confronting conceptual confusion and conflict in knowledge management [Electronic version]. *Organizational Dynamics, 29*(1), 33-44.

Dixon, N. (2000). Replicating best practice [Electronic version]. *Strategic Direction, 16*(8), 15-17.

Droege, S. B., & Hoobler, J. M. (2003). Employee turnover and tacit knowledge diffusion: A network perspective [Electronic version]. *Journal of Managerial Issues, 15*(1), 50-65.

Drucker, P. F. (1993). *Post capitalist society*. New York: Harper Business.

Edvinsson, L., & Malone, M. S. (1997). *Intellectual capital: Realizing your company's true value by finding its hidden brainpower*. New York: Harper Business.

Edvinsson, L., & Sullivan, P. H. (1996). Developing a model for managing intellectual capital [Electronic version]. *European Management Journal, 14*(4), 356-364.

Fahey, L., & Prusak, L. (1998). The eleven deadliest sins of knowledge management [Electronic version]. *California Management Review, 40*(3), 265-276.

Gay, L. R., & Airasian, P. (2003). *Educational research: Competencies for analysis and applications.* (7th ed.). Upper Saddle River, NJ: Pearson Education.

General Accounting Office, U. S. (1990). *Case Study evaluations* (No. GAO/PEMD 91-10.1.9). Washington, DC.

General Accounting Office, U. S. (2001a). *High-risk series: An update* (No. GAO-01-263). Washington, DC.

General Accounting Office, U. S. (2001b). *Human capital. Meeting the government-wide high-risk challenge* (No. GAO-01-357T). Washington, DC.

General Accounting Office, U. S. (2001c). *Federal employee retirements: Expected increase over the next 5 years illustrates need for workforce planning* (No. GAO-01-509). Washington, DC.

Goh, S. C. (2002). Managing effective knowledge transfer: An integrative framework and some practice implications [Electronic version]. *Journal of Knowledge Management, 6*(1), 23-30.

Grover, V., & Davenport, T. H. (2001). General perspectives on knowledge management: Fostering a research agenda [Electronic version]. *Journal of Management Information Systems, 18*(1), 17-22.

Gupta, A., & Govindarajan, V. (2000). Knowledge flows within multinational corporations [Electronic version]. *Strategic Management Journal, 21*(4), 473-496.

Hall, M. L. W. (1998). The confusion of the capitals: Surveying the cluttered landscapes of intellectual 'capitals' and terminology. In P. H. Sullivan (Ed.), *Profiting from intellectual capital. Extracting value from innovation* (pp. 76-83). New York: John Wiley & Sons.

Hansen, M. T. (1999). The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits [Electronic version]. *Administrative Science Quarterly, 44*(1), 82-111.

Hargreaves, D. (1999). The knowledge-creating school [Electronic version]. *British Journal of Educational Studies, 47*(2), 122-144.

Harrison, S., & Sullivan, P. H. (2001). Profiting from intellectual capital. Learning from leading companies [Electronic version]. *Journal of Intellectual Capital, 1*(1), 33-46.

Hedlund, G. (1994). A model of knowledge management and the N-form corporation [Electronic version]. *Strategic Management Journal, 15*, 73-90.

Heskett, J. L., Sasser Jr., W. E., & Schlesinger, L. A. (1997). *The service profit chain: How leading companies link profit and growth to loyalty, satisfaction and value.* New York: The Free Press.

Ichijo, K. (2002). Knowledge exploitation and knowledge exploration. In C. W. Choo & N. Bontis (Eds.), *The strategic management of intellectual capital and organizational knowledge* (pp. 477-483). New York: Oxford University Press.

Klein, D. A., & Prusak, L. (1994). *Characterizing intellectual capital*. Retrieved August 1, 2003, from http://www.cbi.cgey.com/pub/docs/

Koca, G. (2002). *Succession planning - a drastic need for most Federal agencies*. Retrieved June 4, 2003, from http://www.fpmi.com/FedNews/WeeklyInsight/

Kozaryn, L. D. (1997). *DOD headquarters cuts planned*. Retrieved October 26, 2003, from http://www.defenselink.mil/news/Nov1997

Levin, D. Z., Cross, R., & Abrams, L. (2002). The strength of weak ties you can trust: The mediating role of trust in effective knowledge transfer. *Academy of Management Proceedings, 1*, D1-D5.

Levinson, N. S., & Asahi, M. (1995). Cross-national alliances and interorganizational learning [Electronic version]. *Organizational Dynamics, 24*, 50-63.

Levinthal, D. A., & March, J. G. (1993). The myopia of learning [Electronic version]. *Strategic Management Journal, 14*, 95-112.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Newbury Park, CA: Sage Publications.

Martensson, M. (2001). A critical review of knowledge management as a tool [Electronic version]. *Journal of Knowledge Management, 4*(3), 204-216.

McCampbell, A. T., Clare, L. M., & Glitters, S. H. (1999). Knowledge management: The new challenge for the 21st century [Electronic version]. *Journal of Knowledge Management, 3*(3), 172-179.

McElroy, M. W. (2000). Integrating complexity theory, knowledge management and organizational learning [Electronic version]. *Journal of Knowledge Management, 4*(3), 195-203.

Merriam-Webster's Collegiate Dictionary. (10th ed.)(1993). Springfield, MA: Merriam-Webster.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative Data Analysis* (2nd ed.). Thousand Oaks, CA: SAGE Publications.

Munro, B. H. (1997). *Statistical methods for health care research.* (3rd ed.). Philadelphia: Lippincott-Raven Publishers.

Murphy, T. J. (2003). *Controlling "brain drain": Preserving intellectual capital in aging civil service organizations.* Dissertation Abstracts International, 64 (03), 986A, (UMI No. 3085733).

Myers, P. S., & Swanborg Jr, R. W. (1998). Packaging knowledge [Electronic version]. *CIO Enterprise, 11*(13), 26-28.

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage [Electronic version]. *Academy of Management Review, 23*(2), 242-266.

National Academy of Public Administration. (1997). *Managing succession and developing leadership: Growing the next generation of public service leadership* (No. 97-15). Washington, DC.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation [Electronic version]. *Organization Science, 5*(1), 14-37.

Nonaka, I., & Konno, N. (1998). The concept of 'Ba': Building a foundation for knowledge creation [Electronic version]. *California Management Review, 40*(3), 40-54.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.

Nurmi, R. (1998). Knowledge-intensive firms [Electronic version]. *Business Horizons, 41*(3), 26-32.

Office of Personnel Management, U. S. (2002). *Succession planning*. Retrieved June 3, 2003, from http://www.opm.gov/hr/employ/products/succession/

Office of Personnel Management, U. S. (2005). *Eligibility for Federal Retirement Benefits*. Retrieved May 24, 2005, from http://www.opm.gov/retire/html/faqs/faq11.asp

O'Shaughnessy, J. P., & Sullivan, P. H. (1998). The role of intellectual capital in valuing knowledge companies. In P. H. Sullivan (Ed.), *Profiting from intellectual capital: Extracting value from innovation.* (pp. 284-297). New York: John Wiley & Sons.

Ott, R. L., & Longnecker, M. (2001). *An introduction to statistical methods and data analysis*. Pacific Grove, CA: Duxbury.

Pennings, J. M., Lee, K., & van Witteloostuijn, A. (1998). Human capital, social capital, and firm dissolution [Electronic version]. *Academy of Management Journal, 41*(4), 425-440.

Polanyi, M. (1966). *The tacit dimension*. London: Routledge and Kegan Paul.

Polit, D. F., & Hungler, B. P. (1991). *Nursing research: Principles and methods* (4th ed.). Philadelphia: J. B. Lippincott Company.

Pollard, D. (2000). Becoming knowledge-powered: Planning the transformation. In Y. Malhotra (Ed.), *Knowledge management and virtual organizations*. Hershey, PA: Idea Group Publishing.

Privacy Act, 5 U.S.C. 552a (1974).

Protection of Human Subjects, 45 CFR 46.102 (i) (2001).

Quinn, J. B., Anderson, P., & Finkelstein, S. (1996). Managing professional intellect: Making the most of the best [Electronic version]. *Harvard Business Review, 74*(2), 71-80.

Roberts, J. (2000). From know-how to show-how? Questioning the role of information and communication technologies in knowledge transfer [Electronic version]. *Technology Analysis & Strategic Management, 12*(4), 429-443.

Roelof, P. (1999). Questions in knowledge management defining and conceptualizing a phenomenon [Electronic version]. *Journal of Knowledge Management, 3*(2), 94-109.

Roos, J., & Von Krogh, G. (1996). The epistemological challenge: Managing knowledge and intellectual capital [Electronic version]. *European Management Journal, 14*(4), 333-337.

Rowley, J. (2000). Is higher education ready for knowledge management? [Electronic version]. *The International Journal of Education Management, 14*(7), 325-333.

Rudez, H. N. (n.d.). *Intellectual capital – A fundamental change in economy: A case based on service industries*. Retrieved 23 September, 2006, from www2.fm-kp.si/zalozba

Saint-Onge, H. (1996). Tacit knowledge: The key to the strategic alignment of intellectual capital [Electronic version]. *Strategy & Leadership, 24*(2), 10-14.

Shariq, S. Z. (1999). How does knowledge transform as it is transferred? Speculations on the possibility of a cognitive theory of knowledgescapes [Electronic version]. *Journal of Knowledge Management, 3*(4), 243-251.

Skandia. (1994). *Visualizing intellectual capital in Skandia. A supplement to Skandia's 1994 Annual Report*. Sweden.

Skandia. (1995a). *Renewal and development: Intellectual capital a supplement to Skandia's 1995 Interim Annual Report*. Sweden.

Skandia. (1995b). *Value-creating processes: Intellectual capital. A supplement to Skandia's 1995 Annual Report*. Sweden.

Skandia. (1996a). *Power of innovation: Intellectual capital. A supplement to Skandia's 1996 Interim Annual Report*. Sweden.

Skandia. (1996b). *Customer value. A supplement to Skandia's 1996 Annual Report*. Sweden.

Spender, J. C. (1992). Strategy theorizing: Expanding the agenda. In J. Dutton (Ed.), *Advances in strategic management* (pp. 3-32). Greenwich, CT: JAI Press.

Spender, J. C. (1996). Organizational knowledge, learning, and memory: Three concepts in search of a theory [Electronic version]. *Journal of Organizational Change Management, 9*(1), 63-78.

Stewart, T. A. (1994). Your company's most valuable asset: Intellectual capital [Electronic version]. *Fortune, 130,* 68-74.

Stewart, T. A. (1997). *Intellectual capital, the new wealth of organizations*. New York: Doubleday.

Stewart, T. A. (2001). Intellectual capital: Ten years later, how far we've come [Electronic version]. *Fortune, 143,* 192-193.

Stovel, M., & Bontis, N. (2002). Voluntary turnover: Knowledge management – friend or foe? [Electronic version]. *Journal of Intellectual Capital, 3*(3), 303-322.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Sullivan, P. H. (1998). *Profiting from intellectual capital; Extracting value from innovation.* New York: John Wiley & Sons.

Sullivan, P. H. (2000). *Value-driven intellectual capital; How to convert intangible corporate assets into market value*. New York: John Wiley & Sons.

Sveiby, K.-E. (1994). *Towards a knowledge perspective on organisation [Electronic version]*. University of Stockholm, Stockholm.

Sveiby, K.-E. (1997). *The new organizational wealth: Managing and measuring knowledge-based assets*. San Francisco: Berrett-Koehler Publishers.

Sveiby, K.-E. (1998, 2001). *Intellectual capital and knowledge management*. Retrieved June 2, 2003, from http://www.sveiby.com/articles/intellectualcapital.html

Sveiby, K.-E. (2000). *A knowledge-based theory of the firm to guide strategy formulation: Towards a knowledge-based theory of the firm.* Paper presented at the ANZAM Conference, Macquarie University Sydney, Australia.

Sveiby, K.-E., Annell, E., Axelsson, S., Emilsson, P.-M., Karlsson, H., Wikström, S., et al. (1988). *The invisible balance sheet*. Retrieved July 7, 2003, from http://www.sveiby.com/articles/denosynl.htm

Sveiby, K.-E., Linard, K., & Dvorsky, L. (2002). *Building a knowledge-based strategy. A system dynamics model for allocating value adding capacity*. Retrieved June 1, 2003, from http: //www.sveiby.com/articles/sdmodelkstrategy.pdf

Szulanski, G. (1995). Unpacking stickiness: An empirical investigation of the barriers to transfer best practice inside the firm [Electronic version]. *Academy of Management Journal*, 437-441.

Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm [Electronic version]. *Strategic Management Journal, 17*(Winter), 27-44.

Szulanski, G., & Winter, S. (2002). Getting it right the second time [Electronic version]. *Harvard Business Review, 80*(2), 62-69.

Trochim, W. M. K. (2002). *Research Methods Knowledge Base*. Retrieved January 28, 2003, from http://www.socialresearchmethods.net/kb/

Tsai, W., & Ghoshal, S. (1998). Social capital and value creation: The role of intrafirm networks [Electronic version]. *Academy of Management Journal, 41*(4), 464-478.

Turban, E., & Meredith, J. R. (1988). *Fundamentals of management science* (4th ed.). Plano, TX: Business Publications.

US Department of Agriculture. (2002). *Knowledge sharing and transfer*. Retrieved July 6, 2003, from http://ioa-qpnet-co.gsa.gov/QuickPlace/km

Von Krogh, G. (1998). Care in knowledge creation [Electronic version]. *California Management Review, 40*(3), 133-153.

Von Krogh, G., Ichijo, K., & Nonaka, I. (2000). *Enabling knowledge creation; How to unlock the mystery of tacit knowledge and release the power of innovation*. New York: Oxford University Press.

Weckstein, K. B., & Katz, S. D. (2003). *Businesses can sue the Federal government to require outsourcing of government work*. Retrieved October 26, 2003, from http://www.ebglaw.com/article_889.html

Whitney, D., Cooperrider, D. L., Kaplin, B. S., & Trosten-Bloom, A. (2001). *An Encyclopedia of Positive Questions, Volume One: Using Appreciative Inquiry to Bring Out the Best in Your Organization* (Vol. 1). Euclid, OH: Lakeshore Communications.

Wiig, K. M. (1999). What future knowledge management users may expect [Electronic version]. *Journal of Knowledge Management, 3*(2), 155+.

Zander, U., & Kogut, B. (1995). Knowledge and the Speed of the Transfer and Imitation of Organizational Capabilities: An Empirical Test [Electronic version]. *Organization Science: A Journal of the Institute of Management Sciences, 6*(1), 76-92.

APPENDIX A

INTERVIEW PARTICIPATION REQUEST LETTER

1 May 2005

Participant
Organization
Address
Telephone
Email

Dear *Participant*,

Hello, my name is Terrence McGill and I am a Ph.D. Candidate in Business Administration at Touro University International. I am writing to request your participation in research for my dissertation. I am studying the way in which people transfer different types of knowledge throughout an organization. You were selected for this interview because of your retirement eligibility status and because you may have valuable insight into how knowledge is transferred within the organization.

I would appreciate your assistance. I am requesting that you participate in a one-on-one interview with me that will take approximately 45-60 minutes. Any information obtained during this study that can be identified with you will remain strictly confidential.

I realize that your time is important and valuable. I thank you in advance for taking time to answer this request and perhaps to participate in the research. Additionally, if you would like to receive a summary of the results of the research study, I would be happy to send this to you after completing the research.

My research study depends on this interview so I am asking that you take time today to respond to this email. Thank you for your assistance and I look forward to your response!

Sincerely,

Terrence P. McGill
Touro University International
24873 Adams Avenue, Murrieta, CA 92562
909.677.1713
tmcgill@tourou.edu

APPENDIX B

SURVEY PARTICIPATION REQUEST LETTER

8 November 2006

Participant
Organization
Address
Telephone
Email

Dear *Participant*,

Hello, my name is Terrence McGill and I am a Ph.D. Candidate in Business Administration at Touro University International. I am writing to request your participation in research for my dissertation. I am studying the way in which people transfer different types of knowledge throughout an organization. You were selected for this survey because of your retirement eligibility status and because you may have valuable insight into how knowledge is transferred within the organization.

I would appreciate your assistance. I am requesting that you participate in an online survey that will take approximately 15 minutes. Any information obtained during this study that can be identified with you will remain strictly confidential.

I realize that your time is important and valuable. I thank you in advance for taking time to answer this request and perhaps to participate in the research. Additionally, if you would like to receive a summary of the results of the research study, I would be happy to send this to you after completing the research.

My research study depends on this interview so I am asking that you take time today to respond to this email. Thank you for your assistance and I look forward to your response!

Sincerely,

Terrence P. McGill
Touro University International
24873 Adams Avenue, Murrieta, CA 92562
909.677.1713
tmcgill@tourou.edu

APPENDIX C

SEMI-STRUCTURED INTERVIEW GUIDE

1

Knowledge sharing works to strengthen an organization and can be a positive and beneficial experience for the individuals as well as the organization. As employees leave the organization, it is important that they transfer their knowledge to those who remain. In fact, you may be aware of the large number of Federal employees that are now retirement eligible or that will be in a very short time. When this is combined with fiscal constraints currently facing the DOD, focused resource management, including management of our knowledge and associated resources is prudent and will contribute to our sustainability. The information sought through this interview is vital to the success of our organization.

Let us begin by exploring some things you value about yourself, others within the organization, and the organization itself.

Tell me a little about what drew you here and why you have chosen to remain.

What do you value the most about your contributions to the organization?

What do you value the most about the contributions that others bring to the organization?

2

Knowledge transfer involves the sender and receiver. The knowledge must be absorbed to be deemed transferred. The transfer of knowledge among employees occurs in both formal and informal ways. These ways may include documents, videos, learning by doing, and formal training. Or it may involve a combination of media, such as, creating a new product based on combining two concepts. Knowledge in a variety of forms might also be transferred through dialogue with others, through mentorship, observation, or imitation of more experienced workers and on-the-job training.

We have all had experiences of knowledge transfer in our work here that were successful, and others that were less so. But, right now I would like you to tell me about a time when you experienced knowledge transfer at its best.

What happened? What key knowledge was transferred, and who was involved?

How was the knowledge transferred?

Reflecting back on the experiences, what made this knowledge transfer experience so effective?

3

Knowledge, while it cannot be held in one's hand, is a very important company asset. Many employees who are retirement eligible hold a wealth of knowledge in their heads. Knowledge, in its many forms, is what often sets an organization above others. It can lead to the organization obtaining or maintaining a competitive advantage. Knowledge transfer is clearly essential to the success of any organization.

Reflecting on your own experiences within the organization, please tell me about some times when vital knowledge was transferred.

What kind of knowledge was shared within the organization and what were the surrounding circumstances?

How often does this type of knowledge get transferred?

Why is this knowledge important to the organization?

This organization is faced with a wave of retirement eligible employees. Those employees hold a wealth of knowledge, information, and experiences.

In terms of knowledge and maintaining organizational success, describe the significance of their departure.

What are the most important knowledge, information, and experiences to transfer between retirement eligible employees and the employees that are not retirement eligible for the continuing success of the organization?

4

Now imagine that you had a mechanism that would enable you to meet or even exceed your most idealistic goals about sharing and transferring knowledge throughout the organization.

What are your top three ["big stretch"] goals for knowledge transfer throughout the organization?

As you think about all that we have talked about, what stands out for you as your most important insight or learning?

Is there anything else that you would like to express that you did not get a chance to during the interview?

APPENDIX D

PILOT STUDY SEMI-STRUCTURED INTERVIEW GUIDE

Knowledge sharing works to strengthen an organization and can be a positive and beneficial experience for the individuals as well as the organization. As employees leave the organization, it is important that they transfer their knowledge to those who remain. In fact, you may be aware of the large number of Federal employees that are now retirement eligible or that will be in a very short time. When this is combined with fiscal constraints currently facing the DOD, focused resource management, including management of our knowledge and associated resources is prudent and will contribute to our sustainability. The information sought through this interview is vital to the success of our organization.

Let us begin by exploring some things you value about yourself, others within the organization, and the organization itself.

Tell me a little about what drew you here and why you have chosen to remain.

What do you value the most about your contributions to the organization?

What do you value the most about the contributions that others bring to the organization?

Knowledge transfer involves the sender and receiver. The knowledge must be absorbed to be deemed transferred. The transfer of knowledge among employees occurs in both formal and informal ways. These ways may include documents, videos, learning by doing, and formal training. Or it may involve a combination of media, such as, creating a new product based on combining two concepts. Knowledge in a variety of forms might also be transferred through dialogue with others, through mentorship, observation, or imitation of more experienced workers and on-the-job training.

We have all had experiences of knowledge transfer in our work here that were successful, and others that were less so. But, right now I would like you to tell me about a time when you experienced knowledge transfer at its best.

What happened? What key knowledge was transferred, and who was involved?

How was the knowledge transferred?

Reflecting back on the experiences, what made this knowledge transfer experience so effective?

Knowledge, while it cannot be held in one's hand, is a very important company asset. Many employees who are retirement eligible hold a wealth of knowledge in their heads. Knowledge, in its many forms, is what often sets an organization above others. It can lead to the organization obtaining or maintaining a competitive advantage. Knowledge transfer is clearly essential to the success of any organization.

Reflecting on your own experiences within the organization, please tell me about some times when vital knowledge was transferred.

What kind of knowledge was shared within the organization and what were the surrounding circumstances?

How often does this type of knowledge get transferred?

Why is this knowledge important to the organization?

This organization is faced with a wave of retirement eligible employees. Those employees hold a wealth of knowledge, information, and experiences.

In terms of knowledge and maintaining organizational success, describe the significance of their departure.

What are the most important knowledge, information, and experiences to transfer between retirement eligible employees and the employees that are not retirement eligible for the continuing success of the organization?

Now imagine that you had a mechanism that would enable you to meet or even exceed your most idealistic goals about sharing and transferring knowledge throughout the organization.

What are your top three ["big stretch"] goals for knowledge transfer throughout the organization?

As you think about all that we have talked about, what stands out for you as your most important insight or learning?

Is there anything else that you would like to express that you did not get a chance to during the interview?

APPENDIX E

RESEARCH STUDY INTERVIEW CONSENT FORM

CONSENT TO PARTICIPATE IN RESEARCH

HARNESSING INTELLECTUAL CAPITAL:

A STUDY OF ORGANIZATIONAL KNOWLEDGE TRANSFER

You are invited to participate in a research study conducted by Terrence P. McGill, a Ph.D. Candidate from the College of Business Administration at Touro University International. The results of this study will contribute to his dissertation. You were selected for this interview because of your retirement eligibility status and because you may have valuable insight into how knowledge is transferred within the organization. It may also provide information that may be helpful to succession planning in this command.

Purpose of the Study

The purpose of this study is to develop a theory related to knowledge transfer and intellectual capital.

Procedures

If you volunteer to participate in this study, you will do the following things:
If you agree to be involved in this study, you will be asked to participate in a semi-structured interview. You will be interviewed individually and the interview is expected to last approximately two hours. In order to clarify information collected during the interview, you may be asked additional questions or to review the information that is collected. The audio portion of the interview will be taped for record keeping purposes and to facilitate accurate transcription of the interview.

Potential Risks and Discomforts

The study poses no foreseeable risk to participants.

Potential Benefits to Subjects and/or to Society

The benefit to participation is the intrinsic value of participating in a study that will contribute to developing theory in the field of knowledge transfer and to developing effective practices for knowledge transfer and succession planning in this command.

Payment for Participation

There will be no compensation for participation in this study.

Confidentiality

Any information that is obtained in connection with this study and that can be identified with you will remain strictly confidential and will be disclosed only with your permission or as required by law. The interview will be audiotaped, and only Mr. McGill will have access to the tapes. They will be kept for five years and then they will be degaussed and shredded.

Participation and Withdrawal

You can choose whether to participate in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. Participation or non-participation will not affect your employment status or any other personal consideration or right you usually expect. You may also refuse to answer any questions you do not want to answer and still remain in the study. The researcher may decide not to include you in this research if circumstances arise that in the opinion of the researcher warrant doing so.

Identification of Researchers

If you have any questions or concerns about the research, please feel free to contact:

Terrence P. McGill
Touro University International
24873 Adams Avenue
Murrieta, CA 92562
951.677.1713
tmcgill@tourou.edu

Stephen Fitzgerald, Ph.D.
Touro University International
5665 Plaza Drive, 3rd Floor
Cypress, CA 90630
800.375.9878
sfitzgerald@tourou.edu

Rights of Research Subjects

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact:

Institutional Review Board for the Protection of Human Subjects
Touro University International
5665 Plaza Drive, 3rd Floor
Cypress, CA 90630
800.375.9878
aafrookhteh@tourou.edu

Signature of Research Subject or Legal Representative

I understand the procedures and conditions of my participation described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

Name of Subject	Name of Legal Representative (if applicable)
Signature of Subject or Legal Representative	Date

Statement and Signature of Researcher

In my judgment the participant is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study

Signature of Researcher	Date

APPENDIX F

INSTITUTIONAL REVIEW BOARD REQUEST

Touro University International
Institutional Review Board for the Protection of Human Subjects

APPLICATION TO INVOLVE HUMAN SUBJECTS IN STUDENT DISSERTATION RESEARCH

Project Title: Harnessing Intellectual Capital: A Study of Organizational Knowledge Transfer

Project Start Date: 29 November 2004 Project End Date: 31 May 2006

Principal Researcher

Name: Terrence McGill
School/College: Business Administration Degree Sought: Ph.D. Business Management

Phone: 951.677.1713
Mailing Address: 24873 Adams Avenue, Murrieta, CA 92562
Email Address: tmcgill@tourou.edu

Application Status: X New Addendum Renewal

Previous IRB number: NA

BRIEF DESCRIPTION OF PROJECT:

The purpose of this study is to develop a theory that relates knowledge transfer and intellectual capital.

CAN THE RESEARCH BE DONE WITHOUT HUMAN SUBJECTS?

No, the research requires human subjects.

DESCRIBE THE POOL OF SUBJECTS:

The participants will be recruited from two groups at a Naval base in southern California. The two groups at this Department of Navy facility will be divided according to retirement eligibility. One group will be comprised of those who are eligible to retire and the other group will consist of those who are at the beginning or in the middle of their careers and thus are not yet eligible. Initially, 8-10 participants will be selected from the retirement ineligible group for interviews. Subsequent to the interviews with the retirement ineligible participants, an equal number of participants will be selected from the retirement eligible group. It is estimated that a total of 20 to 30 participants will be interviewed. Additionally, 170 participants will be randomly selected from the population of the base for an online survey. Recent optional online surveys conducted at the research site have yielded returns of over 50%, and therefore returns of at least 88 are expected. Prior to

conducting the quantitative research, a mini-pilot study, consisting of about 4-8 participants will be conducted to test the face validity of the survey questions.

HOW ARE SUBJECTS TO BE RECRUITED?

The participants will be recruited via email using the attached form letter. Non-respondents will be contacted by phone one week after the initial email is sent.

DESCRIBE ANTICIPATED RISKS/DISCOMFORT TO THE SUBJECTS:

The study poses no foreseeable risk to participants.

HOW IS PRIVACY AND CONFIDENTIALITY ENSURED?

Any information that is obtained in connection with this study and can be identified with participants will remain strictly confidential and will be disclosed only with permission or as required by law. Pseudonyms, not real names or any identifying information will be used. The interview will be audiotaped and only Mr. McGill will have access to the tapes. They will be kept for five years and then they will be degaussed and shredded. In order to protect anonymity, the surveys will be numbered and will not contain any participant specific identifiable information. Only Mr. McGill will have access to the surveys. They will be kept for five years and then they will be shredded. The data files will be kept for five years and then destroyed.

DESCRIBE ANY DECEPTION TO BE USED WITH HUMAN SUBJECTS:

The study does not involve any deception.

IF PROCEDURES ARE POTENTIALLY HARMFUL, DESCRIBE ARRANGEMENTS FOR MEDICAL REFERRAL OR OTHER ASSISTANCE:

In accordance with the TUI College of Business Administration Student Handbook 2003-2004 and Code of Federal Regulations (CFR), I submit that my proposal qualifies for expedited review by the IRB chair.

My proposed research of individuals employing interview methodology and self-administered surveys qualifies for expedited review because it is considered to pose "minimal risk" to participants. According to the regulations, minimal risk means that:

“The probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves from those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.” ("Protection of Human Subjects," 2001)

WHAT PROVISIONS HAVE BEEN MADE FOR CULTURAL OR LANGUAGE PROBLEMS, SHOULD THEY ARISE?

No cultural or language problems are anticipated due to the nature of the pool of subjects. However, if any of

these issues arise, the researcher will consult with the participant and bring in a third party to bridge the differences, if the researcher cannot resolve the issue.

HAS CONSENT BEEN OBTAINED FROM AUTHORITIES IN A FOREIGN JURISDICTION?

Not applicable.

DOES THE RESEARCHER HAVE ANY FINANCIAL INTEREST IN THE RESEARCH? IF SO, BRIEFLY EXPLAIN AND ATTACH STATEMENT TO BE DISTRIBUTED TO SUBJECTS.

No, not applicable.

THE FOLLOWING ARE ATTACHED TO THE APPLICATION:

1. Appendices E and H (sample research study consent forms)
2. Chapter 3 (the methodology chapter of the dissertation proposal).
3. Appendix C (semi-structured interview guide) and Appendix G (sample survey).
4. Appendices A and B (sample participation request letters).
5. Written statement concerning Principal Investigator's Economic or Financial Interests. As noted in the application, the investigator has no economic or financial interest in the research study.
6. Written proof of compliance with or satisfaction of regulations/requirements of foreign jurisdictions is not applicable

RESEARCHER'S ASSURANCE

I certify that the information provided in this application is complete and correct.

I understand that as Principal Researcher, I have ultimate responsibility for the conduct of the study, the ethical performance of the project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the IRB.

I agree to comply with all TUI policies and procedures, as well as with all applicable federal, state, and local laws regarding the protection of human subjects in research, including, but not limited to, the following:

* performing the project according to the approved research methodology,
* implementing no changes in the approved research methodology or consent form without prior IRB approval (except in an emergency, if necessary to safeguard the well-being of human subjects),
* obtaining the legally effective informed consent from human subjects or their legally responsible representative, and using only the currently approved, stamped consent form with human subjects,
* promptly reporting significant or untoward adverse effects to the IRB in writing within 5 working days of occurrence.

Principal Researcher Date

APPENDIX G

SURVEY AND RESEARCH STUDY SURVEY CONSENT FORM

INTRODUCTION

HARNESSING INTELLECTUAL CAPITAL:
A STUDY OF ORGANIZATIONAL KNOWLEDGE TRANSFER

You are invited to participate in a research study conducted by Terrence P. McGill, a Ph.D. Candidate from the College of Business Administration at Touro University International. The results of this study will contribute to his dissertation. It may also provide information that may be helpful to succession planning in this command. You were selected for this interview because of your retirement eligibility status and because you may have valuable insight into how knowledge is transferred within the organization.

CONSENT

Purpose of the Study
The purpose of this study is to develop a theory related to knowledge transfer and intellectual capital.

Procedures
If you volunteer to participate in this study, you will do the following things:
If you agree, read the remainder of the consent, and then click on **"Next"** below. The survey will be self-administered and is expected to take five minutes to complete.

Potential Risks and Discomforts
The study poses no foreseeable risk to participants.

Potential Benefits to Subjects and/or to Society
The benefit to participation is the intrinsic value of participating in a study that will contribute to developing theory in the field of knowledge transfer and to developing effective practices for knowledge transfer and succession planning in this command.

Payment for Participation
There will be no compensation for participation in this study.

Confidentiality
Any information that is obtained in connection with this study and that can be identified with you will remain strictly confidential and will be disclosed only with your permission or as required by law. In order to protect your anonymity, the surveys will be numbered and will not contain any participant specific identifiable information. Only Mr. McGill will have access to the surveys. They will be kept for five years on a CD-ROM and then the CD-ROM will be destroyed.

Participation and Withdrawal
You can choose whether to participate in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. Participation or non-participation will not affect your employment status or any other personal consideration or right you usually expect. You may also refuse to answer any questions you do not want to answer and still remain in the study. The researcher may decide not to include you in this research if circumstances arise that in the opinion of the researcher warrant doing so.

Identification of Researchers
If you have any questions or concerns about the research, please feel free to contact:

Terrence P. McGill
Touro University International, 5665 Plaza Drive, 3rd Floor, Cypress, CA 90630
tmcgill@tourou.edu

Stephen Fitzgerald, Ph.D.
Touro University International, 5665 Plaza Drive, 3rd Floor, Cypress, CA 90630
800.375.9878 x2120
sfitzgerald@tourou.edu

Rights of Research Subjects
You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact:

Institutional Review Board for the Protection of Human Subjects
Touro University International, 5665 Plaza Drive, 3rd Floor, Cypress, CA 90630
800.375.9878
aafrookhteh@tourou.edu

Acceptance by Research Subject
I understand the procedures and conditions of my participation described above. Any questions have been answered to my satisfaction, and I agree to participate in this study.

If you do not agree to participate:
Click on: "Exit this survey"
In the upper right corner of this page

If you agree to participate:
Click on: "Next"

Section A - Knowledge Transfer

Below, we are asking you for your assessment of the effectiveness of different tools and techniques for performing certain activities, RELATIVE TO EACH OTHER. To give your assessments, you'll be using a judgment scale.

Here is an example:

WHICH IS MORE EFFECTIVE FOR OPENING A CAN OF TUNA?

*1. **Can Opener vs Hammer**

Ø	**Can Opener** Much More Effective
O	**Can Opener** Somewhat More Effective
O	*About the Same*
O	**Hammer** Somewhat More Effective
O	**Hammer** Much More Effective

[By marking this first box, the respondent indicates that s/he believes that a can opener is much more effective than a hammer as a tool to open a can of tuna.]

Please follow the example above as you make relative comparisons in Section A.

Definitions

In Section A, the tasks we ask you to compare involve sharing knowledge of various kinds. We are interested in the interactions between different kinds of knowledge and the different techniques by which they are shared between individuals and within groups.

Knowledge Sharing[1]	Involves two actions, transmission and absorption and may be defined as taking place when knowledge is both transmitted by the sender and received (absorbed) by the receiver.

Knowledge Transfer Techniques	Definition
Documentation	Knowledge transfer through cataloged and/or recorded media such as a book, a folder, a PC, and other recordable sources.
Hands-On Interaction	Knowledge transfer through first-hand and primary performance of a task or duty by a participant.
Mentoring	Professional development support and/or guidance provided by another within the organization; which may be formal or informal.
Observation	Knowledge transfer through watching co-workers interact, experience, and/or perform work functions.

Please follow the previous example to compare the relative effectiveness of the above techniques in terms of sharing four different kinds of knowledge subsequently presented in Section A.

For each of the four different kinds of knowledge, a brief scenario is presented to help paint a general picture of the knowledge and to get you to think about real life situations. Each scenario is followed by six comparisons.

Reference: [1]Cross, R., Parker, A., & Prusak, L. (2000). Knowing what we know: Supporting knowledge creation and sharing in social networks. Cambridge, MA: IBM Institute for Knowledge Management.

Subject Matter Expertise

Scenario: *You entered the organization with a particular skill level. Over time your level of expertise has grown in areas such as analysis, assessment, assurance, management, and measurement, as well as others.*

WHICH IS MORE EFFECTIVE FOR TRANSFERRING SUBJECT MATTER EXPERTISE?

1. Hands-On Interaction vs Documentation

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Documentation** Somewhat More Effective
O	**Documentation** Much More Effective

2. Hands-On Interaction vs Observation

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Observation** Somewhat More Effective
O	**Observation** Much More Effective

3. Hands-On Interaction vs Mentoring

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

4. Documentation vs Observation

O	**Documentation** Much More Effective
O	**Documentation** Somewhat More Effective
O	*About the Same*
O	**Observation** Somewhat More Effective
O	**Observation** Much More Effective

5. Documentation vs Mentoring

O	**Documentation** Much More Effective
O	**Documentation** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

6. Observation vs Mentoring

O	**Observation** Much More Effective
O	**Observation** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

Analysis Procedure or Methodology

Scenario: *Your position requires the know-how and understanding of certain accountable and consistent methods or procedures; including analysis protocols and tools.*

WHICH IS MORE EFFECTIVE FOR TRANSFERRING AN ANALYSIS PROCEDURE OR METHODOLOGY?

7. Hands-On Interaction vs Documentation

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Documentation** Somewhat More Effective
O	**Documentation** Much More Effective

8. Hands-On Interaction vs Observation

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Observation** Somewhat More Effective
O	**Observation** Much More Effective

9. Hands-On Interaction vs Mentoring

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

10. Documentation vs Observation

O	**Documentation** Much More Effective
O	**Documentation** Somewhat More Effective
O	*About the Same*
O	**Observation** Somewhat More Effective
O	**Observation** Much More Effective

11. Documentation vs Mentoring

O	**Documentation** Much More Effective
O	**Documentation** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

12. Observation vs Mentoring

O	**Observation** Much More Effective
O	**Observation** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

Customer / Sponsor Protocols and Procedures

Scenario: *Although you hold your products and deliverables to consistent qualities and standards across the board, some sponsors and/or customers may require unique or tailored communication and interface practices. With all other variables held equal, these adaptations may be the edge necessary to maintain or obtain a successful relationship with that particular sponsor and/or customer.*

WHICH IS MORE EFFECTIVE FOR TRANSFERRING CUSTOMER / SPONSOR PROTOCOLS AND PROCEDURES?

13. Hands-On Interaction vs Documentation

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Documentation** Somewhat More Effective
O	**Documentation** Much More Effective

14. Hands-On Interaction vs Observation

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Observation** Somewhat More Effective
O	**Observation** Much More Effective

15. Hands-On Interaction vs Mentoring

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

16. Documentation vs Observation

O	**Documentation** Much More Effective
O	**Documentation** Somewhat More Effective
O	*About the Same*
O	**Observation** Somewhat More Effective
O	**Observation** Much More Effective

17. Documentation vs Mentoring

O	**Documentation** Much More Effective
O	**Documentation** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

18. Observation vs Mentoring

O	**Observation** Much More Effective
O	**Observation** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

Shared Beliefs

Scenario: *You and your coworkers are guided by some similar ethics, standards, and values as you support the Fleet, DOD, and other customers. These are the guiding principles that are inherent to the organization and which you may have adopted. The principles may include things like "keeping the sailor or war-fighter in mind" as you conduct your daily work.*

WHICH IS MORE EFFECTIVE FOR TRANSFERRING SHARED BELIEFS?

19. Hands-On Interaction vs Documentation

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Documentation** Somewhat More Effective
O	**Documentation** Much More Effective

20. Hands-On Interaction vs Observation

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Observation** Somewhat More Effective
O	**Observation** Much More Effective

21. Hands-On Interaction vs Mentoring

O	**Hands-On Interaction** Much More Effective
O	**Hands-On Interaction** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

22. Documentation vs Observation

O	**Documentation** Much More Effective
O	**Documentation** Somewhat More Effective
O	*About the Same*
O	**Observation** Somewhat More Effective
O	**Observation** Much More Effective

23. Documentation vs Mentoring

O	**Documentation** Much More Effective
O	**Documentation** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

24. Observation vs Mentoring

O	**Observation** Much More Effective
O	**Observation** Somewhat More Effective
O	*About the Same*
O	**Mentoring** Somewhat More Effective
O	**Mentoring** Much More Effective

Section B – Mentoring
In Section B, we ask you to answer some questions related to mentoring. We are interested in the levels of mentoring and desired levels of mentoring between individuals and within groups in the organization.

Mentoring	Professional development support and/or guidance provided by another within the organization; which may be formal or informal. For the purpose of knowledge transfer, this usually takes place when a more experienced individual shares his/her knowledge with one who is less experienced.

For each of the five questions on mentoring, select your answers using the Radio Style Buttons.

25. Mentoring Received

Within your organization, **how frequently have you received mentoring** related to knowledge transfer?

Never	Less than Annually	Annually	Quarterly	Monthly	Weekly	Daily
1	2	3	4	5	6	7
O	O	O	O	O	O	O

26. Mentoring Desired

Within your organization, ideally, **how frequently would you like to receive mentoring** related to knowledge transfer?

Never	Less than Annually	Annually	Quarterly	Monthly	Weekly	Daily
1	2	3	4	5	6	7
O	O	O	O	O	O	O

27. Mentoring Provided

Within your organization, **how frequently have you provided mentoring** related to knowledge transfer?

Never	Less than Annually	Annually	Quarterly	Monthly	Weekly	Daily
1	2	3	4	5	6	7
O	O	O	O	O	O	O

28. Mentoring Willing to Provide

Within your organization, ideally, **how frequently are you willing to provide mentoring** related to knowledge transfer?

Never	Less than Annually	Annually	Quarterly	Monthly	Weekly	Daily
1	2	3	4	5	6	7
O	O	O	O	O	O	O

29. Importance of Mentoring for the Transfer of Knowledge

How important is mentoring for transferring knowledge?

1	2	3	4	5
Not Important	Somewhat Important	Moderately Important	Very Important	Extremely Important
O	O	O	O	O

Section C - Demographic Information

In Section C, we are interested in some demographic information in order to categorize your responses.

Select your Years of Federal Service and Age from the Pull Down Menus.

Select your Retirement System using the Radio Style Buttons.

30. Years of **Federal Service**?

Please type in your years of Federal Service

31. Age?

Please type in your age

32. Retirement System?

Please choose one response

Civil Service Retirement System (CSRS)	Federal Employee Retirement System (FERS)
O	O

33. What else is important for us to know about effective knowledge transfer in this organization?

Please type in your response

End of Survey
Thank You.

APPENDIX H

APPROVAL TO CONDUCT RESEARCH AT RESEARCH SITE

-----Original Message-----

From: [Assistant Technical Director at Research Site]
Sent: Tuesday, December 02, 2003 4:04 PM
To: [Executive Steering Group] and [Senior Management]
Cc: Terrence McGill
Subject: Dissertation

Terry McGill is pursuing a PhD in Business Management through Touro University International. His proposed dissertation involves research on how knowledge (intellectual capital) is transferred. Terry's dissertation subject is extremely important and timely to this Command with our number of new hires and our current retirement rate. In fact, succession planning and training are part of the Command [strategic plans].

The [ESG] has been talking about knowledge transfer and using senior leaders to help with knowledge transfer in a more structured and systematic way -- a sort of [college] concept.

Terry approached me about getting permission to conduct research and interviews on station for his dissertation. Granting permission was a no-brainer since this is a golden opportunity to help Terry and at the same time help the Command by using Terry to assist with our own succession planning and knowledge transfer problems. When he is ready, I will have Terry brief the [ESG] and then use him as a consultant as we move forward.

I also request your full cooperation with Terry as he completes his research and his dissertation.

//s//

[Assistant Technical Director]

APPENDIX I

Table 51

START LIST OF CODES

Intellectual Capital Codes and sub-codes	Definitions
1) Human Capital	Individual knowledge, skills, and abilities
2) Structural Capital	Organization's supportive infrastructure used to meet market demands
3) Customer Capital	Customer relationships and relationship development
4) Social Capital	Trust, mutual understanding, shared values, and behaviors that connect individuals in the organization

Knowledge Transfer Codes and sub-codes	Definitions
1) Socialization	Process of sharing experiences
a) Human Capital transfer via socialization	Sharing experiences related to individual knowledge, skills, and abilities

(table continues)

Table 51 (cont'd)

b) Structural Capital transfer via socialization	Sharing experiences related to the organization's supportive infrastructure used to meet market demands
c) Customer Capital transfer via socialization	Sharing experiences related to customer relationships and relationship development
d) Social Capital transfer via socialization	Sharing experiences related to trust, mutual understanding, shared values, and behaviors that connect individuals in the organization
2) Externalization	Process of reflecting on what is being conveyed through metaphors, stories
a) Human Capital transfer via externalization	Process of reflecting on individual knowledge, skills, and abilities being conveyed through metaphors, stories
b) Structural Capital transfer via externalization	Process of reflecting on the organization's supportive infrastructure being conveyed through metaphors, stories
c) Customer Capital transfer via externalization	Process of reflecting on customer relationships and relationship development being conveyed through metaphors, stories

(table continues)

Table 51 (cont'd)

d) Social Capital transfer via externalization	Process of reflecting on trust, mutual understanding, shared values, and behaviors that connect individuals in the organization being conveyed through metaphors, stories
3) Combination	Process of sorting and adding knowledge
a) Human Capital transfer via combination	Process of sorting and adding knowledge related to individual knowledge, skills, and abilities
b) Structural Capital transfer via combination	Process of sorting and adding knowledge related to the organization's supportive infrastructure
c) Customer Capital transfer via combination	Process of sorting and adding knowledge related to customer relationships and relationship development
d) Social Capital transfer via combination	Process of sorting and adding knowledge related to

(table continues)

Table 51 (cont'd)

4) Internalization	Process of learning by doing
a) Human Capital transfer via internalization	Process of learning by doing related to individual knowledge, skills, and abilities
b) Structural Capital transfer via internalization	Process of learning by doing related to the organization's supportive infrastructure used to meet market demands
c) Customer Capital transfer via internalization	Process of learning by doing related to customer relationships and relationship development
d) Social Capital transfer via internalization	Process of learning by doing related to

Demographics	Definitions
1) Gender	1) Female 2) Male
2) Local Experience (years and months)	

(table continues)

Table 51 (cont'd)

3) Federal (years and months)	
4) Position	1) Supervisory position
	2) Non-supervisory position
5) Retirement Status	1) Eligible to collect a pension
	2) Not eligible to collect a pension

APPENDIX J

Table 52

FINAL LIST OF CODES

Intellectual Capital Codes and sub-codes	Definitions
1) Subject Matter Expertise	The theme that characterizes the knowledge that participants discussed connected to the know-how, skills, and capabilities of individuals within the organization.
2) Project Management Skill	This is defined as the know-how to allocate, utilize, and balance resources in relationship to tasks.
3) Communication Skill	This theme depicts knowledge that participants discussed related to the interrelation, discourse, and exchange between individuals.
4) Analysis Methodology	This theme portrays the knowledge related to processes used to analyze and assess systems.

(table continues)

Table 52 (cont'd)

5) Project Management Methodology	This theme characterizes knowledge related to structured resource management processes.
6) Analysis Tool	This theme characterizes the variety of knowledge that seven participants discussed related to computer programs or software used for system analysis.
7) Protocols	This characterizes the knowledge participants described related to formalities and procedures in customer relations.
8) Relationships	This theme characterizes the connecting bond between participants and the customers.
9) Shared Beliefs	This theme portrays knowledge that depicts main beliefs, principles, ethics, and morals related to the organization.
10) Mutual Understanding	This depicts knowledge related to perceptiveness, and comprehension between individuals.

(table continues)

Table 52 (cont'd)

11) Trust	This theme represents the knowledge related to confidence and assurance levels between individuals.

Knowledge Transfer Codes and sub-codes	Definitions
1) Observation	Knowledge transfer through watching co-workers interact, experience, and/or perform work functions.
2) Mentoring	Professional development support and/or guidance provided by another within the organization; which may be formal or informal.
3) Purposive Encounter	The process of exchanging knowledge during a meeting planned for information and knowledge dissemination.

(table continues)

Table 52 (cont'd)

4) Casual Encounter	This theme relates to situations where knowledge transfer is more of a by-product of the dialogue, as opposed to a primary objective. Participants are transferring knowledge through relaxed encounters, unplanned meetings, and daily conversation.
5) Documenting	Knowledge transfer through cataloged and/or recorded media such as a book, a folder, a PC, and other recordable sources.
6) Story or Metaphor	This is defined as the knowledge transfers that occurred by telling of a narrative or discussing or verbalizing an image of a theme or message.
7) Programming	The theme used to represent knowledge transfer from a participant to a typed computer program.
8) Teaching	This theme represents participant knowledge transfer experiences in the role of a formal instructor.

(table continues)

Table 52 (cont'd)

9) Hands-on Interaction	Knowledge transfer through first-hand and primary performance of a task or duty by a participant.
10) Instructed Training	An exchange between student and teacher in an intentional education setting.
11) Self Training	This represents transfers that participants experienced while participating in individual-based, self-taught training.

Demographics	Definitions
1) Gender	1) Female 2) Male
2) Age	16 to 67 years
3) Years of Service	Federal employee service. 0 to 40 years

(table continues)

Table 52 (cont'd)

4) Position	1) Supervisory position
	2) Non-supervisory position
5) Retirement System	1) Civil Service Retirement System (CSRS)
	2) Federal Employee Retirement System (FERS)
6) Retirement Eligibility Status	1) Eligible to retire
	2) Not eligible to retire