3-2001

Development of an Instrument to Identify Unique Supply Officer Knowledge

Christopher A. Boone

DEVELOPMENT OF AN INSTRUMENT TO IDENTIFY UNIQUE SUPPLY OFFICER KNOWLEDGE

THESIS

Christopher A. Boone, Captain, USAF

AFIT/GLM/ENS/01M-03

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

The views expressed in this thesis are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the U.S. Government.

AFIT/GLM/ENS/01M-03

DEVELOPMENT OF AN INSTRUMENT TO IDENTIFY UNIQUE SUPPLY OFFICER KNOWLEDGE

THESIS

Presented to the Faculty

Department of Operational Sciences

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

Christopher A. Boone, B.B.A.

Captain, USAF

March 2001

AFIT/GLM/ENS/01M-03

DEVELOPMENT OF AN INSTRUMENT TO IDENTIFY UNIQUE SUPPLY OFFICER KNOWLEDGE

Christopher A. Boone, B.B.A.
Captain, USAF

Approved:

Marvin A. Arostegui (Chairman) — 26 Feb 01 date

Mark A. Ward (Member) — 26 Feb 01 date

Acknowledgments

First, I want to thank my Lord and Savior Jesus Christ, who has blessed me in more ways than I deserve. The Bible tells us that every good and perfect gift is from above. All I am, have, and do comes directly from God's hand.

I would also like to thank the members of my thesis committee, Maj. Marvin Arostegui and Maj. Mark Ward. Their leadership and knowledge were invaluable. Without them, I would not have been able to complete this thesis effort.

My thesis sponsor, Brigadier General Robert E. Mansfield, deserves special thanks. His career serves as a personal inspiration to me. His interest and devotion to Air Force supply and supply officers made this thesis effort possible.

My classmates Paul Filcek, Mike Colvard and Steve Martinez each provided advice and encouragement throughout my entire thesis effort. More importantly, they were true friends with whom I am proud to have served.

I want to thank my Grandmother. I will never be able to thank her enough for the lifetime of undying love and support she has given me.

My sons deserve my life-long gratitude for their love and patience. Throughout this entire effort they have served as reminders as to what is truly important in life. I am so proud of them both.

Finally, I want to thank my wife. Words cannot express my gratitude for her patience and sacrifice. She is unquestionably the greatest gift God has ever given me. I love her dearly.

Chris Boone

Table of Contents

List of Figures

Page

List of Tables

Page

Abstract

Air Force supply officers possess a unique body of knowledge. This unique body of supply officer knowledge is an Air Force intellectual asset. In many commercial sectors it is widely accepted that intellectual assets are more valuable than material ones. The value of these intellectual assets depends on the value created by the application of the organization's knowledge and the value this knowledge creates. This thesis establishes a process for measuring the value created by unique supply officer knowledge.

The first step in the methodology is to identify mandatory supply knowledge. This was accomplished through review of Air Force guidance and use of a knowledge audit questionnaire. The knowledge audit is viewed as one of the first steps in the knowledge management area. The knowledge audit provides a means for assessing what knowledge is needed or contained within an organization. The knowledge audit conducted as part of this research effort resulted in the development of 11 mandatory supply knowledge categories consisting of 49 sub-categories.

The second phase of the methodology requires the identification of unique supply officer knowledge. The identification of unique supply officer knowledge is necessary so that the contributions, or value, of the knowledge to the accomplishment of the Air Force mission can be determined. Currently, there is no method available for accomplishing this identification. This research concludes with the development and testing of a survey instrument for use in identifying unique supply officer knowledge.

DEVELOPMENT OF AN INSTRUMENT TO IDENTIFY UNIQUE SUPPLY OFFICER KNOWLEDGE

I. Introduction

General Issue

The world is in the midst of the greatest growth of information and knowledge in human history. Knowledge and information have overtaken material assets as the primary resource of many organizations. The ability of these organizations to identify, manage, and cultivate information and knowledge and to understand its value is critical to their success and competitiveness. The importance of information and knowledge is not restricted to civilian organizations. To ensure its continued success and dominance, the United States Air Force also needs to maximize the understanding and use of its knowledge and information assets. This research focuses on Air Force supply officers and the identification of the knowledge assets they possess, so that these assets may be properly valued, managed, and maximized.

Background

Today's business environment poses new and unprecedented challenges to organization leaders. Civilian organization leaders face an economic environment filled with constant, unpredictable change. Organizations must compete in a global economy, dominated by technology. Qualified employees are hard to recruit and even harder to retain. Compounding this complex environment is the sheer amount of information organization leaders must endure. The amount of information available to leaders today

is greater than ever before. "The total amount of information in the world is doubling every 18 months" (Rowley, 1995).

Air Force leaders are also facing a dynamic and complex environment. In the past, Air Force managers and leaders faced a relatively known and predictable threat in the former Soviet Union. With the end of the cold war, Air Force leaders now face a more uncertain environment. Air Force leaders must meet these threats with aging equipment whose supportability is compromised by a reduced defense budget. Technology growth and information availability also pose challenges for Air Force leaders. The battlefield on which Air Force leaders must fight and win is one that demands the exploitation of real-time information and reliance on technologically advanced weapon systems. This combination of a complex operating environment and information availability forced both civilian business leaders and Air Force leaders to search for new and innovative means for gaining a competitive advantage in the marketplace and on the battlefield.

One approach leaders are turning to in their effort to gain a competitive advantage is the use of knowledge management. The concept of knowledge is not new. What is new is knowledge management's recognition of knowledge as an organizational asset, and the realization that knowledge adds value to the organization.

Because the field of Knowledge Management is relatively new and quickly expanding, many of the terms and definitions used are dependent on the organization implementing the concept. Therefore, the following definitions will be used for the purposes of this research:

Data: a set of discrete, objective facts commonly seen in the structured records of transactions. Data is unorganized but consists of independent numbers, words, sounds, or images that can easily be structured on machines; data by itself provides no judgment or interpretation of events.

Information: when data becomes organized, patterned, grouped, and or categorized; thus increasing depth of meaning to the receiver.

Knowledge: richer and more meaningful information put into productive use, e.g. best practices. Knowledge is derived from information. (Cho, Jerrell, Landay: 00)

The exact definition of knowledge management also varies; however, the concept is the same. "Simply put, knowledge management is the creation, capture, exchange, use, and communication of a company's intellectual capital" (Park: 98). Intellectual capital will be defined and discussed at length in later chapters. At this point, is important to understand that intellectual capital is more than just knowledge.

In order to manage a group's knowledge assets, the knowledge assets of that group must first be known. It is difficult to manage an unknown asset. One area within the Air Force, which could truly benefit from this identification and subsequent management of its knowledge assets, is the Air Force supply officer career field.

It is more important now than ever before to understand the knowledge and value of those within the supply officer career field. There are numerous efforts underway to change many of the current supply and logistics processes. There have even been discussions within the Air Force logistics community of combining the Air Force supply and transportation functions. One discussion

calls for a combination of supply, TMO (Traffic Management Office), and vehicle operations into a single distribution squadron (Gabreski: 00). This and other efforts and discussions are aimed at incorporating commercial best practices and reducing operating costs while increasing the efficiency of Air Force supply and logistic operations. They are also part of an ongoing evaluation of the value of existing Air Force functions.

One such effort is underway within the supply community. As part of the Supply Officer Professional Development Integrated Process Team (IPT), Brigadier General Mansfield, HQ USAF Director of Supply, posed a similar question regarding supply efforts. His tasking was to determine a means to *sell* or *market* the value of a supply officer to those serving in the supply career field and to others in the Air Force. This selling of the value of supply officers could encourage growth by those in the career field. This internal growth, both in knowledge and experience, aids in the development of future supply and logistics officers.

Selling the value of supply to others in the Air Force will generate a greater appreciation and understanding of the career field. This appreciation and understanding for the contributions of Air Force supply is especially important as the search for less costly and more efficient processes continues. The contribution and value of each function, in this case Air Force supply officers, must be understood and evaluated. By understanding each function and its contribution to the accomplishment of the Air Force mission, the true value of that function can be established.

Problem Statement

What is the value of Air Force Supply officers to others in the USAF? The true value of Air Force supply officers lies in the contribution of supply officer knowledge to the Air Force mission. It is the unique supply knowledge held by each of these individuals that distinguishes them. It is their application of this knowledge that gives them their value. To identify and sell this value, the unique supply knowledge must be identified.

Investigative Questions

What is intellectual capital?

What knowledge do Air Force supply officers need?

How can Air Force supply officers' unique knowledge be identified?

The investigative questions are answered through: 1) a review of the literature and official Air Force guidance, 2) structured interviews with Air Force supply officers conducted both to discover new information and to validate existing information, and 3) development of a survey instrument to identify unique supply officer knowledge.

Research Objectives

The objective is to develop an instrument for identifying the unique knowledge of Air Force supply officers. The first step is to identify the mandatory knowledge needed by Air Force supply officers. For this research, this is identified through review of current Air Force guidance and interviews with Air Force supply officers and subsequent content analysis of their responses. Next,

the mandatory knowledge, identified in the previous step, is used to develop a survey instrument. The intent is for this instrument to be given to officers in all of the logistics career fields. The results can be evaluated for the absence or existence of unique supply knowledge in the supply career field as well as other logistics career fields. By knowing what knowledge exists only among supply officers, a value determination of this knowledge and the supply career field could be possible. This research focuses on the development and testing of the survey instrument.

Research Methodology

The fundamental research methodology involves the use of structured interviews. The interviews were conducted among four different groups of supply officers. Content analysis was used to evaluate the interview responses. The content analysis results then provided the foundation for the development of the survey instrument.

Scope of Research

This research is limited to Air Force supply officers. Within the Air Force supply officer career field, the research is limited to those who are company grade officers (CGOs) or field grade officers (FGOs) serving in either retail or wholesale supply officer positions.

This research is limited to identifying the mandatory knowledge of supply officers and the development of a survey instrument to identify unique supply

knowledge. Measuring the intellectual capital or the value created by this knowledge is beyond the scope of this research effort.

Relevance

This topic is relevant by virtue of the current dynamics of the supply officer career field. As senior Air Force leaders attempt to determine the best utilization of their resources, the value of that resource must be known. This study provides a methodology for establishing the value of the supply officer career field. Empowered with this knowledge, Air Force senior leaders can make educated decisions on the best means for managing the resource known as supply officer knowledge.

Outline of Thesis

This thesis divided into the following five chapters: Introduction, Literature Review, Methodology, Findings and Analysis, and Conclusions. A brief description of each follows.

Chapter 1: Introduction - This chapter discusses the background, focus of research, research objectives, and relevance of this thesis document.

Chapter 2: Literature Review – This chapter begins with a description of the Air Force supply officer career field and its current operating environment. Next, intellectual capital is defined and its components discussed. Finally, available methods for identifying and assessing a value to intellectual capital are evaluated.

Chapter 3: Methodology – The methodology chapter begins by describing the process for establishing mandatory supply officer knowledge. First, current Air Force guidance is analyzed. Next, the process for questionnaire development is described. The identification of selected participants is discussed as well as the results of the process for evaluating the questionnaire results. Then, justification is provided for using a survey as a tool for identifying unique supply officer knowledge.

Chapter 4: Findings and Analysis – This chapter presents the results of the supply officer knowledge audit. The resulting eleven mandatory supply knowledge categories are introduced. The development of the survey instrument is described.

Chapter 5: *Conclusions and Recommendations* – The research results are reviewed. Survey analysis methods are presented. The relevance of the research effort is presented. Recommendations for further research are provided.

II. Literature Review

Introduction

The purpose of this chapter is to provide a thorough review of literature relevant to this research effort. Initially, this chapter provides a current description of the Air Force Supply officer career field, its current operating environment, and some of the future challenges it faces. Second, this chapter presents one management approach, knowledge management, to meet these challenges. Within the discussion of knowledge management, this chapter introduces and defines the concepts of intellectual capital and knowledge audit. Additionally, this chapter reviews currently accepted means for identifying and valuing intellectual capital.

Air Force Supply Officer

Air Force supply officers are part of a larger logistics officer core. The logistics officer core consists of contracting, transportation, logistics plans and programs, aircraft maintenance, space and missile maintenance, and supply officers. This research effort focuses on Air Force supply officers.

Air Force supply officers play a vital role in the accomplishment of the overall Air Force mission. In general, supply officers are responsible for ensuring the necessary supplies and fuel are available to meet Air Force mission requirements. In a quote from AFPAM 23-113, *The Supply Officer Guide*, Colonel Al Smith, former HQ USAF/LGS, emphasized the importance of the supply career field:

> You want to know just how important a role the supply community plays in the Air Force—Let Me Tell You!! Every organization depends on timely and effective support from supply. Without it—no Air Force mission could be accomplished. Supply is the vital hub of mission support and don't you ever forget it!!

The supply career field "encompasses a wide spectrum of material management disciplines. They define mission requirements, manage high dollar inventories, and provide timely distribution of assets" (Moore: 95). Supply officers carry out these activities at both a retail and wholesale supply level. Retail supply refers to the supply support activities at the base level. These are the activities most commonly associated with supply and can be directly related to the base level mission. Wholesale supply refers to supply support activities at the depot level. Wholesale supply activities are in support of the retail supply activities, serving as sources of supply and repair activities. Most supply officers begin their supply careers at the retail or base supply level.

The base supply functions are the responsibility of the base supply organization. The base supply organization consists of five flights, each of which is made up of elements.

> The five flights are generally organized into material management, combat support, management systems, storage, and distribution, and fuels management. The flight chiefs of each of the above are usually company grade officers who plan, organize, direct, manage, and operate supply and fuels management systems. (Moore: 95)

Each of the Air Force major commands has authority to alter this basic structure. Also, with the introduction of regionalization, most base level supply organizations no longer resemble the organization structure described above. In some cases, one or two entire flights were eliminated.

Supply officers assigned to a base level supply have a wide range of management and technical responsibilities.

> Supply officers administer and direct the retail supply equipment, fuel activities. These activities consist of financial, inventory, material facilities, and environmental management. The challenges involve determining, procuring, and projecting material requirements, and assessing current stock levels, equipment allowances, and authorizations. In the fuels Management Flight, officers direct all fuels operations activities such as receipt of fuel from pipelines, trucks, rail cars, or marine vessels. In addition, they are responsible for the fuel dispensing systems, bulk storage facilities, cryogenics productions and storage, and the test and evaluation of fuels samples.
>
> One of the main responsibilities of any officer is to prepare one's organization for both its peacetime and wartime missions. This also applies to the supply career field. Supply officers coordinate with both wing and higher headquarters staffs and operating units on spares, equipment, and fuels activities necessary for mission accomplishment. This involves wartime planning and conducting exercises for mobility readiness.
>
> Officers in the supply field are also responsible for the accountability of all supply and fuel assets. This means strict compliance with all directives. Accountable officers implement approved standards, criteria, and safety measures. In addition, fuels officers resolve technical problems to safeguard against fire hazards. (Moore: 95)

Air Force supply officers are also found outside of the base or retail supply organization. Many Air Force supply officers serve at the wholesale level. "At the wholesale level, supply officers support the Air Force Material Command's air logistic centers" (Moore: 95). There are currently five air logistic centers (ALCs): Warner Robins (WR-ALC), Sacramento (SM-ALC), Oklahoma City (OC-ALC), Ogden (OO-ALC), and San Antonio (SA-ALC). Soon there will only be three air logistics centers with the Sacramento and San Antonio centers scheduled for closure. Supply officers assigned to one of these air logistics centers are responsible for depot weapon system

programs and life cycle support. Although the ALCs are the primary source of wholesale supply positions, there are wholesale positions outside of Air Force Material Command.

> In addition, supply officers have the opportunity to work in the joint arena with the Defense Logistics Agency (DLA) and their many centralized support centers. Jobs in both AFMC and DLA involve material management responsibilities in support of air logistic centers and support of the retail community, whereas the retail supply job provides operational support to war fighter missions. (Moore: 95)

With this wide spectrum of responsibilities, Air Force supply officers must be flexible and knowledgeable regarding many different aspects of the Air Force and, in some cases, DoD supply systems. This is especially important in today's rapidly changing operating environment.

Current Operating Environment

Today's supply officers must provide fuel and supply support in a state of near-constant change. Some of the primary forces behind this constant change are the outsourcing and privatization efforts, reengineering programs, and implementation of the Expeditionary Aerospace Force concept.

Outsourcing and Privatization. The size of today's Air Force is significantly smaller than it was just 10 years ago. "The size of the Air Force is down dramatically – from just under 600,000 active duty personnel in 1989 to under 400,000 in 2000, a forty percent reduction in active duty strength" (Hopp: 00). One method used for reducing the size of the force was outsourcing and privatization. General Michael Ryan, USAF Chief

of Staff declared outsourcing and privatization "One of the most significant issues facing the Air Force today" (Ryan).

> Outsourcing is the competing of support services between public and private industry. The government retains full responsibility and control over the delivery of those services whether provided by government employees or contractors. Privatization is the transfer of control of a target business asset and/or associated activity from the public to the private sector; it's also characterized by the shift from public to private capital for the fundamental, long-term financial investment required. (Ryan)

Outsourcing is not new to the supply career field. "Air Education and Training Command began outsourcing supply squadrons during the 1960s" (Phillips: 99). What is new is the pressure to increase the number of outsourced functions. The Quadrennial Defense Review states:

> Reduce logistics support costs by integrating organizations and functions (supply, financial, automated data processing, transportation, maintenance, and procurement) now being performed at multiple locations in a common geographic area. Each military department will reduce inventories and operating costs by sharing and linking consumer-level inventories and by eliminating redundant facilities and operations.
>
> Compete, outsource, or privatize military department infrastructure functions that are closely related to commercial enterprises. Most of these actions involve logistics and installation support functions. The military departments expect that these initiatives will eliminate 25,000 military and 30,000 civilian positions between now and FY 2003. (Cohen: 97)

While driving an increase in outsourcing and privatization, this additional emphasis on reducing support costs has driven senior supply leaders to search for additional means to meet these challenges. One of these efforts involves supply reengineering.

Supply Reengineering. Thus far, supply reengineering efforts have focused on consolidating and regionalizing supply processes. Consolidation efforts like those at Shaw AFB, are "testing the consolidation of several supply and transportation functions" (Phillips: 99). Regionalization efforts began during operations DESERT SHIELD and DESERT STORM. During these operations, " a supply contingency center was established at Langley AFB, Virginia to provide a centralized ordering process to support forward deployments" (Phillips: 99). This organization, known as the Air Force Contingency Supply Squadron, still provides supply support to several different areas of responsibility. This trend towards regionalization is expected to continue. "Air Force leadership anticipates regional centers in four different major commands" (Philips: 99).

Expeditionary Aerospace Force. The Air Force is also making significant changes in how it prepares and acts to meet the military needs of the country. The shift to an Expeditionary Aerospace Force has made a significant impact on how the Air Force accomplishes its mission.

> The Expeditionary Aerospace Force (EAF) embodies the Air Force vision to organize, train, equip, and sustain its future Total Force – Active, Air National Guard and Air Force Reserve – to meet the security challenges of the 21st Century.
>
> At its core, EAF is about structural and cultural changes to create more effective force management tools. The most talked about change under EAF is the Aerospace Expeditionary Forces (AEFs). Under this construct, a pair of AEFs defines the level of deployment our combat and combat support units can sustain. A pair of rotating on-call Aerospace Expeditionary Wings provides the punch in our crisis response capabilities. (HQ USAFE/XOPE: 00)

Figure 1 provides a visual representation of how the EAF vision ties together the Air Force core competencies of Global Attack, Air and Space Superiority, Precision

Engagement, Rapid Global Mobility, Information Superiority, and Agile Combat Support.

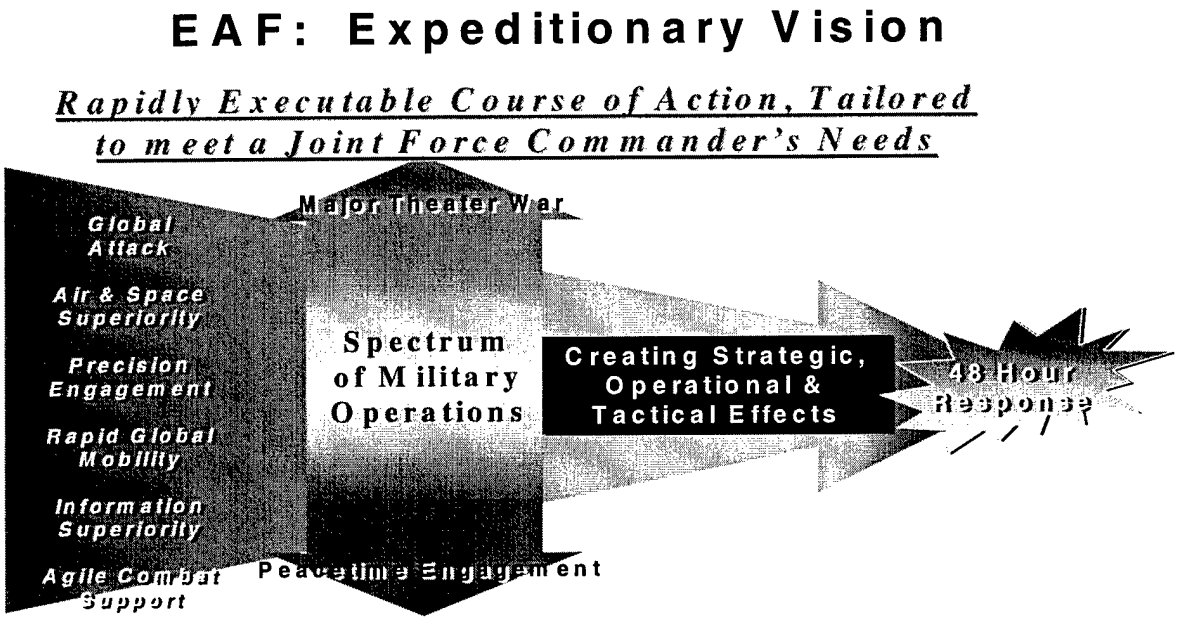

Figure 1: AEF Expeditionary Vision (USAF Agile Combat Support CONOPS)

As a primary component of the Air Force's Agile Combat Support capability, supply must adjust to this new expeditionary concept. The United States Air Force Agile Combat Support Concept of Operations states, "The National Military Strategy now demands a wide spectrum of military capabilities required to support differing geopolitical objectives" (ACS CONOPS: 99). The ACS CONOPS explains that:

> Supply, as a primary element of the supply chain, must be capable of providing materiel support (including fuels) to the warfighting CINCs across the full planning-to-execution spectrum. It is Supply's responsibility to facilitate efficient availability of the right materials, in the right place, in the right condition, and in the right quantities to meet the mission needs of the warfighter. Fuels must be capable of providing fuels and cryogenic support to whatever location an AEF might operate. The correct mix of personnel and equipment must be on hand to meet the

> needs of the CINC. Ensure that all prepositioned equipment is maintained and personnel identified to SEI positions are trained to that level of knowledge. Sufficient flexibility must be maintained to tailor force packages as directed by the CINC.
>
> Supply is the primary function that will provide in-theater reachback capability for material support once each of the MAJCOMs establish regional supply squadrons. Through these regionalized operations, theater reachback support will greatly reduce customer wait times and provide the warfighting CINCs an efficient availability of correct parts. (USAF ACS CONOPS: 99)

All of these factors--outsourcing and privatization, reengineering programs, and implementation of the Expeditionary Aerospace Force Concept--have created a need for an increasingly efficient and flexible Air Force supply officer career field. Exactly what changes need to be made are not yet known. However, efforts to identify those changes are underway.

Supply Officer of the Future

Attempts to define the supply officer of the future have begun. In February 2000, Brigadier General Mansfield engaged in an effort "to create effective senior supply and logistics leaders for the Air Force and DoD" (McClellan: 00). In support of this effort, he established an Integrated Process Team, IPT. The goal of this Supply Officer Professional Development IPT is to "develop a roadmap to ensure a career field that is dynamic enough to react to the rapidly changing environment we operate within" (McClellan: 00). The supply career field seems to be at a critical point in its history. In his paper "*The Air Force Supply Officer of the Future*," Major General (retired) Hopp, suggests that:

> The future for the AF supply officer career field is one that has much opportunity, if the leaders and the officers in the career field are ready and willing to embrace change. If they don't change, I believe the career field will become redundant and could be eliminated.

This need for change and flexibility is not just an Air Force supply officer issue. Air Force leaders, as well as their civilian counterparts realize the need for change.

> Today's turbulent business environment is, in part, an outcome of a very powerful shift in the world's economic system. A mass production based economy is being replaced by an economy based on information and knowledge.
>
> The survival of firms today is so hazardous in an increasingly unpredictable environment that their day-to-day existence depends on the day-to-day mobilization of every ounce of intelligence. For us, the core of management is the art of mobilizing and putting together the intellectual resources of all employees in the service of the firm. (Rastogi: 00)

The following excerpt from Leif Edvinsson and Michael Malone's book, *Intellectual Capital*, provides comments by some of today's business leaders on what it takes for a business to successfully compete.

> *Peter Drucker.* Innovation is the core competence of the competitive modern enterprise. It must be established at the heart of the organization from the beginning, continuously nurtured by investment and executive support, and it must be systematically transformed into value for the firm.
>
> *Dee Hock.* We are currently in an era of institutional failure, where old value system and the traditional organization form no longer work. What are now needed are "chaordic" (organized chaotic) organizations that value speed, flexibility, and adaptability.
>
> *Andrew Grove.* Companies must be ever watchful, to the point of paranoia, for sudden, technology-driven, categorical transformations that threaten not only their products but also the very way they do business
>
> *Tom Peters.* In a world of rapid, even explosive, change, companies must construct a comparably dynamic organization that enlists customers, employees, and strategic partners in pursuit of relationships, products, and

> work environments that create high excitement, creativity, and satisfaction. (Edvinsson and Malone: 97)

Innovation, speed, flexibility, adaptability, technology, and a world of rapid, even explosive--change are all terms mentioned above that are very familiar to senior Air Force supply leaders. If Air Force supply is facing many of the same changes and challenges as the corporate world, then it makes sense that senior Air Force leaders should look to the their civilian counterparts for ideas and practices to meet these challenges.

Meeting the Challenges

One way civilian businesses are meeting these challenges is through knowledge management and the management of intellectual capital. Many authors have written on the role of intellectual capital in today's business environment

> The foundation of an organization is not money or capital or technology -- it's knowledge and education (human capital). (Drucker: 00)

> Enterprises have turned to explicit and systematic knowledge management practices to make available the intellectual capital needed to perform effectively, internally and relative to stakeholders. (Wiig: 95)

> The role of managers in general, and of senior managers in particular, needs to be reoriented around coaching and mentoring. They need to help plan and facilitate the development of the firm's human capital. (Rastogi: 00)

Current senior Air Force supply leaders are aloes attempting to meet these challenges. They are currently working to identify the changes that need to be made to ensure a future supply officer career field capable of supporting the Air Force mission today and in the future. To meet this challenge, supply leaders

should also look to knowledge management and the management of intellectual capital.

Intellectual Capital

What is intellectual capital? The answer to this question lies in one's understanding of the knowledge hierarchy. Although there are some variations, this hierarchy consists of three primary parts: data, information, and knowledge.

> **Data**: a set of discrete, objective facts commonly seen in the structured records of transactions. Data is unorganized but consists of independent numbers, words, sounds, or images that can be easily structured on machines; data by itself provides no judgment or interpretation of events.
>
> **Information**: when data becomes organized, patterned, grouped, and or categorized; thus increasing depth of meaning to the receiver.
>
> **Knowledge**: richer and more meaningful information put into productive use, e.g. best practices. Knowledge is derived from information. (Cho, Jerrell, Landay: 00)

It is important to note that each one of these factors builds on the previous one. Data serves as the foundation. As patterns and organization in the data increase, the data becomes information. As the information takes on greater meaning and can be put into use, a level of knowledge is obtained. "Converting that knowledge into something that has value is what we have come to know as intellectual capital" (Lynn: 00). The following story helps highlight the differences between data, information, knowledge, and intellectual capital, and their importance.

> Intellectual capital, of course, has always been a decisive factor in the rise of civilizations, organizations, and people. For at least 60,000 years our ancestors, the Cro-Magnons, lived side by side with the Neanderthals. Then, about 30,000 years ago, the Neanderthals disappeared.

> Why did one species survive and the other parish? Both used tools and language, but the Cro-Magnons had a lunar calendar. Soon they correlated the passing days with the migratory patterns of bison, elk, and red deer. This insight was dutifully recorded on cave-wall paintings and in sets of 28 notches on reindeer antlers.
>
> Hungry for meat, the Cro-Magnon was taught that all he had to do was wait at a river crossing on certain days, spear in hand. In the meantime, the Neanderthals appear to have unwisely scattered their men and their scarce resources poorly. They perished. Intellectual capital made a difference. (Edvinsson and Malone: 97)

Besides showing the differences between data, information, knowledge, and intellectual capital, this story highlights the importance of all organizations military or civilian to maximize their intellectual capital. Simply put, intellectual capital is using knowledge to create value. With this definition in mind, it is now appropriate to look at the different components of intellectual capital.

Components of Intellectual Capital

There are several different opinions as to the exact components of intellectual capital. All of the authors seem to agree on the elements of intellectual capital. The disagreement seems to be on the number of components or categories these elements should be organized into. Brooking et al claim, "intellectual capital compromises intangible assets to include Market, Intellectual Property, Infrastructure, and Human centered assets" (Brooking et al.: 97). Each of these categories is described below.

> *Market assets*: Market assets are those that belong to the company and give it power in the marketplace. They include brands, positioning, customer base, company name, backlog, distribution channels, collaborations, franchise agreements, licensing agreements, favorable contracts and so on.

Intellectual property assets: This refers to property of the mind, which belongs to the company and is protectable in law. These include patents, copyright, design rights, trade secrets, trademarks and so on.

Infrastructure Assets: infrastructure assets refer to those assets, which belong to the company and provide the infrastructure without which it could not effectively function. These include management philosophy, corporate culture, management processes, business processes, the impact that information technology systems have on the way the company works, its relations with the finance community and its compliance with various standards.

Human Centered Assets: These are the assets which belong to the employees and contractors to the company, but which are used by the company in return for salaries and fees. (Brooking et al.: 97)

Bernadette Lynn breaks intellectual capital into three broader categories of human capital, relational capital, and structural capital.

> Human capital embraces all the skills and capabilities of the people who work in an organization. This is one of the critical assets in the IC group, since management of human capital often creates and sustains organizations' wealth. Relational capital, organizations' connections to its customers and suppliers, also creates value through loyalty, improved markets, speed and quality. Structural Capital is the backbone of the firm itself, its organizational tone and capabilities, including its management planning and control system, processes, networks, policies and even its culture. All of these help an organization create value. (Lynn: 00)

Edvinsson and Malone provide an even broader view of the components of intellectual capital. They divide intellectual capital into two categories: human capital and structural capital.

> *Human capital*: the combined knowledge, skill, innovativeness, and ability of the company's individual employees to meet the task at hand. It also includes the company's values, culture, and philosophy. Human Capital cannot be owned by the company.
>
> *Structural Capital*. The hardware, software, databases, organizational structure, patents, trademarks, and everything else of organizational capability that supports those employees' productivity-in a word,

> everything left at the office when employees go home. Structural capital also includes customer capital, the relationships developed with key customers. Unlike human capital, structural capital can be owned and thereby traded. (Edvinsson and Malone: 97)

Due to its simplicity and inclusion of all of the individual elements mentioned by the other authors, the Edvinsson and Malone description of intellectual capital will be used for the remainder of this research effort. With a definition of intellectual capital and a description of its categories now firmly established, the next question that must be answered is, what does intellectual capital have to do with Air Force supply officers?

Supply Officer Value

One challenge, identified during the Supply Professional Development IPT, that is critical to creating a more effective supply leader for the Air Force and DoD is to identify a means for "selling the value of a supply officer to others in the USAF" (McClellan: 00). To sell the value of supply officers, a value must first be established. So, what is the value of an Air Force supply officer?

"The worth of an Intel or Microsoft lies not in bricks and mortar, or even in inventories, but in another, intangible kind of asset: Intellectual Capital" (Edvinsson and Malone: 97). The true value of Air Force supply officers also lies in their intellectual capital, more specifically their human capital. What is the primary difference between officer categories such as maintenance officers, transportation officers, aircraft pilots, and flight surgeons? It is the special knowledge held by each of these individuals that distinguishes them. It is their application of this knowledge that gives them their value.

Generally speaking, none of the individuals serving in any officer position is more valuable than another officer. It is their knowledge and their ability to apply it that makes them valuable to the Air Force. To sell this value to others, the next step must be to identify the unique knowledge contributions by Air Force supply officers.

Identifying Intellectual Capital

Within the scope of this research, intellectual capital has been described as having two primary components: human capital and structural capital. The portion of intellectual capital of particular interest to this research is human capital. Human capital refers to the combined knowledge, skill, innovativeness, and ability of a company's individual employees to meet the task at hand; while structural capital is defined as the hardware, software, databases, organizational structure, patents, and trademarks. There are two reasons for focusing on human capital rather than structural capital. The first is the current emphasis in the civilian sector to better manage human capital and organizational knowledge. This area is also of particular interest to the sponsors of this research effort because these intangible assets have yet to be identified.

The second reason for focusing on human capital and not on structural capital is that the structural capital used by supply officers has been, or could easily be, identified. Remember that structural capital consists of things owned by the organization such as hardware, software, databases, and anything else left at the office when people go home. These items, especially in the Air Force, are strictly controlled and could easily be identified and assessed a value.

With the focus on human capital or intellectual capital established, what is the first step to identifying the human capital? Dr. Jay Liebowitz identifies the knowledge audit as a critical part of a knowledge management methodology. (Liebowitz: 99)

> One of the critical first steps in the knowledge management area is to conduct a knowledge audit. Some people view the knowledge audit as being the business needs assessment, cultural assessment, and an examination of what knowledge is needed, available, missing, applied, and contained. In the same manner that a manufacturing company will first inventory its assets, an aspiring "knowledge organization" should also inventory its intellectual capital assets. (Liebowitz et. al: 00)

Dr. Bernadette Lynn comments, "Human capital can be seen as an inventory of the skill sets and knowledge within an organization" (Lynn: 00). The knowledge audit can serve as this inventory and help to identify the human capital of an organization.

Knowledge Analysis Methods

Karl Wiig defines a knowledge audit as a survey and characterization of the status of knowledge in an organization (Wiig: 95). In his book, *Knowledge Management Methods, Practical Approaches to Managing Knowledge*, Wiig provides several methods for auditing, surveying, eliciting, analyzing, and modeling knowledge. Tables 1, 2, and 3, borrowed from his book, provide an overview of several of these methods. T he intent of his comparison and the inclusion of his comparison in this research effort is to provide an overview of some of the characteristics of each method. The characteristics discussed in each table include: what the method is used for, which further work it may support, what it provides, what the analysis is based upon, which other analysis methods it may rely upon, whether it can be considered a detail or overview method.

Table 1: Wiig's Overview Of Knowledge Analysis Methods

Overview of Selected Hands-On Methods

Knowledge Analysis Methods	Selected Features
Questionnaire-Based Knowledge Surveys	•Used to obtain broad overview of an operation's knowledge status –a "knowledge audit." •May support further KM work in almost any are •Provides responses from many areas and viewpoints categorized as finely as the initial questionnaire specifies •Analysis is based on completed responses •May also rely upon interviews to determine key areas of interest for questionnaire •Broad overview method
Middle Management Target Group Session	•Used to identify knowledge-related conditions that warrant management attention •May support CFKA, KFA, KBS programs, and other Knowledge Management (KM) initiatives •Provides brief descriptions, often priorities, of conditions •Analysis is based on managers *a priori* insights and visions •May rely on KOA •Broad overview method
Task Environment Analysis (TEA)	•Used to understand, often in great detail, which knowledge is present and the role it plays in the TBP. •May support preparing for other knowledge analyses and KBS developments •Explores and describes activities, tasks, artifacts, and culture including multi-dimensional relationships between these within the TBP and adjacent business processes. •Analysis is based upon observation, interviews, simulation •May rely or precede VPA, BKA, KMap, CFKA. •Knowledge acquisition and overview methodology
Verbal Protocol Analysis (VPA)	•Used to identify knowledge elements, fragments, and atoms •May support applications other knowledge analyses or development of KBS •Provides knowledge details such as production rules, concepts, perspectives, analyses, decisions, judgments, and methodologies used to perform K-I tasks. •Analysis is based on verbal protocols produced while workers undertake complex tasks •May rely on TEA •Detailed knowledge acquisition methodology.

Table 2: Wiig's Overview of Knowledge Analysis Methods

Overview of Selected Hands-On Methods

Knowledge Analysis Methods	Selected Features
Basic Knowledge Analysis (BKA)	•Used to identify aggregated or more detailed knowledge down to knowledge atoms. Knowledge can be reference cases, production rules, or in other representations. •May support BPR or development of KBS applications. •Elicits, analyzes, and describes (models) expert or KW knowledge •Analysis based on observation, interviews, simulation •May rely upon TEA, VPA, KMap, CFKA •Detailed and broad knowledge acquisition methodology
Knowledge Mapping (KMap)	•Used to develop concept maps as hierarchies or nets •May support KS&P, BKA, etc. •Provides highly developed procedure to elicit and document concept maps from KWs, particularly experts and masters •Analysis is based on interactive work session/interviews & self-elicitation •Broad knowledge acquisition methodology
Critical Knowledge Function Analysis (CFKA)	•Used to locate knowledge sensitive areas •May support finding needs for knowledge transfer, KBS applications, staff expansion, knowledge capture, BPR •Identifies and characterize areas of knowledge-related criticality, i.e. bottlenecks, vulnerable situations, opportunities, etc., that warrant management attention •Analysis is based on interviews, group sessions, manger introspection, survey results •May rely upon TEA, knowledge surveys •Knowledge overview methodology
Knowledge Use and Requirements Analysis (KURA)	•Used to identify how knowledge is used for business purposes and determine how situations can be improved •May support BPR, etc •Identifies how knowledge is required to perform quality work and how it is – or is not used by Knowledge Workers. •Analysis is based on •May rely upon TEA, BKA, KMap, CFKA, KS&P •Knowledge overview and acquisition methodology.

Table 3: Wiig's Overview of Knowledge Analysis Methods

Overview of Selected Hands-On Methods

Knowledge Analysis Methods	Selected Features
Knowledge Scripting and Profiling (KS&P)	•Used to identify details of K-I work is conducted and which role knowledge plays to deliver quality products •May support BPR, knowledge-transfer programs (including education) •Determines knowledge-intensive steps, activities, & scripts with associated concept hierarchies & proficiency profiles for performing specific business tasks. •Analysis is based on interviews, simulations, observations, interactive work sessions. •May rely upon TEA, BKA, KMap, KURA •Knowledge acquisition & overview methodology
Knowledge Flow Analysis (KFA)	•Used to gain overview of knowledge exchanges, losses, or inputs of the TBP or the whole enterprise •May sup[port BPR, KM initiatives •Determines characteristics, strengths, & weaknesses of existing and potential knowledge exchanges •Analysis is based on interviews, observations, examinations of available materials, etc. •May rely upon TEA, BKA, KURA, & surveys •Knowledge overview methodology
KADS-Object Analysis (KOA)	•Used to obtain overview of an enterprise's intelligent decision-making functions & knowledge required •May support gaining understanding of the enterprise's reliance on knowledge and which knowledge is used for particular business purposes •Characterizes & describes broad decision-making functions of the enterprise with focus on the TBP and its functions as intelligent objects. Also characterizes the knowledge involved in broad terms. •Analysis is based on interviews & interactive work sessions •May rely upon TEA, BKA, and surveys •Knowledge overview and acquisition methodology

Imported abbreviations in this table: TBP -- Target Business Process; KBS -- Knowledge Based System; BPR -- Business Process Redesign; KW -- Knowledge Worker; K-I – Knowledge-Intensive

Wiig does not limit the knowledge analysis methods to those just described. He points out that other more common research techniques, such as the Delphi technique for surveys, can also be used for knowledge analysis. The comparison above, although admittedly not an all-inclusive list, did serve as the primary source for method comparison. This comparison served as validation of the knowledge audit as the

appropriate first step for this research. As pointed out above, the questionnaire based knowledge surveys is used to obtain a broad overview of an operation's knowledge status, otherwise known as a knowledge audit. The knowledge audit supports further knowledge management work in almost any area. The analysis of a knowledge audit is based on completed responses and is considered a broad overview method. "Once these assets are recognized, their value can be cultivated and realized" (Edvinsson and Malone: 97). With the knowledge audit established as the initial step in identifying supply officer intellectual capital, the next question that must be answered is how to sell this intellectual capital to others in the Air Force. What value is the intellectual capital of an Air Force Supply officer to the rest of the Air Force?

Value of Intellectual Capital

The essence of intellectual capital is the observation that a company's tangible assets such as cash and inventory are, in most cases, far less valuable than its intangible assets such as skills, knowledge, and expertise. "Indeed the new source of wealth is not material, it is information, knowledge applied to work to create value" (Wriston: 92). Edvinsson and Malone suggest that perhaps the best way to appreciate the role of intellectual capital is metaphorically.

> If we picture a company as a living organism, say a tree, then what is described in organization charts, annual reports, quarterly statements, company brochures, and other documents is the trunk, branches and leaves. The smart investor scrutinizes this tree in search of ripe fruit to harvest
>
> But to assume that this is the entire tree because it represents everything immediately visible is obviously a mistake. Half the mass or more of that tree is underground in the root system. And whereas the flavor of the fruit and the color of the leaves provides evidence of how

> healthy that tree is right now, understanding what goes on in the roots is a far more effective way to learn how healthy that tree will be in the years to come. The rot or parasite just now appearing thirty feet underground may well kill that tree that today looks in the prime of health.
>
> That is what makes intellectual capital—the study of the roots of a company's value, the measurement of the hidden dynamic factors that underlie the visible company of buildings and products—so valuable. (Edvinsson and Malone: 97)

As evidenced by the previous discussion, there are various agreed upon means for identifying and mapping these *roots* (or an organization's knowledge or intellectual capital). There are also many methods available for measuring this intellectual capital. Several experts have authored reviews of the methods currently used to measure intellectual capital. An analysis of these reviews reveals a couple of common methods being used. However some seem more prevalent than others. Examples are Tobin's Q and the Skandia approach.

Tobin's Q is one of the simplest approaches. Tobin's Q was created by James Tobin. It is a ratio between the firm's market value and the replacement cost of the firm's physical assets. The firm's market value serves as the numerator and the replacement costs serve as the denominator. A high Q value suggests a significant level of intellectual capital. For example:

> Firms in the steel industry, noted for their large capital assets, have a Q ratio of nearly 1.00. This indicates the market mainly values the firm by the value of its replacement costs. Companies in the software industry, where intellectual capital is abundant, tend to have a Q ration of 7 or greater. These firms are not being valued by their buildings and equipment. (Wagner: 98)

How could one apply this to the Air Force? Although, replacement costs for many of the assets might be available, what is the market value of the Air

Force? There is no established market value for the Air Force, limiting the applicability of the model to measuring the Air Force's intellectual capital. Another alternative might be the Skandia approach.

Skandia is a large Swedish insurance company. Many authors consider Skandia the first company to develop a coherent method for measuring intellectual capital (IC). Skandia began by developing its own definition for intellectual capital.

> Intellectual Capital is the possession of the knowledge, applied experience, organizational technology, customer relationships and professional skills that provide Skandia with a competitive edge in the market. (Edvinsson and Malone: 97)

Based on this definition, Skandia asserted that the value of their intellectual capital was the extent to which these intangible assets could be converted into financial returns for their company.

This recognition of the contribution of Intellectual Capital to the company's value led Skandia to develop its first IC report in 1985. Skandia became the first company to issue an Intellectual Capital addendum accompanying its traditional financial report to shareholders in 1994 (Bontis: 00). This intellectual supplement is called Skandia's Business Navigator (Wagner: 98). "The report uses up to 91 intellectual capital metrics plus 73 traditional metrics to measure the five areas that make up the Navigator model" (Bontis: 00). This model looks at five major areas: financial focus, customer focus, process focus, renewal and development focus, and human focus. Table 4 summarizes some of the metrics within each category.

Table 4: Example of Skandia Measures

Sample of Skandia IC Measures

Financial Focus	•Revenues / Employee ($) •Revenues from new customers / total revenue ($) •Profits resulting from new business operations ($)
Customer Focus	•Days spent visiting customers (#) •Ratio of sales contacts to sales closed (%) •Number of Customers gained versus lost (%)
Process Focus	•PCs / Employee (#) •IT Capacity – CPU (#) •Processing Time (#)
Renewal and Development Focus	•Satisfied employee index •Training Expense / Administrative Expense (%) •Average age of patents (#)
Human Focus	•Managers with advanced degrees (%) •Annual Turnover of Staff (%) •Leadership index (%)

Skandia's efforts to measure its companies are noteworthy and have encouraged others to attempt to do the same. However, Scandia's model does not assign a dollar value to its intellectual capital (Bontis: 00). As shown in the chart above, many of the measures were in percentages or simple numbers.

Air Force Major Thomas Wagner developed a similar model. He developed a model for measuring US Air Force Human Intellectual Capital. As Figure 2 demonstrates, his model measures human capital based on potential, growth renewal, and efficiency. His model represents the only model identified during this research available for measuring Air Force Human Intellectual Capital.

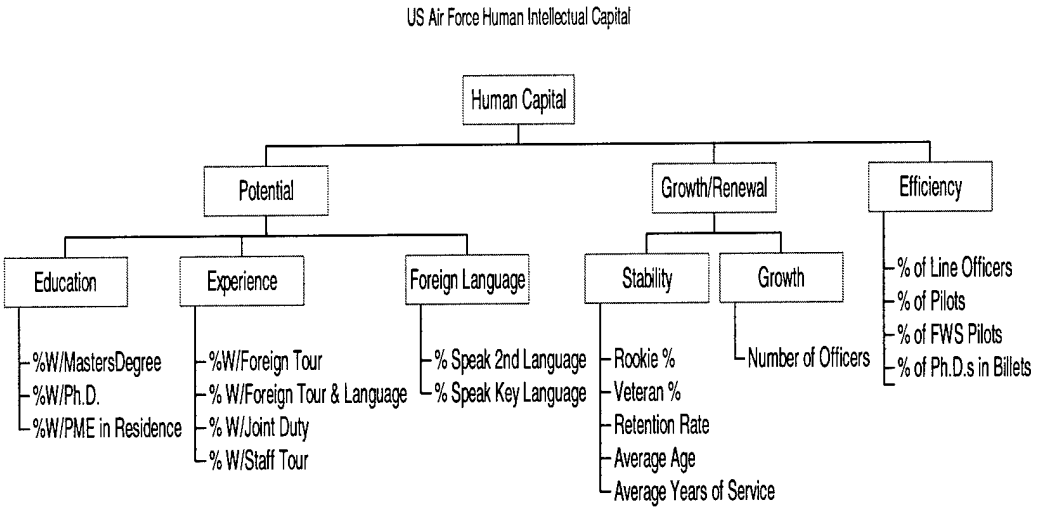

Figure 2: Wagner's Human Intellectual Capital Model

In a more focused effort, such as this one, Maj. Wagner's model does not provide an appropriate level of detail. His model provides an effective yet general measure of human intellectual capital. Even in his recommendations for additional research, he suggests, "Future research on intellectual capital in the Air Force might begin with different methods for deciding exactly what is important to the Air Force, and, therefore, what exactly should be measured" (Wagner: 98).

The measurement and value of supply officer intellectual capital must be one related to its contribution to the Air Force's mission. One that identifies the unique intellectual contribution of Air Force supply officers.

Chapter Summary

Air Force Supply officers must carry out a wide range of responsibilities. The rapidly changing environment in which these responsibilities must be carried out

complicate the process. Knowledge management is a rapidly growing field within the civilian sector and offers a methodology which will help supply officers carry out their responsibilities.

To take advantage of the many tools available within the realm of knowledge management, the groundwork must first be laid. In this case, the groundwork consists of identifying the knowledge required by one to carry out his or her responsibility as an Air Force supply officer. Literature suggests that the best method for identifying this knowledge is through the use of a knowledge audit. Once this needed knowledge is identified, additional analysis can be accomplished.

The next step should be to determine how much of the needed knowledge exists. This knowledge held by each supply officer represents an intangible asset. Value created by this asset is known as intellectual capital. As with all other forms of assets, leaders and managers want to be able to measure and place a value on this capital.

There are several methods for measuring intellectual capital. Some of these methods are well known, while others are closely held organization secrets. Most of the methods have little relevance to the supply officer career field. It is posited by this researcher that the most appropriate method for measuring the value of supply officer intellectual capital must be one that measures *how the knowledge of Air Force supply officers contributes to the accomplishment of the Air Force mission.* But before a measure of intellectual capital can be developed, supply officer knowledge must first be identified. Chapter III describes the methodology proposed to identify supply officer knowledge.

III. Methodology

Introduction

The problem of assessing a value to Air Force supply officers is not a simple process. Before a value can be assessed to supply officers, their intellectual capital must be identified. To identify supply officer intellectual capital, the unique knowledge of supply officers must first be identified and identification of this unique knowledge must be preceded by the identification of supply knowledge. This process is depicted in the figure below. This figure presents a methodology, which could result in the ability to sell the value of supply officers to others.

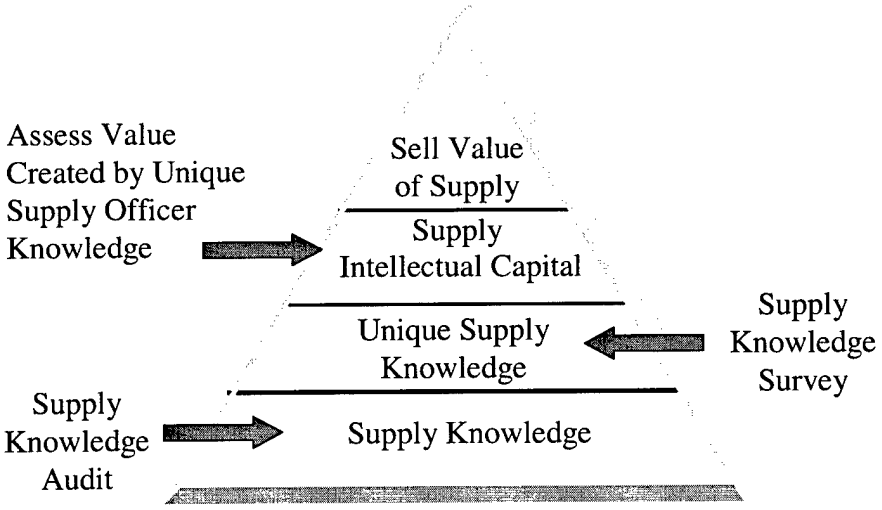

Figure 3: Proposed Methodology

This chapter describes the methodology used in developing the survey instrument. The methodology used to develop the survey instrument consisted of several phases.

Each of these phases will now be discussed in greater detail. Discussion of these phases will provide the reader information on the knowledge audit process used for identification of knowledge categories for use in the survey, justification for using the survey approach for identifying unique supply knowledge, and the development of the survey instrument.

Identification of Knowledge Categories

The first step in developing the survey instrument was to identify mandatory supply knowledge categories. These mandatory supply knowledge categories served as the source from which survey questions could be drawn. The sources for these mandatory supply knowledge categories were official Air Force guidance and structured interviews with active duty Air Force supply officers. The actual identification of knowledge categories for use in the survey was a multi-step process.

Official Guidance. The process began with a review of pertinent Air Force regulatory guidance, in this case, Air Force Manual 36-2105, Officer Classification. AFMAN 36-2105 provides a description of each Air Force officer career field. This description is divided into the categories: specialty summary, duties and responsibilities, and specialty qualifications. The specialty qualifications category is further broken down into four subcategories: knowledge, education, training, and experience. The subcategory of primary interest to this research is the knowledge category. This category lists the knowledge, which is considered mandatory for an officer within a particular career field. The following excerpt from AFMAN 36-2105, Attachment 6, section 3.1 describes the knowledge considered mandatory for Air Force supply officers.

> Knowledge is mandatory of: wholesale supply operations; retail supply and fuels organizations capabilities, limitations, and technical

characteristics; supply policies, procedures, and doctrine; interrelationships of other logistic disciplines; procedures for operating budget preparation, supply data systems, properties and characteristics of petroleum products, propellants, gases, and oxidizers; and U.S. Air Force operations and organizations.

From this statement of mandatory knowledge, the following eight knowledge categories were developed: Wholesale Supply Operations; Retail Supply Operations; Supply Policies, Procedures, and Doctrine; Budget Preparation; Supply Data Systems; Fuels Organization/Operations; Interrelationships With Other Disciplines; and USAF Operations and Organizations. These categories represent the institutional belief regarding the mandatory knowledge needed by Air Force supply officers to accomplish their job. The next phase of the research focused on validating these categories.

Questionnaire Development. The validation of these knowledge categories was conducted using a knowledge audit questionnaire. As referenced in the previous chapter, the knowledge audit is one of the critical first steps in the knowledge management area and is often viewed as being an examination of what knowledge is needed (Liebowitz et. al: 00). The knowledge audit questionnaire used in this research effort was derived from a knowledge audit described in a previously-cited article by Liebowitz et al. In this article, the authors describe a knowledge audit questionnaire used when evaluating a small behavior health care organization in Maryland. The key question asked of organizational members under study was to list specifically the categories of knowledge they needed to do their job.

This type of open-ended question is useful in researching relatively new areas. Salant and Dillman (1998) point out that "open-ended questions are an excellent means of preparing to do a survey." However, they also point out that open-ended questions

have several drawbacks. One of these drawbacks is that open-ended questions often times result in only a few mentions of any one topic. To address this drawback, the question of what knowledge categories individuals need to do their job was expanded into four slightly narrower questions. The following questions were used:

1. List specifically the types of management knowledge you need to do your job.
2. List specifically the types of organizational knowledge you need to do your job
3. List specifically the type of technical supply knowledge you need to do your job
4. List specifically any other types of knowledge you need to do your job.

Again the purpose of expanding the single question into these four questions was to elicit a greater number of responses.

These four questions served as the foundation for the knowledge audit questionnaire. These questions along with five general demographic style questions constituted the entire questionnaire. The questionnaire also included definitions relating to the four knowledge related questions. The purpose of including the definitions was to provide a consistent explanation to all participants and remove any bias on the part of the researcher during the research process. The following definitions were provided in the questionnaire.

> **Knowledge**: Knowledge is the fact of knowing something with familiarity gained through experience or association.
>
> **Organizational Knowledge**: Knowledge related to the overall structure of an organization and the relationships between the elements of that organization.
>
> **Management Knowledge**: Knowledge related to the management of organizations' resources such as personnel and materials.

Technical Supply Knowledge: Specific supply knowledge needed to carry out the job of an Air Force supply officer.

These definitions and the questions discussed previously along with general directions and a description of the purpose of the questionnaire constitute the questionnaire used in this research effort. A complete copy of the questionnaire is available in Appendix A.

Questionnaire Participants. Upon completion of the questionnaire, the next step was to identify participants for the face-to-face interviews. Since the intent of the questionnaire was to validate the already existing required knowledge categories, the decision was made to use a small sample of active duty supply officers. This decision was made with the understanding that if the results of the questionnaires suggested categories other than those put forth by Air Force guidance, additional participants could be identified to validate these new categories. No additional interviews were necessary.

The agreed upon sample size was 20 active duty Air Force supply officers. Furthermore, it was decided that these 20 officers should be representative of the ranks and general experience of current active duty supply officers. Therefore, participants were sought in each of four categories. The categories were: company grade officers with retail supply experience, field grade officers with retail supply experience, company grade officers with wholesale supply experience, and field grade officers with wholesale supply experience. Attempts were also made to include individuals with fuels experience within these categories.

Potential participants were identified from a list provided by the Air Force Personnel Center (HQ AFPC). This list included all supply officers stationed at several selected Air Force Bases. The bases included Wright-Patterson Air Force Base in Ohio, Robins Air Force Base in Georgia, Hill Air Force Base in Utah, Tinker Air Force Base in Oklahoma, Langley Air Force Base in Virginia, Randolph Air Force Base in Texas, Scott Air Force Base in Illinois, and the Defense Logistics Agency in Virginia. The base of primary interest was Wright Patterson, because it is home of the Air Force Institute of Technology and host to a large population of supply officers. These factors significantly reduced the workload and cost associated with conducting the face-to-face interviews. However, the required sample size of 20 interviews could not be completed from among the officers assigned to Wright Patterson Air Force Base alone.

While identifying participants, difficulty arose in locating company grade and field grade officers with wholesale experience. Therefore, to meet the sample size, experience, and rank requirements discussed earlier, not all of the interviews were conducted face-to-face. Four of the interviews, two from the company grade wholesale experience category and two from the field grade wholesale experience category, were conducted via email. The same questionnaire that was used in the face-to-face interviews was used for these interviews. The questionnaire was forwarded to the individuals after telephone contact with each participant. The telephone contact consisted of a general discussion explaining the nature and purpose of the research as well as the details of the questionnaire. Each of the participants was asked to complete the survey and return it via email.

Questionnaire Analysis. Upon completion of all of the face-to-face interviews and receipt of all of the emailed questionnaires, each was analyzed. The analysis was conducted using content analysis. After research and discussion with faculty advisors it was determined that there is no exact methodology for applying content analysis. However, there was a desire to establish some structure for the analysis. Therefore, the content analysis of the questionnaire data was conducted using the basic steps described in the content analysis section of the Colorado State University Writing Reference Center. This section contained eight steps.

The first step is to decide upon the level of analysis. This refers to whether or not the questionnaire data would be analyzed based on a single word or for sets of words or phrases. In this analysis, both words and phrases were coded.

The second step requires a determination of how many concepts to code for. This refers to whether or not the results will be analyzed for every word that was mentioned or just those that were determined applicable to the research. In this research effort, only those topics found to be related to the research were included. For example, topics that arose during the course of the face-to-face interviews such as family and individual career goals of the researcher and interviewee were not included.

This step also requires the researcher to determine whether or not only those topics relating to a set of predetermined categories would be accepted or whether new categories would be allowed to develop. With the intent of the questionnaires being to validate the official knowledge categories, the analysis was not limited to only those preexisting categories. New categories were allowed to develop.

The third step requires a decision as to whether the topics will be categorized by frequency or by existence. Analyzing for existence means only counting a topic once, regardless of how many times it was mentioned. Analyzing for frequency means not only counting a topic when it was mentioned, but recording the number of times it was recorded. According to the Colorado State reference, analyzing the data based on frequency might allow one to identify trends or an emphasis on a particular topic. The analysis conducted for this research counted topics based on both frequency and existence. However, the final determination of categories was based solely on existence.

The reason for using the existence data for final category determination was based on observations by the researcher. During the interviews, many of the topics mentioned more than once by the same interviewee, did not appear to be a result of emphasis. Rather, the multiple mentioning of topics was a result of individual interviewee mannerisms and habits.

The fourth step requires the researcher to decide on the level of generalization. This refers to whether or not the concepts must be recorded exactly as they appear, or if they can be recorded as the same even when they appear in different forms. In this research, both approaches were used. Initially, attempts were made to record the data with little adjustment to the exact words. In subsequent analysis, each of the categories was compressed. During this compression phase, related topics were recorded under a broader category heading.

The fifth step is to develop rules for analyzing texts. This refers to establishing rules so that the researcher is analyzing the data in a way that will allow for the information to be streamlined and organized for exactly the purpose intended. In this

research effort, each topic was recorded under one of the general categories derived from the Air Force guidance, with little alteration or streamlining of the responses. Those topics that were relevant, but did not fall within one of the preexisting categories were recorded so that they could be categorized at a later date. After the completion of the analysis, all of the responses were evaluated to determine if they were appropriately recorded under the correct category. At this time, new categories were also created to accommodate those responses that fell outside of the preexisting categories. Once all of the responses were properly recorded and categorized under one of the larger categories, similar items were then compressed into single response topics. This process allowed for the retention of the existence count and condensing of the number of responses.

The sixth step requires a determination as to the disposition of irrelevant information. For example, the researcher must decide whether or not to code irrelevant words such as *the* and *and*. As mentioned previously, only those topics related to the research, were recorded.

The seventh step involves the actual analysis of the data. This step was conducted by hand, according to the steps just discussed. Each of the completed questionnaires was analyzed and the results documented in a Microsoft Excel spreadsheet like the example shown in Figure 4.

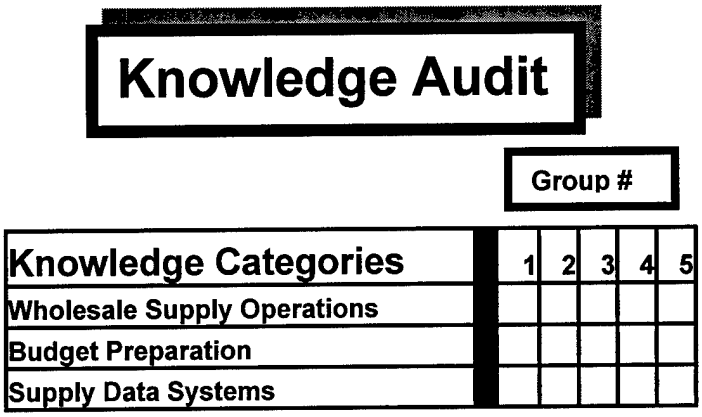

Figure 4: Sample Excel Spreadsheet

The above spreadsheet was used in the following way. The preexisting categories were loaded into the cells labeled Knowledge categories. The group label was used to identify each of the interviews within that group. As each questionnaire was analyzed, a number one was entered into a cell directly below its number designation and directly across from the appropriate category. If the category was mentioned more than once by the same interviewee, then the number of times the category was mentioned was entered rather than a number one. As the analysis progressed, additional categories were added to the knowledge category column when the interviewee mentioned a new category of required knowledge. This frequency spreadsheet was then converted to show the responses based upon existence. This conversion was accomplished by simply changing all of the cells containing a number other than one to a number one.

The eighth step, analyzing results, will be discussed in greater detail during the next chapter. There the results of the analysis will be presented. The analysis was

necessary to identify mandatory supply knowledge for use in the development of the survey instrument.

Survey Justification

At this point it is necessary to justify the selection of a survey instrument as the methodology chosen to measure unique supply officer knowledge. The initial part of this research effort was focused on identifying those knowledge categories deemed mandatory by Air Force guidance and supply officers currently serving in the career field. With the categories in hand, a survey instrument can be used to measure the perceived level of knowledge of survey participants within each of these categories as well as how important each survey participant feels specific knowledge categories are to them in the accomplishment of their job.

Building on this premise, an instrument capable of measuring the portion of a population, which contains these unique supply knowledge categories, would indeed provide a means for determining the value of that group as it relates to the measured knowledge categories. According to Salant and Dillman, there is only one appropriate method for providing this measurement. "If your goal is to find out what percentage of some population has a particular attribute or opinion, and the information is not available from secondary sources, then survey research is the only appropriate method" (Salant and Dillman: 94). In this case there is no information from secondary courses.

Another factor supporting the use of a survey is the demographics of the desired population. Air Force logistics officers are located all around the world. The instrument selected must be capable of reaching a representative sample of all of these officers.

Considering time, cost, and manpower issues, the mail survey presents itself as the best research instrument.

Once the survey is completed, the results will provide insight into the unique knowledge of Air Force supply officers. Those that desire this unique knowledge determine the true value of the knowledge. "The value of intellectual property is in its use, not in its costs. This means that it is only worth what a customer is willing to pay for it" (Strassman: 99).

The value of the unique supply knowledge categories to the customers is not measured by this survey. However, the survey will identify those groups of officers that hold this unique knowledge. Therefore, the value assigned to the identified knowledge, by those who desire it, would be a portion of the intellectual capital assigned to those that possess that knowledge. Thus, this survey instrument provides a tool for use in assessing the value of supply officer knowledge and a partial statement as to the intellectual capital of Air Force supply officers.

Chapter Summary

A survey instrument was developed in order to identify the unique knowledge of Air Force Supply officers. The methodology used to develop the survey instrument consisted of several phases. Discussion of these phases provided the reader information on the process used for identification of knowledge categories for use in the survey, and justification for using the survey approach.

IV. Results and Analysis

Overview

This research began with the research objective of developing an instrument capable of identifying the unique knowledge of Air Force supply officers. This research is in support of a larger effort, which is to be able to sell the value of Air Force supply officers to others in the USAF.

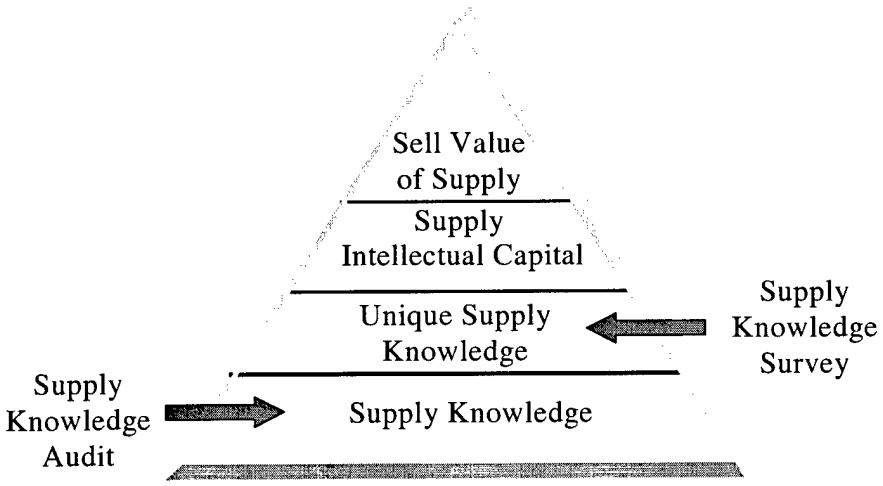

Figure 5: Methodology Progress

As illustrated by the Methodology Pyramid shown above, the identification of supply knowledge and the development of the supply knowledge survey provided the foundation for further research and the ultimate establishment and marketing of the value of Air Force supply officers to others in the Air Force.

Three investigative questions were used to guide the research: 1) What is intellectual capital 2) What knowledge do Air Force supply officers need, and 3) How

can Air Force supply officers' unique knowledge be identified. This chapter will describe the analysis and results from the research accomplished during efforts to answer these investigative questions.

What is Intellectual Capital?

The latter portion of Chapter II, Literature Review, provided an in-depth analysis of the definitions and components of intellectual capital. There intellectual capital was defined as the ultimate realization of data. As the figure below displays, intellectual capital is at the top of the data hierarchy.

The foundation of this hierarchy is data. Data is an unorganized set of discrete, objective facts. Data by itself provides no judgment or interpretation of events.

When data becomes organized or grouped, it becomes information. This grouping and organization of the data increases the depth and meaning to the users of the data. Still, information alone provides little judgment or interpretation of events.

Once information becomes meaningful and is put into productive use, knowledge is created. Knowledge is derived from information and experience. Once this knowledge is converted to something that has value, intellectual capital is created. This hierarchy is presented in Figure 6.

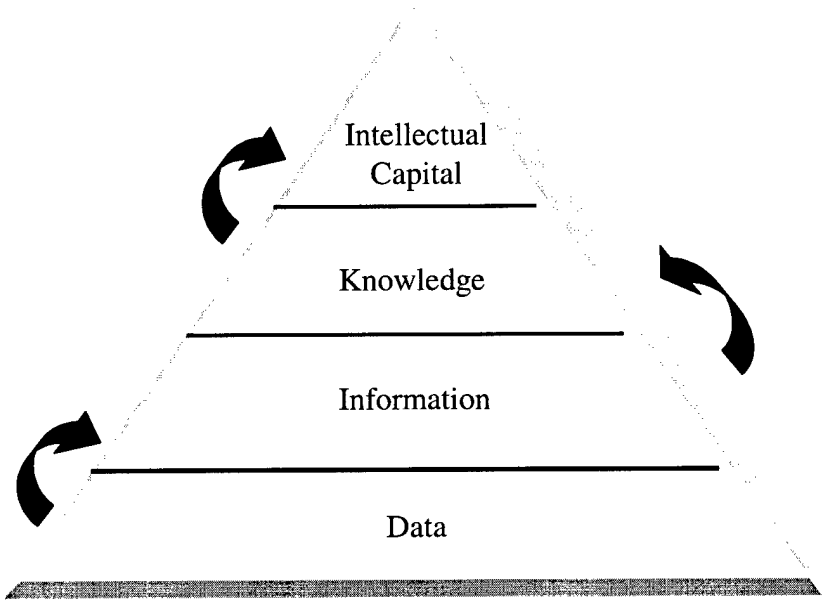

Figure 6: Data Hierarchy

Intellectual capital is more than data, information or even knowledge. Intellectual capital is the capturing and formalizing of all of these in a manner, which produces value. Intellectual capital is knowledge that creates value.

Intellectual capital can be further defined into two primary components. The two components of intellectual capital are structural capital and human capital. Structural capital refers to an organization's connections to its customers and suppliers, its patents, and its trademarks. Human capital refers to the knowledge, skill, and ability of the organizations members. Human capital is individual intellectual capital. It is the value created by the knowledge of the individuals within an organization. The exact value of the knowledge is situational.

The value of specific knowledge is similar to the value of any other consumer product. The market determines value. Those that desire specific knowledge determine the value of that knowledge. It follows then, that a determination of the value of intellectual capital must be preceded by the identification of specific knowledge. The next section is a detailed description of the result of the interviews conducted to identify the mandatory knowledge of Air Force supply officers.

What Knowledge Do Air Force Supply Officers Need?

As described in the previous chapter, the process of identifying mandatory supply knowledge began with a review of Air Force Manual 36-2105, Officer Classification. AFMAN 36-2105 provides a description of each Air Force officer career field. From this review, nine mandatory supply knowledge categories were developed. The eight categories were: Wholesale Supply Operations; Retail Supply Operations; Supply Policies, Procedures, and Doctrine; Budget Preparation; Supply Data Systems; Fuels Organization/Operations; Interrelationships With Other Disciplines; and USAF Operations and Organizations. These categories represent the institutional belief regarding the mandatory knowledge needed by Air Force supply officers to accomplish their job. To validate these categories, responses from the knowledge audit were analyzed using the process described in Chapter III (Methodology).

The twenty questionnaires provided a total of 614 individual responses. Each of these responses was then assigned to the most appropriate one of the supply knowledge categories established above. However, there were several responses that seemed incompatible with the pre-established categories. Therefore, three additional supply

knowledge categories were created to accommodate these additional responses. The following three new knowledge categories were created: Personnel Issues; How to Lead People; and Big Picture/Complete Supply Chain.

In hindsight, none of these three categories is surprising. Air Force supply officers are officers first, and should know how to lead and motivate people. Supply officers are also expected to manage people and need knowledge of personnel issues to be effective managers. An apparent area of growing importance is an understanding of the complete supply chain. Again this should come as no surprise considering the current emphasis on improving efficiency and effectives of Air Force logistics processes.

Many of the responses assigned to the eleven categories were very detailed while others were very general. Some of the responses were duplications of other responses. Therefore each of the topics was reevaluated. This evaluation resulted in the generalization and grouping of the original 614 individual responses into 49 sub-categories within the eleven knowledge categories. These sub-categories provide greater insight into required supply knowledge and provided the basis for the development of survey questions.

Wholesale Supply Operations. Based on their responses, supply officers agree that knowledge of wholesale supply operations is required supply knowledge. Their responses validate official Air Force guidance, which deems knowledge of wholesale supply operations mandatory knowledge for supply officers. There were a total of 34 responses. These 34 responses fell into one of three wholesale supply knowledge sub-categories. The three knowledge sub-categories within the wholesale supply operations category are: general wholesale supply functions; wholesale part distribution; and

retrograde/repair process. These three sub-categories provide additional insight into the type of wholesale supply operations knowledge Air Force supply officers need to do their job.

Table 5: Wholesale Supply Operations Knowledge Category

Wholesale Supply Operations
General Wholesale Supply Functions
Wholesale Part Distribution
Retrograde/Repair Process

Retail Supply Operations. Based on their responses, supply officers agree that knowledge of retail supply operations is required supply knowledge. Their responses validate official Air Force guidance, which deems knowledge of retail supply operations mandatory knowledge for supply officers. There were a total of 77 responses. These 77 responses fell into one of five wholesale supply knowledge sub-categories. The five knowledge sub-categories within the retail supply operations category are: base supply support; KITS; supply flight responsibilities; sources of supply; and quality measurements and metrics. These five sub-categories provide additional insight into the types of retail supply operations knowledge Air Force supply officers need to do their job.

Table 6: Retail Supply Operations Knowledge Category

Retail Supply Operations
Base Supply Support
KITS
Supply Flight Responsibilities
Sources of Supply
Quality Measurements/Metrics

Supply Policies, Procedures, and Doctrine. Based on their responses, supply officers agree that knowledge of supply policies, procedures, and doctrine is required supply knowledge. Their responses validate official Air Force guidance, which deems knowledge of supply policies, procedures, and doctrine mandatory knowledge for supply officers. There were a total of 77 responses. These 77 responses fell into one of five supply policies, procedures, and doctrine knowledge sub-categories. The five knowledge sub-categories are: regulations, policies, procedures, and doctrine; terminology and processes; MICAPS; demand and safety level calculation; and environmental practices. These five sub-categories provide additional insight into the types of supply policy, procedure, and doctrine knowledge Air Force supply officers need to do their job.

Table 7: Supply Policy, Procedure and Doctrine Knowledge Category

Supply Policy, Procedure, and Doctrine
Regulations, Policies, Procedures, Doctrine
Terminology and Processes
Mission Capable (MICAPS)
Demand Forecasting/Safety Levels (Wholesale/Retail)
Environmental Policies and Procedures

Interrelationships With Other Disciplines. Based on their responses, supply officers agree that knowledge of supply's interrelationships with other disciplines is required supply knowledge. Their responses validate official Air Force guidance, which deems knowledge of supply's interrelationships with other disciplines mandatory knowledge for supply officers. There were a total of 73 responses. These 73 responses fell into one of seven knowledge sub-categories. The seven knowledge sub-categories within the interrelationship category are: relationships with base organizations; flight line

support; transportation support; customer service; contracting process; contractor oversight; and interactions with other services. These seven sub-categories provide additional insight into what Air Force supply officers need to know about the interrelationships of supply to accomplish their job.

Table 8: Supply Interrelationships Knowledge Category

Supply Interrelationships
Supply relationships with other base organizations - Logistics, Accounting and Finance, Civil Engineering Squadron,
Flight Line Support (Maintenance)
Transportation
Customer Service (Needs and Expectations)
Contracting Process
Contractor Oversight/Interaction
Interactions with other services

Budget Preparation. Based on their responses, supply officers agree that knowledge of budget preparation is required supply knowledge. Their responses validate official Air Force guidance, which deems knowledge of budget preparation mandatory knowledge for supply officers. There were a total of 20 responses. These 20 responses fell into one of three knowledge sub-categories. The three knowledge sub-categories within the budget preparation category are: general budget preparation; stock fund management; and the planning, programming, and budget system (PPBS). These three sub-categories provide additional insight into the types of budget preparation knowledge Air Force supply officers need to do their job.

Table 9: Budget Preparation Knowledge Category

Budget Preparation
General Budget Preparation
Stock Fund Management
Planning, Programming, and Budget Systems (PPBS)

Supply Data Systems. Based on their responses, supply officers agree that knowledge of supply data systems is required supply knowledge. Their responses validate official Air Force guidance, which deems knowledge of supply data systems mandatory knowledge for supply officers. There were a total of 63 responses. These 63 responses fell into one of four knowledge sub-categories. The four knowledge sub-categories within the supply data system category are: interaction of supply systems; standard base supply system (SBSS); wholesale supply systems; and basic computer knowledge (word processing, spreadsheets, internet, or EMAIL). These four sub-categories provide additional insight into the types of supply data system knowledge Air Force supply officers need to accomplish their job.

Table 10: Supply Data System Knowledge Category

Supply Data Systems
Interaction of Supply Systems
Standard Base Supply System
Wholesale Systems
Basic Computer Knowledge (Word Processing, Spreadsheets, Internet, or EMAIL)

Fuels Organization and Operations. Based on their responses, supply officers agree that knowledge of the fuels organization and operations is required supply knowledge. Their responses validate official Air Force guidance, which deems knowledge of the fuels organization and operations mandatory knowledge for supply officers. There were a total of 33 responses. These 33 responses fell into one of five knowledge sub-categories. The five knowledge sub-categories within the fuels category are: fuels operations; fuels accounting; pipeline and equipment characteristics; product characteristics; and fuels technical orders/regulations. These five sub-categories provide

additional insight into the types of fuels knowledge Air Force supply officers need to accomplish their job.

Table 11: Fuels Organization and Operations Knowledge Category

Fuels Organization and Operations
Fuels Operations
Fuels Accounting
Pipeline and Equipment Characteristics
Product Characteristics
Fuels TO's/Regulations

USAF Operations and Organizations. Based on their responses, supply officers agree that knowledge of Air Force operations and organizations is required supply knowledge. Their responses validate official Air Force guidance, which deems knowledge of the Air Force operations and organizations mandatory knowledge for supply officers. There were a total of 58 responses. These 58 responses fell into one of four knowledge sub-categories. The four knowledge sub-categories within the Air Force operations and organization category are: general Air Force operations and organization; mobility process; readiness process; and foreign military sales. These four sub-categories provide additional insight into the types of Air Force operational and organizational knowledge Air Force supply officers need to accomplish their job.

Table 12: USAF Operations and Organization Knowledge Category

USAF Operations and Organization
General USAF Operations and Organizations
Mobility Process
Readiness Process
Foreign Military Sales

Personnel Issues. This is the first of the three knowledge categories identified during the interview analysis. Based on their responses, supply officers agree that knowledge of Air Force personnel issues is required supply knowledge. There were a total of 96 responses. This represents the largest number of responses received by any knowledge category. These 96 responses fell into one of eight knowledge sub-categories. The eight knowledge sub-categories within the personnel category are: general personnel issues; training and education; enlisted and officer promotion reports; award and decorations; enlisted and officer promotion process; military discipline actions; use of the unit manning document; and civilian personnel actions. These eight sub-categories provide additional insight into the types of personnel knowledge Air Force supply officers need to accomplish their job.

Table 13: Personnel Issues Knowledge Category

Personnel Issues
General Personnel Issues
Required Professional Military Education and Training (Officer and Enlisted)
Enlisted and Officer Performance Reports
Air Force Awards and Decorations Program
Enlisted and Officer Promotion Systems
Uniform Code of Military Justice
Unit Manning Document
Civilian Personnel Relations

How to Lead People. This is the second of the three knowledge categories identified during the interview analysis. Based on their responses, supply officers agree that knowing how to lead people is required supply officer knowledge. There were a total of 56 responses. These 56 responses fell into one of three knowledge sub-categories. The three knowledge sub-categories within the personnel category are: principles of leadership; problem solving/program management; and communication skills. These three sub-categories provide additional insight into the types of leadership knowledge Air Force supply officers need to accomplish their job.

Table 14: Leadership Knowledge Category

Leadership
Principles of Leadership
Problem Solving/Program Management
Communication Skills

Big Picture/Complete Supply Chain. This is the third and smallest of the three new knowledge categories identified during the interview analysis. Based on their responses, supply officers agree that having a *big picture* understanding of Air Force and DoD supply chains and processes is required supply officer knowledge. There were a total of 27 responses. These 27 responses fell into one of two knowledge sub-categories. The two knowledge sub-categories within the supply chain category are: DoD logistics process/initiatives and the DoD acquisition process. These two sub-categories provide additional insight into the types of "Big Picture" knowledge Air Force supply officers need to accomplish their job.

Table 15: Big Picture/Supply Chain Knowledge Category

Big Picture/Complete Supply Chain
DoD Logistics Process and Initiatives
Acquisition Process

Section Summary. This analysis provided three key findings. First, it provides insight into the specific types of knowledge supply officers need within each of the larger categories. For example, the sub-category KITS provides a better understanding of what supply officers need to know than the larger category of retail supply operations alone.

Second, it validates the Air Force position relating to mandatory supply officer knowledge. Active duty Air Force supply officers concurred with the Air Force's position that supply officers need knowledge of wholesale supply operations; retail supply operations; supply policies, procedures, and doctrine; budget preparation; supply data systems; fuels organization /operations; interrelationships with other disciplines; and USAF operations and organizations.

Third, three new knowledge categories were found. Supply officers indicated that in addition to the knowledge categories listed above, they also need knowledge of personnel issues, and big picture/complete supply chain as well as how to lead people.

The three new constructs are new constructs in the theory of mandatory supply knowledge. These three new constructs along with the original eight categories combine to form a new theory. These new constructs combined with the existing constructs or categories build on the previous theory that mandatory knowledge for supply officers was found only in the eight original categories. It is the theory of this researcher that mandatory knowledge for Air Force Supply officers consists of the eleven knowledge categories identified as mandatory Air Force supply officer knowledge.

Table 16: Mandatory Supply Knowledge

MANDATORY SUPPLY OFFICER KNOWLEDGE
Wholesale Supply Operations
Retail Supply Operations
Supply Policy, Procedure, and Doctrine
Supply Interrelationships
Budget Preparation
Supply Data Systems
Fuels Organization and Operations
USAF Operations and Organization
Personnel Issues
Leadership
Big Picture/Complete Supply Chain

How Can Air Force Supply Officers' Unique Knowledge Be Identified?

The theory described above establishes a set of knowledge categories. The combination of these knowledge categories constitutes mandatory supply officer knowledge. The next portion of this research was the development of an instrument to determine the portion of this knowledge that is unique to Air Force supply officers.

The survey was chosen as the best instrument for this task. Explanation and justification for this choice were provided in Chapter III (Methodology). The remainder of this section details the construction and testing of the survey instrument.

To identify unique supply knowledge, the survey will measure the perceived level of supply knowledge among Air Force logistics officers. The survey was constructed using the eleven supply officer knowledge categories and their respective sub-categories.

Question Development. The interview process provided valuable insight into each of the knowledge categories. This insight was captured through the creation of the knowledge sub-categories. Each of these sub-categories helped generate questions capable of measuring an individual's perceived knowledge of supply officer knowledge

categories. A question relating to each sub-category was used as a means to measure the major knowledge category. Posing additional questions or asking the question in multiple ways may have allowed for greater testing consistency, however it was feared that the resulting survey size would impact the number of potential respondents. The goals of this research are to identify unique supply knowledge and depends more on respondent rate than question consistency. Therefore, the respondent rate vs. consistency trade-off was considered acceptable. Also, consider that by asking a question for each sub-category, each major category is being measured by several questions. It is the measurement of these major categories that is the focus of this research.

The following tables illustrate the primary knowledge category being measured, and the questions associated with each sub-category. The sub-categories associated with each question are illustrated in the previous section. Tables showing the category to which each question is assigned can be found in Appendix B.

Table 17: Wholesale Supply Questions.

Wholesale Supply Operations
Functions of Air Logistic Centers and Defense Logistics Agency
Execution and Prioritization of Repair Support System (EXPRESS)
Depot Level Repair Process

Table 18: Retail Supply Questions

Retail Supply Operations
Depot Level Reparable (DLR) Stock Fund Concept
Establishment and Accounting of Kits and Spares Packages
Base Supply Structure and Flight Responsibilities
Potential Sources of Supply Items
Stockage Effectiveness Calculation and Meaning

Table 19: Supply Policy, Procedure, and Doctrine Questions

Supply Policies, Procedures, Doctrine
Air Force Manual 23-110, Supply Manual
Conducting Sample, Complete, and Special Inventories of Supplies and Equipment
Mission Capable (MICAP) Start, Stop, and Change Actions
Calculating Inventory and Safety Stock Levels
Procedures for the Receipt, Storage, and Handling of Hazardous Materials and Waste

Table 20: Interrelationships Questions

Interrelationships of Other Disciplines
Supply Relationships With Other Base Organizations - such as Logistics, Accounting and Finance, and Civil Engineering Squadron
Repair Cycle Support
Transportation Material Control Support
Priority Support Indicators (Priority Due-Outs and Priority Requisition Rate)
Local Purchase Process
Providing Contractor Oversight
Military Standard Requisitioning and Issue Procedures (MILSTRIP)

Table 21: Budget Preparation Questions

Budget Preparation
Annual Budget Preparation
Stock Fund Management
Planning, Programming, and Budget Systems (PPBS)

Table 22: Supply Data System Questions

Supply Data Systems
Standard Base Supply System's Major Base Level and Wholesale Interfaces
Standard Base Supply System
Wholesale And Retail Receiving And Shipping System (DO35K)
Basic Computer Operation (Word Processing, Spreadsheets, Internet, or EMAIL)

Table 23: Fuels Organization/Operations Questions

Fuels Organization/Operations
Fuels Management Structure and Responsibilities
DoD 4140.25M, DoD Management of Bulk Petroleum Products, Natural Gas, and Coal
Types of Fuel Hydrant Systems
Characteristics of Jet Fuels Used by the Air Force (JP-8, JP-8+100, and additives)
TO 42B-1-1, Quality Control of Fuels and Lubricants

Table 24: USAF Operations and Organization Questions

USAF Operations and Organizations
USAF Organizations and Chain of Command
Chemical Warfare Defense Equipment Management – (CWDE)
Air Expeditionary Force Concept (AEF)
Foreign Military Sales

Table 25: Personnel Issue Questions

Personnel Issues
Base Support Services
Required Professional Military Education and Training (Officer and Enlisted)
Enlisted and Officer Performance Reports
Air Force Awards and Decorations Program
Enlisted and Officer Promotion Systems
Uniform Code of Military Justice
Unit Manning Document
Civilian Personnel Relations

Table 26: How to Lead People Questions

How to Lead People
Principles of Leadership
Problem Solving Process
Fundamentals of Good Communication

Table 27: Big Picture/Complete Supply Chain Questions

Big Picture/Complete Supply Chain
Supply Chain Management Initiatives Such as Logistics Transformation, Seamless Supply and Lean Logistics)
DoD Acquisition Life Cycle

In some instances, participants were asked to rank their knowledge of the sub-category itself. While in other instances, an example related to the sub-category was used. This is due to the fact that some of the sub-categories represented specific aspects of supply and lent themselves to direct questioning. Some of the other sub-categories were more general. In the case of the general sub-categories, a more specific supply example of the general sub-category was used. Participants were asked to rate their perceived level of knowledge of each of the listed topics using a knowledge scale.

Scale Development. The questionnaire asked participants to rate their perceived level of knowledge relating to each of the topics using a five-point knowledge scale. Participants were asked to use the following scale:

1	**No Knowledge**	**Never heard of the topic**
2	**Little Knowledge**	**May have heard of the topic or read about it once or twice**
3	**Moderately Knowledgeable**	**Familiar with the topic – Would have difficulty explaining it to others**
4	**Very Knowledgeable**	**Familiar with the topic - Could explain it to others**
5	**Extremely Knowledgeable**	**Very familiar with the topic – Others seek your opinion on the topic**

Figure 7: Knowledge Scale

A second section of the survey asked each participant to assign a level of importance to each of the supply knowledge categories based on their need of the information accomplishment of their job. Although this is not the primary intent of the survey, all those involved in this research felt this measure of perceived importance could provide valuable insight into the results of the other survey section. Participants were asked to use the following scale to rate the level of importance of each knowledge category:

1	**Unimportant**	**Have never needed knowledge of this topic to do my job**
2	**Minor**	**Needed some knowledge of this topic once or twice to do my job**
3	**Important**	**Knowledge of this topic not mandatory to do my job but would enable me to perform my job better**
4	**Very Important**	**Use my knowledge of this topic frequently – lack of this knowledge would hinder the performance of my job**
5	**Critical**	**Could not perform my job without knowledge of this topic**

Figure 8: Importance Scale

Pilot Testing. The survey was pilot tested. The participants in the pilot test were fellow students in the AFIT GLM masters degree program. This group included supply, transportation, maintenance, and logistics plans officers. This provided a representative sample of the desired population of Air Force logistics officers. The intent of the pilot test was to identify any aspects of the survey that were unclear, redundant, misleading, or could possibly cause measurement error.

Order of Questions. Originally, the questions were randomly sorted. Feedback from the pilot test suggested that the random ordering of questions caused confusion. David Dooley suggests that questions on related topics should be clustered together to

alleviate confusion. He also suggests that the questions should be ordered in a manner that increases respondent cooperation. He suggests beginning with simple, more interesting questions to provide a smooth progression through the survey. (Dooley: 99) Considering this feedback, the questions assigned to each knowledge category appear in the survey grouped together.

Reliability and Validity. The use of a survey instrument raises concerns of validity and bias. Although all measurement error cannot be removed, attempts have been made to make this measurement as valid and reliable as possible.

"The most fundamental test of reliability is repeatability" (Alreck and Settle: 95). This concept of repeatability drove the question development methodology. The use of the sub-categories as sources of questions was not to measure the sub-categories. The goal of using the sub-categories was to ask several questions directly related to the construct of interest. In this case, the constructs under question were the primary knowledge categories. The use of these sub-categories provides the trait of repeatability.

The validity of the test was ensured through the use of validated supply knowledge categories as the source of all questions. This prevents extraneous factors from systematically "pushing or pulling" the responses in any one direction (Alreck and Settle: 95). Additional validity was added through the pilot testing process. This allowed for removal of extraneous factors that may have impacted the results.

Section Summary. The survey instrument just described provides a tool for identifying unique supply knowledge. Each supply knowledge category is represented by several questions. Each of these questions is linked to one of the sub-categories within each knowledge category. The survey instrument was pilot tested. Adjustments were

made to the survey instrument to incorporate this feedback. The final survey can be found in Appendix C.

Chapter Summary

This chapter provided a review of the research objective and the three investigative questions. It provided the results of the research conducted to answer each of these research questions. A definition of intellectual capital was provided. This included a discussion of the components of intellectual capital and of the data hierarchy. A new theory of mandatory supply officer knowledge was created. This new theory includes three previously unidentified constructs. Finally, this chapter discussed the process used to create a survey instrument for use in identifying unique supply officer knowledge. Efforts to pilot test the survey as well as efforts to ensure reliability and validity were presented.

V. Conclusions

This chapter reviews the importance of this research as well as the major issues covered during this research. The major findings of the literature are summarized. This is followed by a review of the results of efforts to identify mandatory supply officer knowledge and the development of a survey instrument to identify unique supply officer knowledge. The chapter ends with a statement as to the importance of this research as well as recommendations for future research relating to this topic.

Literature Review Findings

The literature review began by describing the Air Force supply officer. Air Force supply officers are one of a group of officers within the logistics officer core. Supply officers have a wide spectrum of responsibilities, but in general supply officers are responsible for ensuring the necessary supplies and fuel are available to meet Air Force mission requirements. Supply officers may be asked to perform these duties while serving in both retail and wholesale supply positions. This wide spectrum of responsibilities and potential positions means supply officers must be flexible and knowledgeable of many different aspect of their job. This is especially important in today's rapidly changing environment.

Today's supply officers must provide fuel and supply support in a state of nearly constant change. Today's supply officers face an environment full of outsourcing and privatization, regionalization, reengineering, and downsizing. This is complicated by the fact that these challenges must be met while at the same time adapting to the changing

threat environment. Efforts to transition to an Expeditionary Aerospace Force also provide special challenges to Air Force supply officers.

However, these types of challenges are not isolated to Air Force supply officers. Civilian companies face many of the same types of challenges. They are attempting to meet these challenges while maintaining a competitive advantage. One way these civilian companies are meeting this challenge is through the use of knowledge management and the management of intellectual capital. Civilian companies realize that a significant portion of the capital within their company resides within the individuals working in the company. These civilian managers recognize the value of knowledge and how the management of this knowledge can create value or intellectual capital for their organization.

Current efforts by senior Air Force supply leaders are focused on developing supply officers into future senior logistics leaders. Part of this effort focuses on selling the value of Air Force supply officers to others in the Air Force. The position taken during this research effort is that the value of Air force supply officers to others in the Air Force lies primarily in their intellectual capital.

The intellectual capital of Air Force supply officers is the value created by the unique knowledge they provide for the Air Force. This means that for one to establish a value to supply officers, they would have to know what knowledge these officers provide and the value created by that knowledge. This is no simple task and there are no exact methods available for identifying this value. This research established a methodology that, if followed, could provide a means for identifying the value of Air Force supply officers. The methodology was best illustrated using a pyramid.

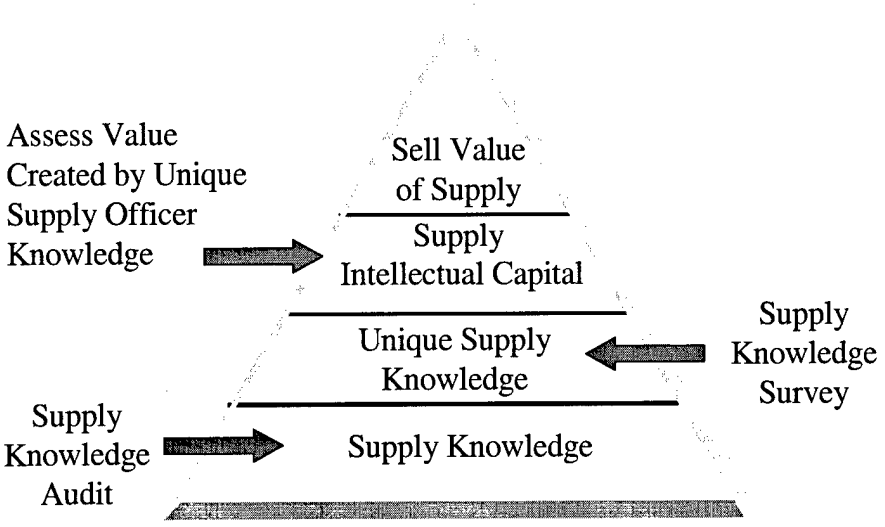

Figure 9: Restatement of Methodology

The pyramid provides a valuable illustration. The foundation of the research lies in identifying supply knowledge. After an understanding is gained as to the elements that form supply knowledge, efforts can begin to identify those portions of the supply knowledge that are unique to Air Force supply officers. This identification of unique knowledge is important. It provides insight into the unique contributions of supply officers to the Air Force mission. Once the unique contributions are known, a value could be assessed. After a value is assessed, supply intellectual capital can be realized. Once the supply intellectual capital is realized, senior leaders can sell the value of Air Force supply officers to others in the Air Force.

Mandatory Supply Knowledge

The first step in the methodology was to identify supply knowledge. This was done through the review of Air Force regulatory guidance and the use of a knowledge

audit. The review of regulatory guidance resulted in the identification of eight mandatory supply knowledge categories. The next step was to validate these supply knowledge categories.

The knowledge audit validated the eight categories and identified three additional categories. These additional categories were deemed valid and a new theory was created. The new theory is that mandatory supply knowledge consists of eleven constructs or knowledge categories, not eight. The eleven mandatory supply knowledge categories are: Wholesale Supply Operations; Retail Supply Operations; Supply Policies, Procedures, and Doctrine; Budget Preparation; Supply Data Systems; Fuels Organization /Operations; Interrelationships With Other Disciplines; USAF Operations and Organizations; Personnel Issues; How to Lead People; and Big Picture/Complete Supply Chain.

Table 28: Restatement of Mandatory Supply Knowledge Categories

MANDATORY SUPPLY OFFICER KNOWLEDGE
Wholesale Supply Operations
Retail Supply Operations
Supply Policy, Procedure, and Doctrine
Supply Interrelationships
Budget Preparation
Supply Data Systems
Fuels Organization and Operations
USAF Operations and Organization
Personnel Issues
Leadership
Big Picture/Complete Supply Chain

This combination of knowledge categories represents supply knowledge. The next step in the methodology is to identify the portion of this knowledge that is unique to supply officers.

Survey Development and Implementation

Using the supply knowledge categories, a survey instrument was developed to measure the portion of this combination of knowledge that was unique to supply officers. The development of the instrument was described in detail. The survey was pilot tested and modifications were made to the survey based on feedback from the pilot test participants.

The final survey contains a total of 71 questions. Eleven of the questions are demographic questions, designed to identify the career field and experience of the survey participant. The other 60 questions are divided into two sections. The first section contains 49 supply knowledge questions. Each of these 49 questions is assigned to one of 11 supply knowledge categories. Responses to these questions will provide the bulk of the survey results. The final 11 questions ask each participant to rate how important each of the supply knowledge categories are to the performance of their jobs.

According to the methodology presented in this thesis, the survey should be given to a large sample of Air Force logistics officers. This sample population should include an equal distribution of supply, maintenance, transportation, and logistics plans officers. The survey results from such a large sample of Air Force logistics officers will provide unique insight into the supply officer career field.

Results from the survey can be analyzed using statistical analysis. There are two ways in which the results can be analyzed. One can compare the mean response at the question level or at the category level.

By analyzing the results at the question level, one could identify differences in the level of very specific supply knowledge areas by career field. Although insightful, this

detailed level of information or analysis goes beyond the scope of this research and the intent of the survey. The individual questions are intended to be a measure of the mandatory supply categories. Therefore, the preferred method of comparison would be at the category level. This requires a comparison of each career fields' mean response in relation to the 11 supply knowledge categories. By comparing the differences between the mean category scores, one could determine whether or not there is a statistically significant difference in the perceived level of supply knowledge among the sampled career fields. Those categories in which supply officers demonstrate the greatest level of perceived knowledge represent unique supply knowledge.

Relevance of the Research

This research effort provides the foundation from which all other supply officer intellectual capital studies can build. A need for the study of supply officer capital was established. Current Air Force guidance and interviews with active duty supply officers were used to establish a theory relating to mandatory supply officer knowledge. Three new knowledge constructs relating to personnel issues, leadership, and supply chain management were developed. An instrument to measure the unique knowledge of supply officers was created and tested. Finally, a methodology was presented which, if followed, will allow for an assessment and marketing of the value of Air Force supply officers.

Recommendations for Future Research

A key result of this research effort was the creation of a methodology. The methodology presents a process by which a value could be assessed to Air Force supply

officer knowledge. The first step in this process was to identify supply knowledge. This was completed. The next step is to identify knowledge that is unique to Air Force supply officers. This research provides the instrument for use in the accomplishment of this step. The next step is to implement the survey and analyze its results.

Building on the results of the survey, additional research should focus on identifying the contributions of the unique knowledge. The contributions of the unique supply knowledge to the accomplishment of the Air Force mission would provide valuable insight into the value of unique supply officer knowledge and supply officers.

The survey instrument also provides additional opportunities for research. In-depth analysis of supply officer responses to the survey could provide insight into several areas within the supply officer community. Research could focus on the absence or level of supply knowledge categories within the supply community. This would provide valuable support for the creation of new training programs or the continuation or adjustment of existing training programs. Also, since knowledge can be gained in many different ways, additional research could focus on the methods by which specific supply knowledge is obtained.

Another recommendation would be to combine the supply knowledge categories developed in this thesis with the human intellectual capital model developed by Maj. Wagner. This model was discussed previously as a useful but general model. Inclusion of supply specific categories in Maj. Wagner's model could yield more comprehensive and useful results.

The final assessment of supply officer value to the Air Force will be one that demonstrates the value created by supply officer knowledge to the accomplishment of the

Air Force mission. The ultimate mission of the Air Force is to fly, fight, and win. What knowledge is needed to accomplish this mission? What portions of that knowledge reside only within Air Force supply officers? The value of Air Force supply officers lies within the answers to these questions.

The world of knowledge management presents a multitude of additional research opportunities. This research laid the foundation for all future knowledge research efforts within the supply officer community. The Air Force supply officer community is primed for this type of research. The challenges facing the supply officer community are real but the desire to overcome these challenges is strong. The continued study of supply knowledge and the value it creates is an important first step in meeting these challenges.

Appendix A: Supply Knowledge Content Questionnaire

Introduction:

The purpose of this interview is to collect data for use in a HQ ILS sponsored thesis project. The intent of the thesis effort is two fold. The initial effort is focused on determining whether or not there are specific categories of required knowledge within supply work. Your responses will provide the necessary data for this effort. The second part of the thesis focuses on developing a survey that will be used to establish a value for any categories of supply knowledge that might result from the analysis of the interview responses.

Your responses to these questions will be recorded solely for the purposes of completing the thesis effort just described. Neither your responses nor your personal information will be released to a third party.

Demographic Questions:

What is your name?

What is your rank?

What is you core AFSC?

What types of supply positions have you held: wholesale, retail, or both?

The following questions will provide the bulk of the data for this research effort.

When responding to the questions, please consider all supply officer positions you have held not just your current position.

The questions are intentionally vague and open-ended. Please answer the questions as thoroughly as possible based on your interpretation of the question.

If there are terms that are unfamiliar, please refer to the definitions provided on the last page. To avoid introducing any bias on my part, these are the only definitions that will be provided.

Knowledge Questions:

1. List specifically the types of management knowledge you need to do your job as a supply officer and examples if possible.

2. List specifically the types of organizational knowledge you need to do your job and examples if possible.

3. List specifically the types of technical supply knowledge you need to do your job and examples if possible.

4. List specifically any other types of knowledge you need to do your job and examples if possible.

Primary Definitions:

Knowledge: Knowledge is the fact of knowing something with familiarity gained through experience or association.

Organizational Knowledge: Knowledge related to the overall structure of an organization and the relationships between the elements of that organization.

Management Knowledge: Knowledge related to the management of an organization's resources such as personnel and materials.

Technical Supply Knowledge: Specific supply knowledge needed to carry out the job of an Air Force supply officer.

Secondary Definitions:

Data: a set of discrete, objective facts commonly seen in the structured records of transactions. Data is unorganized but consists of independent numbers, words, sounds, or images that can be easily be structured on machines, Data by itself, provides no judgment or interpretation of events.

Information: when data becomes organized, patterned, grouped, and or categorized; thus increasing depth of meaning to the receiver.

Appendix B: Knowledge Categories and Survey Questions

Knowledge Categories and Sub-Categories	Knowledge Categories and Assigned Survey Questions
Wholesale Supply Operations	***Wholesale Supply Operations***
General Wholesale Supply Functions	Functions of Air Logistic Centers and Defense Logistics Agency
Wholesale Part Distribution	Execution and Prioritization of Repair Support System (EXPRESS)
Retrograde/Repair Process	Depot Level Repair Process
Retail Supply Operations	***Retail Supply Operations***
Base Supply Support	Depot Level Reparable (DLR) Stock Fund Concept
KITS	Establishment and Accounting of KITS and Spares Packages
Supply Flight Responsibilities	Base Supply Structure and Flight Responsibilities
Sources of Parts	Potential Sources of Supply Items
Quality Measurements/Metrics	Stockage Effectiveness Calculation and Meaning
Supply Policies, Procedures, Doctrine	***Supply Policies, Procedures, Doctrine***
Regulations, Policies, Procedures,	Air Force Manual 23-110, Supply Manual
Terminology and Processes	Conducting Sample, Complete, and Special Inventories of Supplies and Equipment
MICAPS	Mission Capable (MICAP) start, stop, and change actions
Demand Forecasting/Safety Levels (Wholesale/Retail)	Calculating Inventory and Safety Stock Levels
Environmental Policies and Procedures	Procedures for the Receipt, Storage, and Handling of Hazardous Materials and Waste
Interrelationships of Other Disciplines	***Interrelationships of Other Disciplines***
Supply relationships With Other Base Organizations	Supply Relationships With Other Base organizations – (Such as Logistics, Accounting and Finance, and Civil Engineering Squadron)
Flight Line Support (maintenance)	Repair Cycle Support
Transportation	Transportation Material Control Support
Customer Service (Needs and Expectations)	Priority Support Indicators (Priority Due-Outs and Priority Requisition Rate)
Contracting Process	Local Purchase Process
Contractor Oversight/Interaction	Providing Contractor Oversight
Interactions With Other services	Military Standard Requisitioning and Issue Procedures (MILSTRIP)
Budget Preparation	***Budget Preparation***
General Budget Preparation	Annual Budget Preparation
Stock Fund Management	Stock Fund Management
Planning, Programming, and Budget Systems (PPBS)	Planning, Programming, and Budget Systems (PPBS)

Knowledge Categories and Sub-Categories	Knowledge Categories and Assigned Survey Questions
Supply Data Systems	***Supply Data Systems***
Interaction of Supply Systems	Standard Base Supply System's Major Base Level and Wholesale Interfaces
Standard Base Supply System	Standard Base Supply System
Wholesale Systems	Wholesale And Retail Receiving And Shipping System - D035K
Basic Computer Knowledge (Microsoft / Internet)	Basic Computer Operation (Word Processing, Spreadsheets, Internet, or EMAIL)
Fuels Organization/Operations	***Fuels Organization/Operations***
Fuels Operations	Fuels Management Structure and Responsibilities
Fuels Accounting Responsibilities	DoD 4140.25M, DoD Management of Bulk Petroleum Products, Natural Gas, and Coal
Pipeline and Equipment Characteristics	Types of Fuel Hydrant Systems
Product Characteristics	Characteristics of Jet Fuels used by the Air Force (JP-8, JP-8+100, and additives)
TO's/Regulations/Doctrine/Quality	TO 42B-1-1, Quality Control of Fuels and Lubricants
USAF Operations and Organizations	***USAF Operations and Organizations***
General USAF Operations and Organizations	USAF Organizations and Chain of Command
Mobility Process	CWDE - Chemical Warfare Defense Equipment Management
Readiness Process	Air Expeditionary Force
Foreign Military Sales	Foreign Military Sales
Personnel Issues	***Personnel Issues***
General Personnel Issues	Base Support Services
Training/Education	Required Professional Military Education and Training (Officer and Enlisted)
EPR's/OPR's	Enlisted and Officer Performance Reports
Decorations	Air Force Awards and Decorations Program
Enlisted/Officer Promotion Process	Enlisted and Officer Promotion Systems
Military Disciplinary Action	Uniform Code of Military Justice
How to read a UMD/Manpower Requirements	Unit Manning Document
Civilian Actions	Civilian Personnel Relations
How to Lead People	***How to Lead People***
Leadership	Principles of Leadership
Problem Solving/Program Management	Problem Solving Process
Communication Skills	Fundamentals of Good Communication
Big Picture/Complete Supply Chain	***Big Picture/Complete Supply Chain***
DoD Logistics Process/Initiatives	Supply Chain Management Initiatives Such as Logistics Transformation, Seamless Supply and Lean Logistics)
Acquisition Process/Program Office	DoD Acquisition Life Cycle

Appendix C: Supply Knowledge Survey

About the Study

Purpose: This purpose of this research effort is to identify unique supply knowledge.

Participation: You are one of several Air Force Logistics officers asked to participate in this research. Although you may not be a Supply officer, your answers are very important.

Confidentiality: All answers are anonymous. No identification of individual responses will occur. The demographic information requested will serve only as a means for interpreting the results more accurately.

Privacy Notice

In accordance with AFI 37-132, Paragraph 3.2, the following information is provided as required by the Privacy Act of 1974:

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

Purpose: To obtain information regarding the value of Air Force Supply officer intellectual capital. Surveys will be administered to Logistics officers of the USAF.

Routine Use: No analysis of individual responses will be conducted and only members of the research team will be permitted access to the raw data.

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

INSTRUCTIONS

This survey is designed to assess your knowledge level relating to a selected group of supply knowledge categories. All items must be answered by circling your response for each of the survey questions. If, for any item, you do not find a response that fits your situation exactly, use the one that is the closest to the way you feel.

The following definitions will be used throughout this survey:
Knowledge: the fact of knowing something with familiarity gained through experience or association.
Important: strongly affecting the course of events or the nature of things; significant

SECTION 1: General Knowledge Level:

Please rate the following series of questions *based on your perceived knowledge level of each category.* Please use the rating scale below and circle your answer.

Scale definitions:

1	**No Knowledge**	**Never heard of the topic**
2	**Little Knowledge**	**May have heard of the topic or read about it once or twice**
3	**Moderately Knowledgeable**	**Familiar with the topic – Would have difficulty explaining it to others**
4	**Very Knowledgeable**	**Familiar with the topic - Could explain it to others**
5	**Extremely Knowledgeable**	**Very familiar with the topic – Others seek your opinion on the topic**

Available Base Support Services (Family Support, Chaplain)	1	2	3	4	5
Required Professional Military Education and Training (Officer and Enlisted)	1	2	3	4	5
Enlisted and Officer Performance Reports	1	2	3	4	5
Air Force Awards and Decorations Program	1	2	3	4	5
Enlisted and Officer Promotion Systems	1	2	3	4	5
Uniform Code of Military Justice	1	2	3	4	5
Unit Manning Document	1	2	3	4	5
Civilian Personnel Relations	1	2	3	4	5
Principles of Leadership	1	2	3	4	5
Problem Solving Process	1	2	3	4	5
Fundamentals of Good Communication	1	2	3	4	5
Supply Chain Management Initiatives such as Logistics Transformation, Seamless Supply and Lean Logistics)	1	2	3	4	5
DoD Acquisition Life Cycle	1	2	3	4	5
USAF Organizations and Chain of Command	1	2	3	4	5
Chemical Warfare Defense Equipment Management	1	2	3	4	5
Air Expeditionary Force	1	2	3	4	5
Foreign Military Sales	1	2	3	4	5
Annual Budget Preparation	1	2	3	4	5

Stock Fund Management	1	2	3	4	5
Planning, Programming, and Budget Systems (PPBS)	1	2	3	4	5
Supply relationships with other base organizations - such as Logistics, Accounting and Finance, and Civil Engineering Squadron	1	2	3	4	5
Repair Cycle Support	1	2	3	4	5
Transportation Material Control Support	1	2	3	4	5
Priority Support Indicators (Priority Due-Outs and Priority Requisition Rate)	1	2	3	4	5
Local Purchase Process	1	2	3	4	5
Providing Contractor Oversight	1	2	3	4	5
Military Standard Requisitioning and Issue Procedures (MILSTRIP)	1	2	3	4	5
Functions of Air Logistic Centers and Defense Logistics Agency	1	2	3	4	5
Execution and Prioritization of Repair Support System (EXPRESS)	1	2	3	4	5
Depot Level Repair Process	1	2	3	4	5
Depot Level Reparable (DLR) Stock Fund Concept	1	2	3	4	5
Establishment and Accounting of KITS and Spares Packages	1	2	3	4	5
Base Supply Structure and Flight Responsibilities	1	2	3	4	5
Potential Sources of Supply Items	1	2	3	4	5
Stockage Effectiveness Calculation and Meaning	1	2	3	4	5
Air Force Manual 23-110, Air Force Supply Manual	1	2	3	4	5
Conducting Sample, Complete, and Special Inventories of Supplies and Equipment	1	2	3	4	5
Mission Capable (MICAP) Start, Stop, and Change Actions	1	2	3	4	5
Calculating Inventory and Safety Stock Levels	1	2	3	4	5
Procedures for the Receipt, Storage, and Handling of Hazardous Materials and Waste	1	2	3	4	5
Standard Base Supply System's Major Base Level and Wholesale Interfaces	1	2	3	4	5
Standard Base Supply System	1	2	3	4	5
Wholesale And Retail Receiving And Shipping System - D035K	1	2	3	4	5
Basic Computer Operation (Word Processing, Spreadsheets, Internet, or EMAIL)	1	2	3	4	5
Fuels Management Structure and Responsibilities	1	2	3	4	5
DoD 4140.25M, DoD Management of Bulk Petroleum Products, Natural Gas, and Coal	1	2	3	4	5
Types of Fuel Hydrant Systems	1	2	3	4	5
Characteristics of Jet Fuels Used by the Air Force (JP-8, JP-8+100, and additives)	1	2	3	4	5
TO 42B-1-1, Quality Control of Fuels and Lubricants	1	2	3	4	5

Scale definitions:

1	2	3	4	5
No Knowledge	**Little Knowledge**	**Moderately Knowledgeable**	**Very Knowledgeable**	**Extremely Knowledgeable**

SECTION 2: General Knowledge Importance

Please use the following scale to rate the importance of having knowledge of each of the following topics *to you, in the performance of your job. Please consider all of your past and present positions held.* Please respond by circling the most appropriate response

1	Unimportant	Have never needed knowledge of this topic to do my job
2	Minor	Needed some knowledge of this topic once or twice to do my job
3	Important	Knowledge of this topic not mandatory to do my job but would enable me to perform my job better
4	Very Important	Use my knowledge of this topic frequently – lack of this knowledge would hinder the performance of my job
5	Critical	Could not perform my job without knowledge of this topic

1. Wholesale Supply Operations	1	2	3	4	5
2. Retail Supply Operations	1	2	3	4	5
3. Supply Policies, Procedures, and Doctrines	1	2	3	4	5
4. Supply's Interrelationships with other disciplines (e.g. Maintenance, Transportation, Contracting, and Finance)	1	2	3	4	5
5. Budget Preparation	1	2	3	4	5
6. Supply Data Systems	1	2	3	4	5
7. Fuels Management Operations	1	2	3	4	5
8. Personnel Issues	1	2	3	4	5
9. Air Force Supply Chain	1	2	3	4	5
10. Leading People	1	2	3	4	5
11. USAF Operations and Organizations	1	2	3	4	5

SECTION 3: Demographics

Please answer the following questions by filling in the most appropriate circle or writing your answer on the lines provided.

a. What is your current rank?

O 2LT O 1LT O CAPT O MAJ O LT COL O COL
O Other _____

b. What MAJCOM are you assigned to?

O ACC O AMC O AFMC O AFSPC O PACAF O USAFE O AETC
O AFSOC O Other_____

c. To what officer career field are you assigned?

O Aircraft Maintenance (21AX)
O Contracting (21XX or 64PX)
O Logistician (21LX)
O Supply (21SX)
O Transportation (21TX)
O Logistics Plans and Programs (21GX)
O Space and Missile Maintenance (21MX)
O Other _____

d. How many years have you served in this career field?

O 0-2 years
O 2-5 years
O 5-10 years
O 10-15 years
O More than 15 years

e. To which of the following supply flight(s) have you been assigned? Please complete all that apply.

O Combat Operations Support Flight
O Readiness Flight
O Materiel Management Flight
O Fuels Management Flight
O Other _____
O Management and Systems Flight
O Materiel Storage and Distribution Flight
O Hazmat or Hazmart
O None of the above

f. Have you ever cross-flowed or served in more than one Logistics AFSC?

O Yes, Please proceed to question **g** prior to continuing
O No, Please skip to question **h**.

g. To what additional officer career fields were you assigned? Please complete all that apply.

O Aircraft Maintenance (21AX)
O Contracting (21XX or 64PX)
O Logistician (21LX)
O Supply (21SX)
O Transportation (21TX)
O Logistics Plans and Programs (21GX)
O Space and Missile Maintenance (21MX)
O Other _____

h. Which of the following types of positions have you held? Please complete all that apply.

O Base Level
O MAJCOM Staff
O Center Staff
O Air Staff
O Wholesale Level
O Other_____

i. Did you serve as an enlisted service member prior to being commissioned

O Yes, Please proceed to question **j.**
O No, survey is completed. Add any comments in the space provided at the bottom of the page.

j. To what enlisted career field where you assigned? _____

k. How many years did you serve as an enlisted member?

O 0-2 years
O 2-5 years
O 5-10 years
O 10-15 years
O More than 15 years

This completes the survey. Thank you for your participation. If you have any additional comments please write them here.

_____

_____

_____

_____

Bibliography

Air Force Logistics Management Agency. *1995 Logistics Handbook for Aircraft Maintenance Managers.* Washington DC: November 1994

Alreck, Pamela L. and Robert B. Settle. *The Survey Research Handbook.* New York: McGraw-Hill 1995

Bontis, Nick. Assessing Knowledge Assets: A review of the Models used to measure Intellectual Capital, 23 August 2000. Hamilton Ontario: Michael G. DeGroote School of Business, McMaster University.

Brooking, Annie, Peter Board, and Sue Jones. "The Predictive Potential of Intellectual Capital," Presented at the National Business Conference, Hamilton Ontario: January 22-24 1997.

Capshaw, Stacie. "Whaddya know? – Find out With a Knowledge Audit, the First Step Towards Knowledge Management." Inform: Vol. 13 Issue 7, 1999.

Cho, George, Hans Jerrell, and William Landay. *Program Management 2000: Know the Way, How Knowledge Management Can Improve DoD Acquisition.* Fort Belvoir VA: Defense Systems Management College Press, 2000.

Colorado State University. "Content Analysis." Taken from Colorado State University Writing Center website. pg. http://www.colostate.edu/DEPTS/Writing Center/references/research/content/com3b1.htm. 26 October 2000.

Department of Defense. *DoD Management of Bulk Petroleum Products, Natural Gas, and Coal.* DoD Directive 4140.25M. Washington DC: June 1994.

Department of the Air Force. *The Supply Officer Guide.* Air Force Pamphlet 23-113. Washington DC: HQ USAF, 1 March 1996.

Department of the Air Force. *Officer Classification.* AFMAN 36-2105. Washington DC: HQ USAF, 31 October 1999.

Department of the Air Force. *USAF Supply Manual.* AFMAN 23-110. Washington DC: HQ USAF, 1 October 2000.

Department of the Air Force. *Fuels Management.* AFI 23-201. Washington DC: HQ USAF, 1 August 1999.

Department of the Air Force. *Promotion Fitness Examination.* AFP 36-2241 vol. 1. Washington DC: HQ USAF, 1 July 1999.

Department of the Air Force. *Quality Control of Fuels and Lubricants*. TO 42B-1-1. San Antonio TX: SA-ALC, 1 May 1997.

Department of the Air Force. *Chemical Warfare Defense Equipment (CWDE) Consolidated Mobility Bag Management*. AFI 23-226. Washington DC: 1 May 1997

Department of the Air Force. *United State Air Force Agile Combat Support Concept of Operations*. Washington DC: 1 October 1999.

Dooley, David. *Social Research Methods*. Upper Saddle River NJ: Prentice-Hall, Inc. 1995.

Drucker, Peter. "Knowledge Work: Knowledge workers and e-commerce are creating new technologies, leading to major new industries," Executive Excellence: Vol. 17 Issue 4. April 2000

Drucker, Peter. *Peter Drucker on the Profession of Management*. Boston: Harvard Business School Press, 1998.

Edvinsson, Leif and Michael S. Malone. *Intellectual Capital, Realizing Your Company's True Value by Finding its Hidden Roots*. New York: Harper Collins Publishers, 1997.

Gabreski, Terry L. CSAF Logistics Review, Detailed Option Analysis, 22 June 00. Headquarters United States Air Force.

Headquarters United States Air Force/XOPE, EAF Implementation Division. "Expeditionary Aerospace Force (EAF), Detail Concept Paper." HQ USAF Washington DC: 3 January 2000.

Hopp, James W. "The Air Force Supply Officer of the Future," Air Force Journal of Logistics: Vol. XXIV, Number 3: 21-23 (Fall 2000).

Liebowitz, Jay. *Knowledge Management Handbook*. Washington DC: CRC Press, 1999.

Liebowitz, Jay, Bonnie Montano-Rubenstein, Doug McCaw, Judah Buchwalter, and Chuck Browning. "The Knowledge Audit," Knowledge and Process Management: Vol. 7 No.1 (2000).

Lynn, Bernadette E. "Intellectual Capital, Unearthing Hidden Value by Managing Intellectual Assets." Ivey Business Journal: Vol. 64 Issue 3, p 48, Jan/Feb 2000.

McClellan, James. Notes from Supply Officer Professional Development IPT (#1), 14 Feb 00. Booz Allen & Hamilton McLean Campus Facility

Moore, Grace A. "Supply Career Field," Air Force Journal of Logistics. Vol. XIX, NO. 2: 20-21 (Spring 1995).

Park, Mary W. *Info Think, Practical Strategies for Using Information in Business*. Lanham, MD, & London: The Scarecrow Press, Inc., 1998.

Phillips, James M. *Supply Downsizing How to Make the Best Fit? A Case Study Between Air Education and Training Command and Air Mobility Command, April 1999.* AU/ACSC/158/1999-04. Air Command and Staff College, Air University, Maxwell AFB AL.

Quinn, Philip Anderson, and Sydney Finkelstein. "Managing Professional Intellect, making the Most of The Best," in Harvard Business Review on Knowledge Management: Boston: Harvard Business School Press, 1998.

Rastogi, P.N. "Knowledge Management and Intellectual Capital – The New Virtuous Reality of Competitiveness," Human Systems Management: Vol. 19 Issue 1 (2000).

Rowley, Bill. "The Future is not What it Used to Be." Air War College, Maxwell AFB AL, 1995.

Ryan, Michael E. "Getting the Word Out on Outsourcing and Privatization (O&P)." Memorandum For All Commanders. Department of the Air Force, Washington DC.

Salant, Priscilla and Don A. Dillman. *How to Conduct Your own Survey*. New York: John Wiley & Sons, Inc 1994

Strassman, Paul A. "The Value of Knowledge Capital." Excerpt from the author's forthcoming book, *Knowledge Capital* published in, American Programmer: Vol.11 No. 3 (March 1998).

Wagner, Thomas J. *The Measurement of Human Intellectual Capital in The United States Air Force.* MS thesis, AFIT/GOR/ENS/98M-26. School of Engineering, Air Force Institute of Technology (AETC), Wright-Patterson AFB OH, March 1998.

Wiig, Karl M. "The Intelligent Enterprise and Knowledge Management." Article prepared for UNSECO's Encyclopedia of Life Support Systems: 1999

Wiig, Karl M. *Knowledge Management Methods, Practical Approaches to Managing Knowledge*. Arlington TX: Schema Press, 1995.

Wriston, Walter. *The Twilight of Sovereignty*. New York: Scribner's 1992.

Vita

Captain Christopher A. Boone enlisted in the Air Force and was called to active duty in May of 1990. He graduated from basic training in June of 1990 and was assigned to Brooks AFB Texas. While assigned to Brooks, he completed Environmental Health Specialists training at the School of Aerospace Medicine. He was a distinguished graduate and assigned to the Air University Hospital at Maxwell AFB, Alabama.

While assigned to Maxwell, he graduated from the Community College of the Air Force with an Associate of Science Degree in Environmental Medicine. Also while assigned to Maxwell, he graduated with Honors from Faulkner University in 1993 with a Bachelor of Business Administration degree.

He was commissioned in May 1995 through the Air Force Officer Training School. He was assigned as the Fuels Management Flight Commander, 9th Supply Squadron, 9th Reconnaissance Wing, Beale AFB, California. In May 1997, he was transferred to Arnold Engineering Development Center, Arnold AFB, Tennessee as the Chief of Supply. In August 1999, he entered the Graduate School of Engineering and Management, Air Force Institute of Technology, Wright Patterson Air Force Base, Ohio. Upon graduation, he will be assigned to the Air Force Logistics Management Agency (AFLMA), Maxwell AFB, Alabama.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 074-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From – To)*
20-03-2001	Master's Thesis	May 2000 – Mar 2001

4. TITLE AND SUBTITLE
DEVELOPMENT OF AN INSTRUMENT TO IDENTIFY UNIQUE SUPPLY OFFICER KNOWLEDGE

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Boone, Christopher A., Captain, USAF

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S)

Air Force Institute of Technology
Graduate School of Engineering and Management (AFIT/ENS)
2950 P Street, Building 640, WPAFB OH 45433-7765

8. PERFORMING ORGANIZATION REPORT NUMBER

AFIT/GLM/ENS/01M-03

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Director of Supply
Deputy Chief of Staff for Installations and Logistics
Headquarters U.S. Air Force
Washington, D.C. (e-mail: Robert.Mansfield@pentagon.af.mil)

10. SPONSOR/MONITOR'S ACRONYM(S)

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

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

13. SUPPLEMENTARY NOTES

14. ABSTRACT Air Force supply officers possess a unique body of knowledge. This unique body of supply officer knowledge is an Air Force intellectual asset. The value of these intellectual assets depends on the value created by the application of the organization's knowledge and the value this knowledge creates. This thesis establishes a process for measuring the value created by unique supply officer knowledge.

The first step in the methodology is to identify mandatory supply knowledge. This was accomplished through review of Air Force guidance and use of a knowledge audit questionnaire. The knowledge audit provides a means for assessing what knowledge is needed or contained within an organization. The knowledge audit conducted as part of this research effort resulted in the development of 11 mandatory supply knowledge categories consisting of 49 sub-categories.

The second phase of the methodology requires the identification of unique supply officer knowledge. The identification of unique supply officer knowledge is necessary so that the contributions, or value, of the knowledge to the accomplishment of the Air Force mission can be determined. This research concludes with the development and testing of a survey instrument for use in identifying unique supply officer knowledge.

15. SUBJECT TERMS
Knowledge Management, Intellectual Capital, Supply Officer, Knowledge Audit

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Marvin A. Arostegui, Maj., USAF
U	U	U	UU	101	19b. TELEPHONE NUMBER *(Include area code)* (937) 255-6565, ext 4333 (Marvin.Arostegui@afit.af.mil)

Form Approved
OMB No. 074-0188