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INFORMATION SUPERIORITY: OUTSOURCING AN AIR FORCE CORE COMPETENCY?

THESIS

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Hugh J. McTernan

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Abstract

The information age is upon us. More and more businesses are relying on access to immediate and accurate information just to survive in the global marketplace. This reliance, combined with the ever-increasing cost of information has caused most companies to take a closer look at what core business the firm is actually in, how information impacts those critical, strategic areas, and how best to obtain the needed information.

Similarly, information has also assumed a central role in national defense. *Joint Vision 2010 — "America's Military: Preparing for Tomorrow,"* (the joint war fighting strategic plan), identifies *information superiority* as the foundation for joint war fighting doctrine and concepts moving toward the year 2010.

This thesis first explores the perceived relationship (or "fit") between the core competency requirements for information superiority and the tasks defined for the Air Force communication, computer, and information career field. Then, the results of the relationships and the tendency to outsource positions based on those evaluations are investigated.

With this perspective, Air Force leaders will be relying on the commanders and line officers to provide a critical assessment of the skills needed to provide the information essential for mission success. Most importantly, once these skills are accurately assessed, determining the best means of acquiring the qualified personnel will be of utmost importance. Gaining an understanding of the probability of accurate assessment should be extremely useful in quantifying the validity of the subsequent sourcing recommendations.

INFORMATION SUPERIORITY:

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I. Introduction

Chapter Overview

This chapter discusses the historical backdrop fueling the current debate over Air Force core competencies, roles and missions, and future force structure. Operational definitions for outsourcing and privatization are provided along with a description of the Communications-Computer Officer specialty and the core competency of *Information Superiority*. Next, the research and investigative questions including three hypotheses are identified and discussed. Finally, the contribution of this thesis to the Air Force and an outline of subsequent chapters is presented.

Background

The *Air Force Times* headline reads, "Air Force to Outsource Majority of Global Attack and Rapid Global Mobility Positions." Obviously this headline will never be written, because these primary Air Force functional areas comprise two of the six core competencies described in the Air Force's strategic vision, "Global Engagement" (Department of the Air Force, 1997). According to the Wright-Patterson AFB paper *Skywriter,* the Air Force is planning to reduce the officer communication-computer field (33S3X) by 24% (1200 positions) within five years. Within the same time frame, the enlisted communication-computer systems operations career field (3C0XX) is being targeted for a 33% reduction, constituting a loss of 3550 positions (Thomas, 1997:12). The question then becomes, why is the Air Force pushing so diligently to outsource a

large number of positions in another stated core competency, information superiority? These positions may appear to be non-essential because direct relationships between the tasks required to support the core competency of information superiority and those specified for the information resource utilization field are not well defined. More specifically, information technology tasks as outlined in AFMAN 36-2105 (Department of the Air Force, 1995) may not meet the perceived information superiority core competency requirements. The analysis of this correlation and the influence on subsequent outsourcing decisions is the basis for this study. But first, a few definitions are necessary.

The terms privatization and outsourcing are often used interchangeably to describe performance of business functions by entities outside the normal in-house workforce. In order to create a common basis of understanding, the following operational definitions are presented.

> ***Outsourcing*** is defined as the transfer of a function performed in-house to an outside provider while retaining control and responsibility via a service contract.
>
> ***Privatization*** is the transfer of the ownership of function(s) and/or business assets (HQ USAF/SC, 1996).

For the purpose of this paper, both terms will be used synonymously to identify use of non-Air Force personnel to perform duties previously accomplished by Air Force officers.

Whether the United States Air Force pursues outsourcing and privatization programs is no longer in question. Leadership and management at all levels of the federal government and military services are in agreement on the need for reducing "non-essential" and "non-core competency" functions. In his *Annual Report to the President and the Congress* in April 1997, Secretary of Defense William S. Cohen stressed the absolute importance of outsourcing, privatization, and competition.

> To ensure that DoD is able to meet its goal of maintaining readiness, improving quality of life, and increasing funding for modernization DoD is carefully examining its internal operations and support activities to determine where it can lower costs and improve performance. One key way to achieve these objectives is by drawing on the tools of *outsourcing*, *privatization*, and competition (emphasis added). (Cohen, 1997)

The private sector has served as a proving ground for outsourcing in the past decade. Entire new industries have grown to meet this demand for specialized services across a range of functions from aircraft maintenance to computer network support. In 1996 alone, these outsourced service industries generated an estimated $100 billion in sales (Cohen, 1997).

Increasing globalization and technological advancement, especially in the information services area, have created a much more competitive environment for both commercial business and government. In response, U.S. businesses reengineered internal processes, invested in technology, and focused on mission essential core competencies. This streamlining allowed them to cut costs through improved efficiency and enhanced focus on what they do best. Functions which were not defined to be part of their core businesses were turned over to outside sources to provide the needed capabilities. These outsourcing efforts contributed to many otherwise troubled U.S. firms reestablishing their positions of world economic leadership (Barney, 1991:99-120).

With these documented commercial successes and the defense budget focused on weapon system modernization, the DoD is poised to introduce greater competition into its non-core activities. Therefore, establishing which currently-defined information

technology (IT) activities are central to Air Force core competencies is the beginning point for identifying potential outsourcing opportunities. These activities can then be matched against the skill sets of active duty officers and evaluated to present a clearer picture of which areas are best performed by an active duty USAF officer and which could be best accomplished through commercial sources.

Most commercial businesses do not attempt to outsource their primary capabilities. In Global Engagement: A Vision for the 21st Century Air Force, the Air Force has identified six major areas which constitute its primary capabilities. Information Superiority is presented as one of those six core competencies. From this document, the activities, tasks, and responsibilities required to meet the IT needs of the Air Force are identified. Introducing the importance of IT, the Secretary of the Air Force states that the pace and extent of technological change has been greatest in the realm of information. She goes on to say that our future ability to dominate the battlefield will rely more heavily on global awareness provided by our information operations (Department of the Air Force, 1997).

Having established the importance of information as part of the total force of the future, the next step is to be able to discriminate information superiority tasks from information support activities. Identification of individual positions far removed from the "tooth," (or operational units) as described by Secretary of Defense Cohen, will help mark them as candidates for the outsourcing option (Department of Defense, 1997a). Savings from these efforts can be used to enhance force capabilities and fund much-needed weapons modernization programs. The outsourcing of support functions will also

allow DoD to focus on core missions, thereby providing a more effective fighting force (Department of Defense, 1997a).

The guiding documents defining what skills the Air Force needs to meet core competency requirements and the qualifications of our IT professionals are

a. Global Engagement: A Vision for the 21st Century Air Force
b. AFMAN 36-2105, Attachment 7: Communications-Computer Systems Utilization Field (33XX).

Within the current communications-computer systems officer utilization field, ten specific duties and responsibilities are listed (Department of the Air Force, 1995:167-168). How well these duties and responsibilities support the core competency requirements of *Global Engagement* will provide a basis for identifying which positions are the best candidates for future outsourcing and which ones should remain "in-house."

Research Problem

Once a decision to outsource has been implemented, reversing that decision would be extremely difficult. Restaffing an IT workforce at the entry levels (lieutenant and airman basic) would require only an interested pool of qualified entrants. However, mid- and high-level technicians, managers, and leaders would no longer be available because of the progressive rank structure of the military.

Even though a great deal of research has been conducted on the outsourcing of IT functions within corporate America, none of these models completely address the military-specific requirements. Requirements unique to the military such as wartime mobility and command flexibility complicate any outsourcing decision model currently in use. These additional factors need to be identified and included to create a more comprehensive outsourcing decision model.

But, before a complete decision tool can be developed, the Air Force must evaluate how closely the skills outlined for current officer positions match the skills required to meet the stated strategic information needs. The degree to which these skill sets and strategic requirements correspond will determine the degree to which we must look outside the in-house, "blue suit" pool to satisfy these deficiencies.

Investigative Questions and Hypotheses

The following investigative questions and associated hypotheses form the basis of this thesis.

IQ1. Is there a significant relationship between the stated IT officer skill set and the skill set needed to meet the Air Force's core competency of information superiority?

H1. A significant difference exists between core-to-task fits (perceived level of support) for each core requirement.

IQ2. Is there a significant difference in the way IT professionals and non-IT professionals evaluate the correlation between these skill sets?

H2. Information technology professionals will perceive a higher correlation between the specified tasks than non-IT professionals.

IQ3. Does the degree to which these skill sets correlate indicate or predict a tendency to outsource these tasks and capabilities?

H3a. The tendency to outsource an IT function will be inversely related to the strength of the core-to-task fit (information superiority core competency requirement and AFMAN 36-2105 task).

H3b. Information technology professionals will recommend outsourcing of IT functions at a lower rate than non-IT professionals.

Thesis Contribution

Outsourcing and privatization initiatives are important issues to everyone concerned with the defense of the United States. The national leadership is looking for ways to accomplish national strategic objectives while under the constraint of ever-decreasing funding. Potential modifications in active duty personnel end strengths obviously concern those whose jobs may be affected by outsourcing decisions. Also, commercial vendors will look to position themselves to provide the needed capabilities. With these often conflicting concerns, care must be taken to avoid the rush toward cost savings at the expense of effective information operations.

This study will attempt to indicate whether the Air Force has defined the correct skill set necessary to fulfill core competency requirements and if reevaluation of currently-defined specialty descriptions is needed. Additionally, active duty personnel will be able to target their training and education efforts to acquire the necessary skills. The result will be a more accurate description of information operations needs and a better alignment of quality personnel to the core tasks and functions to support the Air Force of the future.

Assumptions

1. Air Force officers possess the skill sets as described in AFMAN 36-2105.
2. Duties and responsibilities as described in the manual accurately reflect those exhibited in the operational units.

3. A competitive commercial market exists for any activity targeted for outsourcing. Cost savings will be realized through these competitive markets.

4. The DoD will **NOT** consider the outsourcing of the stated core capabilities; that is, capabilities essential to preparation and execution of the Air Force's war fighting mission.

Thesis Outline

Chapter II of this paper will present a review of applicable literature from both academic and non-academic sources. Chapter III will provide the methodology to answer the research questions and validate the hypotheses outlined in Chapter I. Once data is gathered, a statistical analysis of the data will be conducted and documented in Chapter IV. Finally, a discussion of the results and subsequent conclusions will be included in Chapter V.

II. Literature Review

Chapter Overview

The information age is upon us. More and more businesses are relying on access to immediate and accurate information just to survive in the global marketplace. This reliance, combined with the ever increasing cost of information has caused most companies to take a closer look at what core business the firm is actually in, how information impacts those critical, strategic areas, and how best to obtain that information.

Similarly, information has assumed a central role in national defense. Joint Vision 2010 — "*America's Military: Preparing for Tomorrow,*" (the joint war fighting strategic plan), identifies *information superiority* as the foundation for joint war fighting doctrine and concepts moving toward the year 2010. DoD corporate level goals 4 and 5 of Joint Vision 2010 highlight the strategic role information plays as they strive to:

> 4. *Maintain U.S. qualitative superiority in support of national defense in key war fighting capabilities (e.g., information warfare, logistics).*
>
> 5. *Employ modern management tools, total quality principles, and best business practices to reduce costs and eliminate unnecessary expenditures, while maintaining required military capability across all DoD mission areas (Department of Defense, 1997b).*

Furthermore, the Information Technology Management Reform Act (ITMRA) of 1997 mandates we improve our day-to-day mission processes and properly use information technology to support those improvements. The act goes on to say:

> Technology must be fielded in an orderly, fast, and efficient way. We must use streamlined acquisition processes, commercial off-the-shelf products and services, and outsourcing, as appropriate, to take advantage of industry capabilities. The information technology investment portfolio

> concept, as put forth in ITMRA, emphasizes the need to do a better job of prioritizing information technology capital investments and being accountable for results—from each person individually up to mission commanders and Congress. Keeping our workforce, military and civilian, trained in new technologies and improved processes is critical to achieving savings. The law recognizes all this is in vain if our information is not being protected. (Department of the Air Force, 1996)

In the past, many companies including the Defense Department have attempted to provide most, if not all of their information needs internally. If providing corporate information resources is a core competency of the organization, then this internal approach is probably cost effective and efficient. If not, then alternative means of acquiring the necessary skills and resources should be investigated. One such organizational alternative is outsourcing.

Even though the need to reduce costs is driving the interest in outsourcing, we must be careful to first define our core competencies; that is, the activities we should be engaged in as an organization, based on our strategic areas of competitive advantage. Then, the skills and capabilities required to accomplish those missions can be acquired through in-house or contract personnel, or a combination of the two. Once an organization arrives at this point, great care must be taken when considering the option to convert current employees to contractor positions. When a decision to move a task outside the organization has been implemented, bringing that task back under internal control can prove extremely expensive (Halper, 1993c:16). Additionally, major changes in organizational structure usually have ramifications far beyond the bottom line. Two of these areas—the corporate culture and the company-employee relationship—will likely be drastically affected by these work sourcing decisions.

With regard to change, (Slaughter and Ang, 1996:48-50) developed a model which focuses on two specific areas—environmental and technological change. As shown in Figure 1 (Slaughter and Ang, 1996:48), the environmental area consists of two factors—the need to focus on core business and the need for flexibility. Technological change is represented as a function of the dynamics of the information systems skills market. The following conclusions were presented with regard to each of these factors. First *environmental changes* included the following three areas:

1. Computing firms are more likely to insource IT employment than non computing firms.

2. Firms in the public sector are more likely to outsource IT employment than firms in the private sector.

3. Firms are more likely to outsource for jobs that have volatile demand (e.g. systems development jobs, such as programmers, analysts, engineers and consultants) than for jobs that have more stable demand (e.g. systems support jobs, such as systems programmers or operators and managers).

Next, with regard to *technological change*, the (Slaughter and Ang, 1996:50) study concluded that firms are more likely to insource employment for IT skills that are relatively abundant in the marketplace (such as COBOL), than for skills that are relatively scarce (such as UNIX, client-server, Assembly, fourth-generation languages, and CASE technologies).

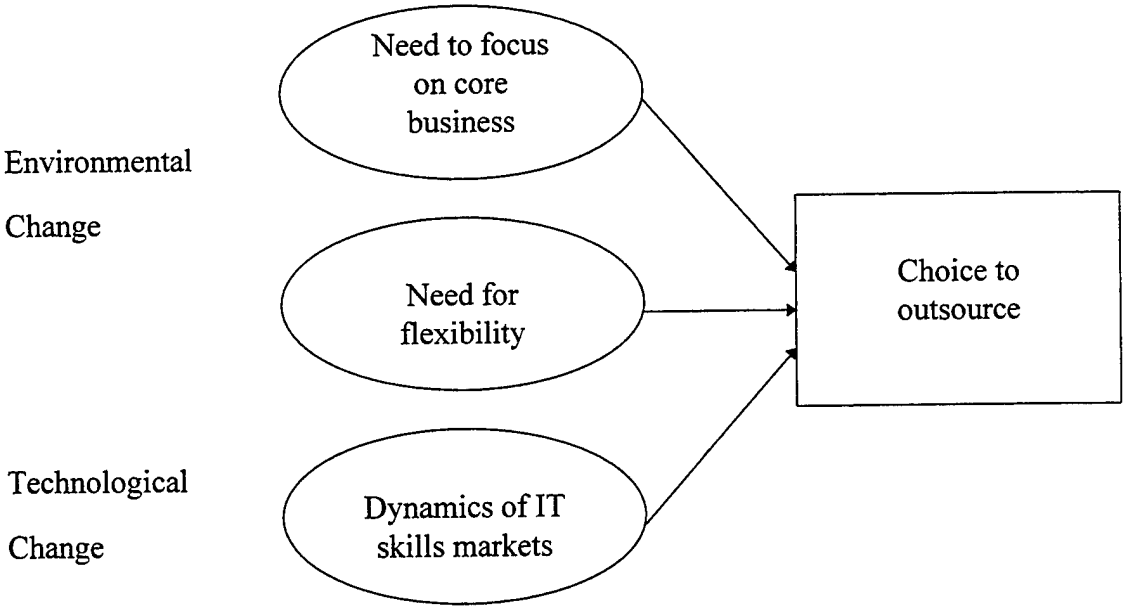

Figure 1. Determinants of the Decision to Outsource

In their chapter on the enabling role of information technology, (Hammer and Champy, 1993:28) state that a company which cannot change the way it thinks about information technology cannot re-engineer for modern day competition. They go on to assert that most executives do not understand the power behind modern information. Decision makers focus on the "boxes and wires" and then automate broken processes which should be re-engineered. Instead, managers need to think inductively by recognizing powerful solutions and opportunities and then seeking out problems they might solve.

Rethinking how business is done involves radical changes to fundamental processes to achieve dramatic improvements. Kodak used a radical new information technology computer-aided design (CAD) tool to fundamentally change the way next generation cameras were developed. The rapid turnaround capability enabled them to catch up with arch-rival Fuji. More importantly, they went one step further. Realizing they were not in the information technology business, they proceeded to radically and

fundamentally redesign their corporate information systems structure. They outsourced their entire multi-million dollar IT department to IBM, whose core competency was information and computer systems (Hammer and Champy, 1993: 85-91).

In a recent study, (Macmillan, 1997:12) identifies why information resource management has rapidly gained importance in the success of the enterprise. Macmillan states how IT now has a fully operational role in contrast to a traditional support arrangement. Demand and cost of IT are growing faster than unit costs are falling. IT also is allowing companies to achieve new strategic competitive advantage (Macmillan, 1997:12). But, with this increased focus comes additional scrutiny. With the option to outsource otherwise ineffective IT operations, the internal operation cost must now be justified when compared to the value added to the bottom line. Finally, IT management has become more decentralized and integrated into business operations requiring a more complete view of the enterprise.

In organizations where information technology is strategically mapped to critical business processes and the skills are available in-house, even the mention of outsourcing is quite controversial. One question which arises is whether purchasing services from outside the organization weakens a company's ability to use information and information technology as a corporate strategic resource. In a study by (Duncan, 1995:21-34) on infrastructure flexibility and information resource management issues, data was collected from 82 firms in the insurance industry. The results indicate ownership of infrastructure is increasingly important for firms with strategies that require support for innovation or rapid response to change.

The remainder of this chapter will expand on three distinct areas: strategic core competencies, officer requisite skill sets, and alternative sourcing options. First core competencies will be discussed from a general, commercial sense and then within the context of one of the Air Force's six strategic core competencies: *information superiority*.

The requirements of information superiority can be further subdivided into six subtask requirements which will be used to identify how well the overall core competency is being accomplished. Secondly, we will investigate the necessary communication-computer officer skill set required to successfully meet the core competency requirements. Finally, by means of matching these skills to the required subtasks, combined with an understanding of the determinants of sourcing decisions, the best alternative can be selected.

Strategic Core Competencies

Experts disagree on whether employing a "technology pull" philosophy based on the core strengths of a business or a "technology push" approach of utilizing technological capabilities to drive strategy is more beneficial in attaining organizational goals. In either case, experts do agree that to succeed, an organization needs to develop complimentary business and information technology strategies (Currid, 1994:9-12). Furthermore, the more closely these areas complement each other, the more likely the IT function will be considered a legitimate core competency candidate.

(Prahalad and Hamel, 1990:79-91) define a core competency as "an area of specialized expertise that is the result of harmonizing complex streams of technology and work activity." In addition, core competencies have special qualities. They exemplify excellence and also provide competitive advantage for the organization. It is also important for this excellence to be translated into customer-perceived value, extend into new areas of strategic advantage, and be difficult for competitors to imitate or recreate.

Information technology is the major resource available to executive decision makers—after people and machines—consuming 50 percent of capital-goods budgets in the United States. Effectively employing information systems as a corporate resource has become not only important, but imperative. Computer Sciences Corporation (CSC) of El

Segundo, California produces an annual survey of senior information systems executives. In the 1997 survey, they found "aligning I/T and corporate goals" to be the top management issue followed closely by "using I/T for competitive breakthroughs (Groenfeldt, 1997:36)."

One of the ten critical mistakes identified by (Remenyi, 1996: 87-88), which threaten the success of an organization, is a "lack of alignment of IT and business strategies." We can no longer view information systems as just performing routine administrative functions or automating manual processes. In today's competitive, daily-changing environment, firms must first have an information strategic plan and then ensure it is synergistically aligned with what the company is trying to accomplish.

In order to formulate such a strategic plan, (Macmillan, 1997:13) suggests two principles which will assist information resource managers. First, understand how past and future IT investments relate to your business. He advocates expanding the classical view of business strategy to include more focus on flexible, global, future-oriented operations. Second, organize IT activities to encourage effective interaction between business people and IT specialists. In essence, business people must become more information resource knowledgeable and IT people must become more business minded.

(Remenyi, 1996: 78) points out a prevailing thought among managers, "...the information systems function in many organizations is regarded by general management as a substantial expense. The function frequently costs organizations between one and ten percent of their total revenue." The fact that information systems consume a large percentage of revenue is nothing new. The more subtly revealing point is that managers still see information as a cost of doing business and not as the essential strategic link between success and failure in today's information-rich global environment (Remenyi, 1996: 80).

Therefore, treating IT as a cost center in its traditional role of task automation and labor replacement, rather than supporting or creating new ways of doing business, will almost surely keep the company in catch-up mode. Instead, the organization should forge a strong partnership between information systems people and the business side of the organization focusing on core business competencies. Only by determining strategic drivers, optimizing those processes, and concentrating IT resources will an organization maximize the return on IT investment (Groenfeldt. 1997:36).

In a related work, (Duncan, 1995:21-34) studied the differences between enabling technology and revenue-generating technology. Enabling technologies are those processes which aid, enhance, or advance other processes (much like support operations for the military). In contrast, revenue-generating technologies are those which either by themselves or with other resources lead to income for the corporation (parallel to Air Force operational units). In theory, the more closely a technology is tied to revenue generation, the more likely that process will be considered a core competency. Furthermore, in firms where accurate and timely information is critical and flexibility of internal operations is needed, most will be better off keeping their major IT resources in-house.

In *Return to Global Engagement: A Vision for the 21st Century Air Force Core Competency: Information Superiority,* the Defense Department and USAF leadership remark on the criticality of information to future operations,

> In no other area is the pace and extent of technological change as great as in the realm of information. The volume of information in joint warfare is already growing rapidly. The ability of the future Joint Team to achieve dominant battlefield awareness will depend heavily on the ability of the Air Force's air- and space-based assets to provide global awareness, intelligence, communications, weather and navigation support. While Information Superiority is not the Air Force's sole domain, it is, and will remain, an Air Force core competency. The strategic perspective and the

> flexibility gained from operating in the air-space continuum make airmen uniquely suited for information operations.

The strategic perspective of information as a corporate resource which will remain a core competency for air and space operations of the future is the foundation of this paper. Although information is not the sole domain of the Air Force, the time is right to add information to the air-space continuum. The document goes on to say...

> Providing Full Spectrum Dominance requires a truly interactive common battlespace picture. The Air Force is committed to providing the integrated global and theater air, space and surface picture of the battlespace to the 21st Century Joint Force Commander. Moreover, its future Battle Management/Command and Control (BM/C2) systems will enable real-time control and execution of all air and space missions. The Air Force will also ensure that its information systems will be fully interoperable for seamless integrated battlespace management.

The concept of the battlespace and the management of that battlespace will be crucial link which allows the Air Force to maintain an integrated and interoperable battle plan working jointly with the other services and our allies. As the next excerpt points out, advances in technology will be the primary force allowing the Air Force to remain superior in air and space. The Air Force of the future will rely more heavily on cost-effective, unmanned aerial vehicles to accomplish not only intelligence missions, but more significantly, the primary missions of the Air Force.

> The Air Force will exploit the technological promise of Unmanned Aerial Vehicles (UAVs) and explore their potential uses over the full range of combat missions. The highest payoff applications in the near-term are Intelligence, Surveillance, Reconnaissance (ISR) and communications. A dedicated Air Force UAV squadron will focus on operating the Predator

> medium-range surveillance UAV, which also will serve as a test bed for developing concepts for operating high altitude, long endurance UAVs. In the mid-term, the Air Force expects that suppression-of-enemy-air defense (SEAD) missions may be conducted from UAVs, while the migration of additional missions to UAVs will depend upon technology maturation, affordability and the evolution to other forms of warfare.
>
> Information Operations, and Information Warfare (IW) in particular, will grow in importance during the 21st Century. The Air Force will aggressively expand its efforts in defensive IW as it continues to develop its offensive IW capabilities. The top IW priority is to defend our own increasingly information-intensive capabilities. Already dedicated and operational in the garrison defense of computer systems, the Air Force will continue to invest in defensive IW, and move to defend its forward-deployed assets, particularly in BM/C2. On the offensive side, the Air Force will emphasize operational and tactical IW and continue, in conjunction with other Federal agencies, to support strategic information operations. (HQ USAF/XP)

For Air Force officers at all levels, this document combined with the National Military Strategy (NMS) guidelines provide guidance on what capabilities will be required and where our energies and resources should be focused. To be even more succinct six primary requirements can be extracted from the strategic direction outlined. Superiority will be measured by our ability to

A. provide for joint force commanders to keep pace with information crucial to the campaign plan.

B. provide for joint force commanders to incorporate information into the campaign plan.

C. provide military leaders with an integrated and interactive picture of the entire battle space.

D. provide global and theater representation of air, space, and surface battle spaces.

E. provide the capability to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination.

F. provide interoperable, integrated, and seamless information systems.

Undoubtedly, information is critical to the United States Air Force and to U.S. superiority in technology. But, whether information superiority is a true Air Force core competency or an essential component of successful battlefield operations remains in question. Having said that, the purpose of this paper is not to investigate the Air Force methodology in determining the mission essentiality of information superiority. Rather, it is to gather perceptions on whether Air Force officers have an understanding of the requirements of information superiority, the skill set necessary to fulfill those requirements, and the alternative means of acquiring the requisite personnel resources.

Up to this point, this paper has discussed the importance of information to the health and growth of an organization, tied the critical nature of information to the strategic core competencies of that organization, and framed these competencies within the Air Force's core competency of information superiority. The next step will be to briefly investigate the personnel skill set needed to attain these objectives.

Required Personnel Skill Set

The strategic-theoretic discrepancy model presented by (Teng et al., 1994:75-103), offer insight into the decision process from a standpoint of "supply and demand." On the supply side, it is extremely difficult to find qualified personnel with the required technical capabilities and also the breadth of knowledge for long term employment. In addition, obtaining the needed equipment in-house, on a real-time basis is becoming more difficult with the diversification of information technology. From a demand standpoint, corporate functional managers are often unsure what they really need in an IT professional or from the entire IT department in general. This disconnect often leads to technical incompatibilities and IT products which fall far short of expectations. Is it any

wonder, that internal users are four times more likely to request external support for their information requirements?

(Teng et al., 1994:99) state, "...recognize that outsourcing is not necessarily a panacea for all IT management problems or an instant cure for incompetent IT groups." Instead, when it comes to making sourcing decisions, one recommendation stands out. Managers should make systematic internal evaluations of the company's IT function in terms of information quality and support service, both actual and desired. User Information Satisfaction instruments developed over the years could be a useful application for this type of evaluation.

In utilizing these types of instruments, senior managers attempt to determine if perceived in-house skills and levels of performance are actually contributing to the organization's goals. Two important assumptions are necessary—organizational goals and competencies are known to decision makers and perceptions are consistent throughout the organization. Taking these assumptions into consideration, the strategic-theoretic discrepancy model could be a very useful tool in understanding the relationship between desired and actual performance. Once this "fit" or lack thereof is identified, the value in maintaining these functions within the organization or looking outside for resources may become apparent.

In the research model, desired levels of performance are compared against actual levels yielding a theoretic discrepancy value. (Teng et al., 1994:95) results support the contention that, "perceived discrepancies in the performance of IS resources in terms of information quality and IT support are positively associated with the propensity for strategic outsourcing." In an Air Force context, the level at which communication-computer officers are perceived to be supporting the identified strategic goals and missions of the organization should be inversely related to that propensity to outsource.

Accurate measurement of this perceived "fit" between goals and level of support assumes a basic understanding of the core competency of information superiority and the required skills of the 33SX officer. Core competency requirements have already been highlighted and the duties and responsibilities are contained in AFM 36-2105, included in Appendix. The next step will be to gain an understanding of the alternative means of sourcing. Several avenues will be discussed with emphasis on aspects of the outsourcing option.

Alternative Means of Sourcing and Managing Information Needs

Once the leadership of an organization has a firm grasp on what they do best and what skills will be needed to accomplish those core tasks, the next step will be to determine the best method of attaining those resources. In this section, we will introduce four sourcing alternatives, concentrating on *outsourcing* methodologies.

Insourcing. Insourcing, the process of providing IT functionality within the parent organization, can be considered the opposite of the outsourcing option. Whether these functions are being initially created or returned after a failed outsourcing attempt, the rationale for insourcing decisions can also be studied as obstacles to outsourcing. Empirical evidence from case studies identifies several potential reasons to insource (Reponen, 1993:112):

1. Higher than expected costs of external IT/IS services.
2. IT service companies' inability to adapt to new and changing situations.
3. Desire to use the core IT skills internally.
4. New IT strategy and its implications for new software development.

Studies have found a positive correlation between the internal IT cost structure and the degree of IT outsourcing. However, the number one reason for later returning IT functions to in-house operations is a lack of realized cost savings (Loh and Venkatraman, 1992:22a). This type of finding should promote a more in-depth evaluation of the perceived cost savings before the decision to outsource is taken.

Contracting. The process of contracting or hiring a worker with a particular skill on a temporary basis gives the manager a tremendous amount of flexibility. There seems to be an increasing trend toward reliance on contractors for numerous reasons. The organization may have a deadline that cannot be met internally or a special skill may be required on a one time basis. Additionally, hiring freezes and other employment regulations may be circumvented using short-term contracts. Contracting is also useful to test a potential full-time employee without making an immediate commitment (Currid, 1994:147-148).

Of course there are considerable drawbacks to selecting this sourcing option. Contracted workers normally have very little loyalty and may choose to leave at an inconvenient time. Much worse, they may leave with extensive corporate and project knowledge which could be sold to the highest rival bidder. Often times, previous employees are good candidates for contract work if they had left on good terms. They usually take less time to come up to speed and may already know something about the specific project. The bottom line is that contracting with individual workers may seem to be a favorable financial arrangement, but great care should be taken when choosing this option over working directly with a corporate contracting agency (Currid, 1994:148).

Consolidation. With the advent of high-speed data communications, computing power and data storage no longer have to be located close to the user. By collapsing these far-flung locations into a consolidated center, thereby eliminating duplication of staff, equipment, and facilities, significant savings can be realized. Data centers, help

desks, and network services are also prime candidates for consolidation. For example, the Federal Reserve Bank (The Fed) has merged the 12 regional data processing centers into three super centers realizing considerable initial savings (Currid, 1994:148-149).

At the national government level, political considerations often make good business decisions like consolidation nearly impossible to implement. Since 1991, the Air Force has attempted to draw several dozen data centers into as few as four mega-centers. Once the affected groups began to lobby Congress, the optimum number of sites quickly expanded to six, essentially halving the projected savings (Currid, 1994:149).

Outsourcing. The necessity to outsource for most IT operations is a foregone conclusion. Max Hopper, senior vice president of information systems at AMR Corporation said, "...the question is not *whether* to outsource, but *how much* to outsource, and *to whom* (Currid, 1994:133)."

(Loh and Venkatraman, 1992a:9) define outsourcing to be, "the significant contribution by external vendors in the physical and/or human resources associated with the entire or specific components of the IT infrastructure in the user organization."

Further explanation by (Duncan, 1995) describes IT infrastructure as "the complex set of IT resources which provide a technological foundation for firms' present and future business applications." The infrastructure usually includes platform hardware and software, network and telecommunications technology, core organizational data, and data processing applications which are fundamental to the business (Earl, 1989; Niederman et al., 1991).

Reasons to Outsource. Most firms believe they must do everything themselves, often with disastrous results. Another critical mistake (Remenyi, 1996:78-89) identifies is the effect of not enough attention to the outsourcing option. As with companies which acquire other businesses outside their original area of expertise, performing non-core competency information management functions also decreases organizational focus.

Today the requirement is for the corporation to identify its core competencies and areas of competitive advantage and then alternatively source all other operations. This strategy will allow firms to devote time and energy to those issues vital to their success.

With expected savings ranging from 20 to 40 percent, the economic incentive to outsource is the primary justification (Lacity, 1995:13). But for many organizations, cost containment is even more important than a decrease in IT expenses. Other reasons stated in a 1993 survey of business executives include expectations of improved performance, reduced IT department management levels, increased expertise, and shorter implementation periods (Currid, 1994:134).

Williamson's (1983) transaction cost theory suggests cost reduction is the foremost reason a company would consider outsourcing (Lacity, 1993:25-37). Within this cost evaluation structure, two types of costs need to be investigated—production and coordination costs. In the final evaluation, the savings through vendor economies of scale must be weighed against the additional coordination costs incurred in developing and maintaining the contract.

Most of the realized cost savings come from the economies of scale offered by contracting firms. These savings come from both personnel and equipment, freeing capital for strategic investment. Many companies realize a greater positive impact in the firm's ability to focus on current operations and core competencies. Also, increased flexibility and ability to quickly hire expertise are two surprising benefits. Relinquishing control of personnel and equipment was often seen by managers as a negative result of outsourcing. In reality, managers gained considerable flexibility by tailoring all available resources to fit their project needs in a more timely manner (Currid, 1994:139).

Senior managers tend to evaluate each function solely on the basis of efficiency. Because no concrete measure of actual efficiency exists, the perception of efficiency is often what is used. If managers perceive the IT function as inefficient, outsourcing is

seen as an improvement. This reaction to the efficiency imperative is the first of six reasons cited for initiating outsourcing evaluations. The remaining five make up the IT Outsourcing Framework (Lacity, 1993:198-200).

1. The need to acquire resources
2. Reaction to the bandwagon
3. Reduce uncertainty
4. Eliminate a troublesome function
5. Enhance credibility

As can be seen in the preceding list, perceptions are the driving force behind each item. This is especially true in the case of enhanced credibility, where senior managers don't recognize the contributions of the IT department and therefore outsourcing a portion to an outside agency improves the perceived level of competence and expertise.

Max Hopper, Senior VP of IS for American Airlines used information technology for competitive advantage during the 1980s with the airline scheduling system, SABRE. The internal development and implementation of this system was tremendously successful, yet Hopper offers a somewhat unexpected observation:

> We look forward to the day when we can buy more and more of our hardware and software from third-party vendors capable of tailoring their systems to our needs. Our skills as electronic tool builders, honed over decades, will become less and less decisive to our information strategy. This may sound like bad news, but we welcome it. We're not in business to build computer systems. (Hopper, 1990:120)

What Not to Outsource. Historically, application development has been among the most popular areas to outsource. When there is a large backlog or a project requires specialized knowledge and skills, the outsourcing option is very tempting. This approach may be the only one feasible, but it is not without risk. When outsourcing a truly strategic application, the organization risks the loss of confidentiality. In the commercial

sector that could mean not getting to market first (Currid, 1994:137). In the defense industry, such a breach could expose strengths and weaknesses to potential adversaries.

Drawbacks of Outsourcing. Although the concept of outsourcing has produced some exceptional results, many planners are keeping a watchful eye toward the long range perspective. Some problems have already surfaced, such as contract overruns due to improperly designed initial agreements. Often, a manager cannot foresee longer range requirements at the time of the original proposal. Contract firms can also be guilty of underbidding, even though they know additional services will be required. Once under contract, higher prices can be charged to increase the level of performance, sometimes eliminating the cost savings entirely. Besides the cost of increasing service, the cost of terminating a contract can also be significant if not planned for in advance (Currid, 1994:140).

Another potential problem, especially in the case of off-site contractors, is the loss of control and oversight. Many of these concerns can be reduced by maintaining solid lines of communication between the parties. Probably the most often cited concern expressed is the loss of in-house expertise. When the internal staff is let go, insight into the culture and business philosophy is lost; sometimes to competing firms. Michael Hammer, an industry consultant believes only internal IT employees can determine how a company's information resources should be deployed (Currid, 1994:142).

Determinants of the Outsourcing Decision

Summarized below are the fifteen areas identified as potential determinants in the outsourcing decision. Definitive ranking of these factors is extremely subjective and relative to each organization. Therefore, the following factors are listed in random order:

1. The organization is not primarily in the information technology business and needs to focus on their defined core competencies

(Slaughter and Ang, 1996:48-50; Hopper, 1990:120; Richmond and Seidmann, 1993:57-72; Hammer and Champy, 1993:33; Macmillan, 1997:12; Currid, 1994:10; Remenyi, 1996:87-88; Outsourcing Institute, 1996).

2. The organization is in the public sector (Slaughter and Ang, 1996:48-50).

3. Desired jobs or tasks have a volatile demand (Slaughter and Ang, 1996:48-50).

4. Required skills are abundant in the marketplace, but qualified IT personnel are not available in-house (Tend and others, 1994:75-103; Slaughter, 1996:48-50; Outsourcing Institute, 1996; Reponen, 1993:108; Duncan, 1997:1; Williamson, 1983).

5. The firm operates in a stable, non-innovative environment (Duncan, 1995:21-34; Lacity, 1993:198-200).

6. Perceived costs of in-house operations are greater than perceived value added (Duncan, 1995:21-34; Lacity, 1995:13; Williamson, 1983; Richmond and Seidmann, 1993:57-62). In contrast, other studies found the cost factor to be the least important reason to outsource (Reponen, 1993:114; Loh and Venkatraman, 1992:234).

7. Operations not closely linked to revenue generation (Duncan, 1995:21-34).

8. Flexibility of internal operations is only a minor concern (Duncan, 1995:21-34). Currid and others site the loss of flexibility is actually a drawback of outsourcing when using a fixed type of contract (Currid, 1994:142; Williamson, 1985).

9. Information technology requirements are ill-defined, diversified in nature, or geographically-separated (Tend and others, 1994:75-103).

10. Previous outsourcing experiences have been successful or other firms within the industry have documented favorable results (Reponen, 1993:112).

11. Expectations of improved IT using greater expertise outside the organization and therefore improving overall business performance (Currid, 1994:134; Lacity, 1993:198).

12. Shorter implementation periods are needed, there is a large backlog, or a project requires specialized knowledge (Currid, 1994:134; Lacity, 1993:198).

13. Confidentiality of trade secrets or internal operations is not critical (Currid, 1994:137).

14. Organization wishes to minimize or share risk (Outsourcing Institute, 1996).

15. Political infighting precludes efficient use of internal IT resources (Kelleher, 1990:76).

In a study of 55 major US corporations, positive correlation was identified between the internal IT cost structure and the degree of IT outsourcing. However, the number one reason for returning IT functions to in-house operations (insourcing) as previously cited by (Reponen, 1993:111-112) and supported by (Loh and Venkatraman, 1992:334) is a lack of realized cost savings.

Of interest again is the lack of consideration for whether a corporation should even be in the information technology business at all. In the framework for outsourcing model, business competence is a major category. Yet, whether that activity is a core competency or even a critical success factor necessary to accomplish the strategic goals of the organization is somewhat overlooked. This type of finding leaves much room for a more in-depth evaluation from a strategic viewpoint. Finally, the mixed results of the study and those experienced through Kodak's total outsourcing effort should temper the rush to jump on the outsourcing bandwagon (Loh and Venkatraman, 1992b: 334-358).

The results of another investigation dealing with one segment of the information management arena, software design and development, is included because the authors hit on the strategic role of IT and the aspect of value-added analysis. Both of these concerns have previously either been ignored or excluded when in fact they must both be considered before a potential sourcing decision can be made. The majority of the study

concerns, without conclusion, a comparison of the two-stage and the stage-by-stage contract management models. Of significance in the model is the inclusion of a risk-sharing factor which may lessen the all-or-nothing flavor of current decision models (Richmond and Seidmann, 1993:57-72).

While costs savings attributed to IT outsourcing continue to grab the headlines in both the public and private sectors, the difference between expectations and results is a more accurate determinant of corporate IT outsourcing tendencies. The size of EDS's 10-year, $750 million contract with Enron and its almost $2 billion contract with System One illustrate why this topic should be of tremendous interest at all levels of management (Teng and Cheon, 1994:75-103).

Outsourcing may entail significant organizational upheaval, transfer of important assets, dislocation of people, and long-term contractual relationships with an outside partner. None of these make sense unless the benefits to be gained and the risks involved are clearly understood and managed from the outset. Through a series of studies conducted since 1991, including surveys of over 1,200 companies, the Outsourcing Institute developed a clear understanding of the reasons companies outsource (Outsourcing Institute, 1996). An important insight gained from working with hundreds of companies looking into outsourcing is the fact that for outsourcing to be successful, management must have a clear set of goals and objectives in mind from the beginning. The following list outlines the high level or strategic reasons to outsource followed by the more operational or tactical view.

Strategic

1. Improve business focus
2. Access to world class capabilities
3. Accelerate BPR benefits
4. Share risks

5. Free resources for other purposes

Tactical

1. Reduce or control operating costs
2. Make capital funds available for core areas
3. Cash infusion from capital resources sold to IT provider
4. Resources not available internally
5. Functions difficult to manning or out of control

Researchers at the institute conclude that, "outsourcing can enable an organization to accelerate its growth and success through expanded investment in the areas which offer it the greatest competitive advantage (Outsourcing Institute, 1996)." User managers believe increased motivation and technical expertise among IT professionals is the primary reason to outsource all or part of process. Both user and IT managers were skeptical of the technical knowledge and overall skill level of those within the in-house IT organization (Reponen, 1993:108). The decision to outsource infrastructure may also depend on a firm's assumptions about the efficiency of the market for relevant IT resources and its own IT development capabilities (Duncan, 1997:1).

The determination of whether to make or buy resources, according to Williamson (1983, 1985), depends on the efficiency of the market for the needed resource. He identifies four factors as useful in determining that efficiency:

1) number of suppliers: larger number - greater efficiency
2) uncertainty/complexity of requirements: higher - lower efficiency
3) information impactedness: lack of true information - lower efficiency

4) length of contract periods - longer contract periods - lower efficiency. The standard period for an outsourcing contract with a service agency is ten years.

Because of these long term contract periods, IT infrastructure is best owned and managed internally when long term IT requirements are unknown. This is especially true where those unknown requirements could significantly impact future performance (Duncan, 1997:2). The second assumption deals with the decision maker's view of internal IT skills and capabilities. The real issue is whether the diversification of skills distracts from the true core competencies and central goals of the business.

Howard Anderson, managing director at Yankee Group, believes organizational politics preclude internal IT departments from achieving economies of scale. The power struggles among profit centers prevent the efficient utilization of information resources. Therefore, circumventing political roadblocks may be more of a factor in the decision-making process than the rational evaluation of costs and benefits (Kelleher, 1990:76).

One model developed by Tapio Reponen of the Turku School of Economics and Business Administration in 1988 utilized questionnaires, surveys, and case studies to identify key determinants of outsourcing decisions. The conceptual model divided the environment into personnel, finance, and organization. Through the questionnaire, determinants were evaluated from the IT-manager and user-manager perspective. As a result of this research, a stratified list of determinants for outsourcing was compiled as presented in Table 1 (Reponen, 1993:106-107).

Table 1. Determinants of Outsourcing (IT and User Managers)

Main Category	Determinant	IT Manager	User Manager	Average
Personnel	Motivation	3.5	4.7	4.1
(Avg:3.53)	Customer Orientation	4.0	4.2	4.1
	Efficiency	3.6	4.2	3.9
	Turnover	1.8	2.3	2.05
Finance	Responsibility	3.2	3.2	3.2
(Avg:2.48)	Investment Planning	4.0	1.8	2.9
	Understanding Costs	2.3	2.9	2.6
	Cost Control	2.2	2.8	2.6
	Cost Structures	2.6	2.2	2.4
	Cost Reduction	1.4	2.2	1.8
Organization	Cumulative Experience	4.3	3.6	3.95
(Avg:3.17)	Outside Sales	4.2	2.6	3.4
	User Support	2.8	3.2	3.0
	Order Backlog	3.2	2.4	2.8
	Decision Making	2.6	2.8	2.7

According to this study, the most important factors were identified in order as: motivation of IT professionals; customer orientation of IT professionals; cumulative experience through the market mechanism in IT services; efficiency of IT professionals; and investment in IT planning.

Interestingly, three of the factors above related to personnel, one to finance, and one to organizational factors. It should also be noted that financial aspects received the least amount of emphasis from the user managers, and surprisingly, the IT managers as well. These findings contrast with the current Air Force emphasis on cost reduction.

From an Air Force point of perspective, the whole purpose of this type of investigation is to make better, quicker outsourcing decisions. Strategy 3.1.3 of the ITMRA states that guidelines and a framework for systematically making outsourcing,

privatization, and in-house decisions are needed at all levels. Policy and procedures are also needed to address issues such as IT outsourcing and privatization scope and context definitions, expectations and targets, elements of acceptable business case analyses, and use of these in oversight and resource allocation processes (Department of the Air Force, 1996:14). The following section outlines one such framework or methodology for improving the sourcing decision process.

Information Systems Sourcing Methodology

Lacity and Hirschheim (1995:181-183) present a procedural methodology for making sourcing decisions based on lessons learned from case studies. One must assume that those responsible for the decision, the stakeholders, are working in concert to produce the most cost efficient and effective result. The methodology addresses both the rational and political aspects of the decision-making process. The six phases and brief purpose statements are outlined below.

1. **Stakeholder assessment.**
    - Purpose: Understand why stakeholders posses different perceptions and expectations of IT performance.
        a) senior management's view: cut costs
        b) business units' and end-users' view: service excellence
        c) IT managers' view: caught in the middle
        d) understanding stakeholders' perspectives: the cost/service trade-off
    - Lesson: Conflicting stakeholders expectations place IT managers in the precarious position of "providing a Rolls-Royce service at a Chevrolet price."
2. **Create a shared agenda for IT.**
    - Purpose: Create a shared agenda for evaluating the business contribution for the portfolio of IT activities.

a) align IT strategy with business strategy

b) classify IT activities as "differentiators" or "commodities"

- Lesson: Stakeholders must ignore generalizations about alleged IT commodities and differentiators and not let superfluous accounting mask the IT contribution.

3. **Select outsourcing candidates from IT portfolio.**
   - Purpose: Identify outsourcing candidates among the IT commodities by examining the economic efficiency.
     a) efficient IT management practices
     b) economies of scale
   - Lesson: Cost efficiency largely depends on adoption of efficient management practices and to a lesser extent, economies of scale.
4. **Compare in-house provision with vendor offerings.**
   - Purpose: Conduct an official outsourcing evaluation for the outsourcing candidates.
     a) Inform IT staff of the evaluation
     b) create teams
     c) create a request for proposal (RFP)
     d) create evaluation criteria
     e) invite internal and external bids
     f) assess validity of submitted bids
   - Lesson: Successful sourcing depends on comparing vendor bids against a newly submitted internal bid, not against current IT performance.
5. **Negotiate contract with external vendor.**
   - Purpose: If an external bid is selected, stakeholders must attend to 15 rules of contract negotiations.

- Lesson: Value talk of 'partnership' with the contracting agency is no substitute for a sound contract.

6. **Post-decision management.**
    - Purpose: Whether internal or external bids are selected, continued management of IT activities is vital to ensure success.
        a) insourcing: providing continued support for internal IT managers
        b) outsourcing: creating the role of the contract manager
    - Lesson: For insourcing, senior managers must support IT managers against user backlash and commit to IT investments to reduce costs. For outsourcing, contract managers must learn four new skills: managing the contract, managing demand, managing profit and loss, and balance the risks and costs of monitoring.

Just following these six steps in one suggested methodology does not guarantee successful sourcing decisions, but if outsourcing is chosen, the final two sections of this chapter may serve as valuable checklists for implementation of that policy.

Recommendations for Successful Outsourcing

(Currid, 1994:142-143) provides seven specific recommendations once the outsourcing option has been decided upon. The primary thrust of each of these suggestions deals with the search for a legitimate contractor and the subsequent steps in dealing with the contract and planning for the inevitable contingencies.

1. Look for an outsourcer with proven expertise in your industry and a thorough grasp of your business processes.

2. Be sure to leave yourself some options for getting out of the contract without much difficulty. You may find your partner isn't working out and a termination may become necessary.

3. Be sure to retain the right to all source code for applications developed for your company. If you don't, you may find it difficult to maintain the applications later.

4. Stress that all software used by the outsourcer should be unmodified. Then, if you need to transfer operations to another vendor, you should have minimal problems in getting the software to work for you.

5. Work out a very detailed contract before turning over your operations. Good legal counsel is absolutely essential and can save you a lost of aggravation.

6. Clearly define all performance parameters and the penalties for not meeting them.

7. Establish a well-defined reporting structure so that the vendor can keep you informed on the issues and progress. The vendor should allow you to establish direction and control of strategic work.

Lessons Learned

Finally, the lessons learned section provides a wrap-up of six areas which managers should keep a close eye on in order to head off potential problems (Lacity, 1993, 256-260).

Lesson 1: Public information sources portray an overly optimistic view of IT outsourcing. Reports are often made during the honeymoon period when clients first sign an outsourcing contract. The cost savings reported are still projected but sometimes assumed to be actual values. Additionally, the public reports focus on success stories because most companies do not want to advertise their failures.

Lesson 2: Outsourcing appears to be a symptom of the problem of demonstrating the value of IT. For the most part, executives view the IT function as a cost burden which cannot be ties to profitability. IT managers find it hard to justify their contribution to the organization's core business areas. To make matters more difficult, profit centers tend to over-inflate the cost of IT in order to boost the department's bottom line. Three areas which must be addressed to get a better understanding of the value of outsourcing are the internal IT accounting structure, the reporting level of the IT manager, and the direct contribution of IT to the critical business competencies.

Lesson 3: Organizational members may initiate outsourcing for reasons other than cost efficiency. Managers tend to avoid risk-taking behavior because it is not normally rewarded. They will therefore lean toward jumping on the current media bandwagon when a solution must be made for a troublesome function or technological problem.

Lesson 4: An outsourcing vendor may not be inherently more efficient than an internal department. The theories of economies of scale and specialization efficiency have yet to be positively identified in the IT arena. Smaller shops tend to have lower costs by employing older technology and maintaining tighter procedural controls. Specialization efficiency is not as big of a factor as is often advertised because many of the staff transition to the vendor awarded the contract. Table 2 shows how costs of insourcing vary based on the type of cost and size of the department (Lacity, 1995:192).

Table 2. Economies of Scale

Costs	Small IT Department	Large IT Department	Outsourcing Vendor
Technical expertise			Advantage
Opportunity cost			Advantage
Business expertise	Advantage	Advantage	
Transaction costs	Advantage	Advantage	
Shareholder costs	Advantage	Advantage	
Marketing costs	Advantage	Advantage	
Data center costs		Advantage	Advantage
Hardware costs		Advantage	Advantage
Software costs		Advantage	Advantage

Lesson 5: The internal IT department may be able to achieve similar results without vendor assistance. Such cost reduction options as data center consolidation and resource optimization may in fact allow the internal IT function to match the perceived cost savings without the additional risk.

Lesson 6: If a company decides to outsource, the contract is the only mechanism to ensure that expectations are realized. Many companies view the contractor as a partner in achieving the IT objectives. But, because the evaluation of efficiency is a zero sum game. That is, every

dollar spent for service is an expense to the business and profit for the vendor. In this respect, all aspects of the arrangement must be stipulated in the contract with provisions for growth and flexibility.

Summary

Increasing globalization and technological advancement, especially in the information services area, have created a much more competitive environment for both commercial business and government. In response, many US businesses re-engineered internal processes, invested in technology, and focused on mission essential core competencies. This streamlining allowed them to cut costs through improved efficiency and enhanced focus on what they do best. Those functions which were not defined to be part of their core businesses were turned over to outside sources to provide the needed capabilities. These outsourcing efforts contributed to many otherwise troubled US firms reestablishing their positions of world economic leadership (Barney, 1991:99-120).

With many documented commercial successes combined with a defense budget focused on weapon system modernization, the DoD is poised to introduce greater competition into its non-core activities. Establishing which currently-defined information technology activities are central to Air Force core competencies is the beginning point for identifying potential outsourcing opportunities. Subsequently, these activities can be matched against the skill sets of active duty officers and the enlisted corps. Then, the degree of fit can be evaluated to present a clearer picture of which areas are best performed internally and which could be best accomplished through commercial sources.

Conclusions drawn from the 1988 case studies by Reponen indicate systems engineering, project management, training, user support, and application software are best handled internally. Such services as programming and computer operations can be feasibly obtained externally unless these skills have been identified as core to the business of the organization (Reponen, 1993:111).

III. Methodology

Chapter Overview

This chapter describes the research method used to test the hypotheses presented in Chapter I. First, the research design and methodology are outlined. Then, a pictorial research model illustrates that design from independent through dependent variables. Next, the determinants of the outsourcing decision are described. Additionally, procedures for data collection, analysis and measurement are presented. And finally, the pilot study process and results are provided to include research instrument modification. Overall, this section will document and justify the research methodology used in this study.

Research Design and Methodology

Research design, according to Cooper and Emery, is a plan for selecting the sources and types of information used to answer the primary research question. In addition, it sets the framework for the relationships between the variables of the study. The design will also outline the necessary procedures beginning with the hypotheses and concluding with analysis of the data gathered (Cooper and Emery, 1995:114). The remainder of this section consists of a brief discussion on each classification of design including justification for the selected approach (Cooper and Emery, 1995:114-128).

A *formal study* was selected based on the need to define research questions, formulate hypotheses, specify data sources, and develop precise procedures for collection and analysis of research results. Numerous *exploratory and historical studies* have been accomplished as reviewed and documented in Chapter II. These studies provide the foundation for this formal research.

Conducting an *observational study* is not appropriate because we do not require a natural setting to gather pertinent data. Therefore, data will be collected using the *survey method.* The survey will allow for cross-sectional comparisons of a larger sample size which will increase the overall validity of the study. The goal of the data collection is to investigate both the core competency-to-task fit and its ability to predict the tendency to recommend outsourcing. The core-to-task fit and the subsequent outsourcing decision based on that fit are best identified using a self-administered survey instrument.

Cross-sectional data will be gathered through random selection of subjects and adherence to standard sampling procedures. Statistical manipulation and analysis of the findings will be based on demographic partitioning of the sample population. The *statistical* study was selected over the *case* study for two reasons. First, the results from a valid statistical study, designed for breadth rather than depth, can be generalized from the sample population to make inferences about the larger population. Providing a truly random sampling of the Air Force officer population is achieved, similarities and differences observed will be fairly representative of the population as a whole. Second, hypotheses are best tested using quantitative data, whereas the qualitative data produced from a case study would make support or rejection much more difficult (Cooper and Emery, 1995:114-128).

Research Model

The research model (Figure 2) illustrates how the requirements of the Air Force's Information Superiority core competency and the Communication-Computer officer task descriptions combine to produce the core competency-to-task fit (henceforth, core-to-task fit). The six specific requirements within Information Superiority and the ten communications-computer utilization field (33SX) tasks comprise the two variables on the left. How well respondents perceive each task fulfills the core competency

requirement will be represented by the core-to-task fit value. The degree to which the fit in turn provides insight on the tendency to outsource the task can then be quantified.

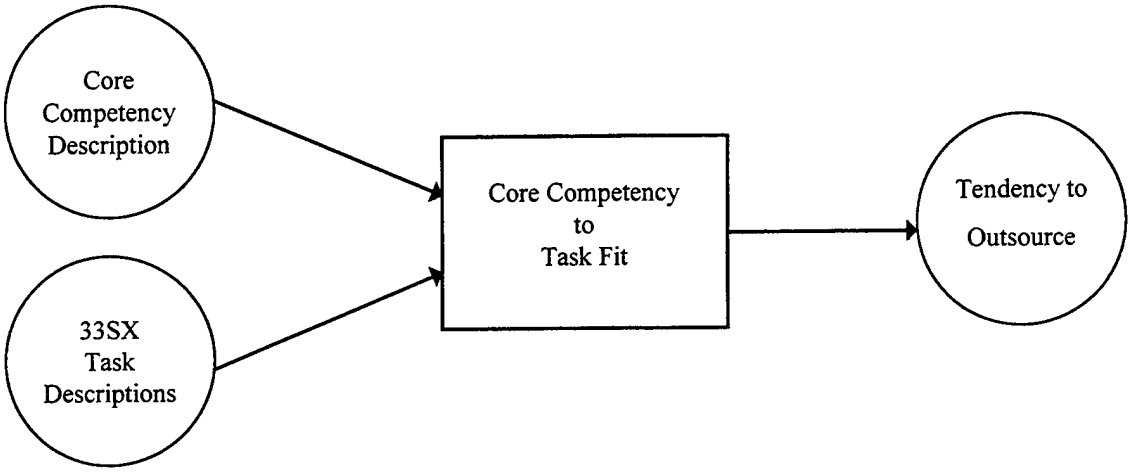

Figure 2. Research Model

Procedures

A sample of 300 Air Force officers in the grades second lieutenant through lieutenant colonel (O1 - O5) was randomly selected from the general population of Air Force officers in those grades. Approximately 150 officers currently employed in information technology occupations and 150 officers from non-information technology fields received the *Information Superiority and Outsourcing Survey* shown in Appendix A. The cost of administering the survey instrument was the primary constraint in determining the sample size of 300 officers.

In order to achieve a random and independent sample of the population, AFPC provided a list of officers from their official database using an authenticated random number generator. By utilizing a stratified sampling plan with random assignment into two groups, we will be able to compare and analyze the relevant subgroups, thereby adding breadth to the research.

The information technology occupations are identified by the 33SX Air Force Specialty Code (AFSC) with non-information technology occupations included to gather data to contrast perceptions. Additionally, the following demographic information was gathered:

a. A three-tiered **grade level** grouped as follows: O1-O2, O3, and O4-O5. These divisions are intended to further stratify managers into junior (0-4 years), mid-level (4-11 years), and more senior (11-20 years) officers to identify possible trends at varying levels of managerial experience.

b. **Supervisory status,** where the individual is either supervising at least one person or not currently performing in a supervisory capacity. The results could indicate a tendency on the part of supervisors to avoid recommending the outsourcing option based on perceived loss of authority and control.

c. A four-level information technology occupation **experience indicator** divided into these categories: No experience, 0-3 years, 4-8 years, and more than 8 years experience. Whereas the grade level provides managerial experience data, the IT experience data will indicate the amount of technical background and may identify the degree to which this knowledge influences perceptions and subsequent sourcing recommendations.

d. **Organizational affiliation**. Possible trends may surface based on operational and support officers' perceptions of information technology's contribution to the Air Force mission. As discussed in Chapter II, those within the IT organization tend to view their contributions more positively than do those whom they support. Officers belonging to operational units may perceive their role as more essential to accomplishing the goals and missions of the Air Force.

Survey Instrument

The survey is comprised of three major components of the research model: tasks, core competency requirements, and the two scales for measuring each. First, the ten task descriptions listed in Table 3 were extracted verbatim from the communications-

computer utilization field (33SX) manual (AFMAN 36-2105,165-168). Further, explanation was provided in the survey and is included in Appendix B.

Table 3. Abbreviated Task Descriptions

Task	Description
1	Plans for communications-computer systems resources, and performs system requirements definition, funding, and acquisition.
2	Manages and coordinates communications-computer systems activities.
3	Manages communications-computer systems software development and maintenance.
4	Directs communications-computer systems activities.
5	Performs engineering functions.
6	Coordinates communications-computer systems engineering activities.
7	Develops communications-computer systems software and firmware.
8	Implements software engineering discipline into Air Force software systems.
9	Provides communications-computer systems security support.
10	Maintains knowledge of current communications-computer systems commercial practices.

Next, six elements were extracted from the core competency of information superiority, as stated in *Global Engagement* (Department of the Air Force, 1997). These six elements were identified as the requirements necessary to successfully accomplish the core competency. Henceforth, the terms "requirement" and the "core" in core-to-task fit, will be used interchangeably to refer to these six elements.

Table 4. Core Competencies

	Core Competency Requirement
A	Provide joint force commanders with the capability to keep pace with information crucial to the campaign plan.
B	Provide joint force commanders the capability to incorporate information into the campaign plan.
C	Provide military leaders with an integrated and interactive picture of the entire battle space.
D	Provide global and theater representation of air, space, and surface battle spaces.
E	Provide the capability to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination.
F	Provide interoperable, integrated, and seamless information systems.

Finally, separate Likert scales were developed and used to determine the perception of core-to-task fit (Figure 3) and the task outsourcing recommendation (Figure 4). The five ratings were arbitrarily created to cover the full spectrum of possible positions while providing adequate separation between intervals. The scales were validated by peer review and subsequently tested in the pilot study explained in the final section of this chapter. Each respondent was asked to read the task description and indicate, using the scale, how well the task provides the capability to satisfy the core competency requirement (Cooper and Emery, 1995:179-180). For example, in the case of task 1, the respondent would answer how well he or she believed the task as described, supported each of the six core requirements. How well the task supported (fit with) the requirement would indicate the perception of core-to-task fit.

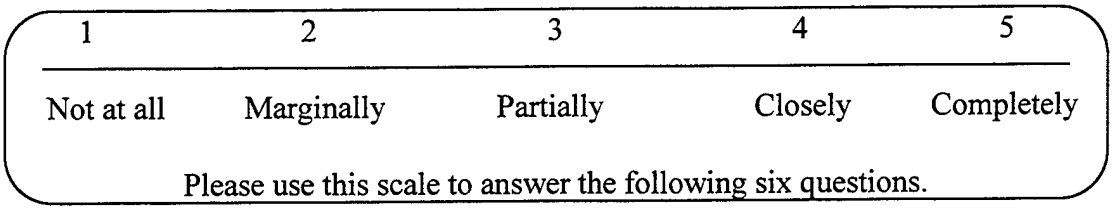

Figure 3. Core-to-Task Fit Scale

For each of the ten tasks, an outsourcing recommendation was requested using the scale shown (Figure 4). The degree to which the core-to-task fit influenced the outsourcing recommendation will be analyzed in Chapters Four and Five.

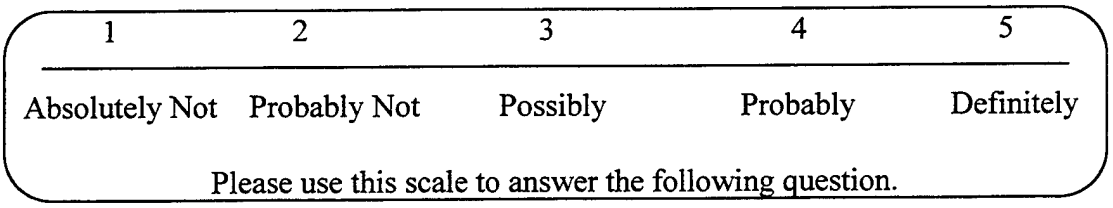

Figure 4. Outsourcing Recommendation Scale

Statistical Analysis

Data Measurement. Many attitude scales are presumed to be interval data assuming near equality throughout the scaled continuum (Cooper and Emory, 1995:146). Interval scaled data has the power of nominal and ordinal scales plus provides for equality of each subinterval. Employing interval data will allow for use of the arithmetic mean as the measure of central tendency. Parametric statistical analyses such as one- and two-tailed t-tests and a multiple regression model will be utilized. A confidence level of 90% will be used due to the exploratory nature of the study.

Descriptive Statistics. The Pearson (product moment) correlation coefficient will be used to show the magnitude and direction of the most significant core-to-task fit for each of the 10 task outsourcing decisions. Both correlation with a negative and a positive

coefficient were considered to determine the relationship between core-to-task fit and the outsourcing decision (direct or inverse relationship).

Arithmetic means, standard deviations, and variances for the six independent variables and single dependent variable are provided. These same values are then tabulated and analyzed for each of the 70 survey items. Also, assumptions of normality within the sample will be discussed and evaluated.

Next, ten sets of multiple regressions will be applied to the data in order to identify which tasks are most relevant and explain the most variance for the outsourcing decisions. Figure 5 shows the core-to-fit and outsourcing relationship for each of the ten tasks.

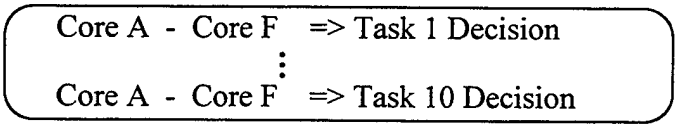

Figure 5. Core-to-Task Fit and Outsourcing Relationship

Figure 6 below shows the core-to-task fit for each of the six core requirements (A - F) across the ten tasks. Fifteen difference of means tests will be applied across each of the six core competencies to uncover possible significance. Furthermore, analysis of the data along demographic lines will be evaluated to understand any differences between rank levels, age groups, and information technology experience.

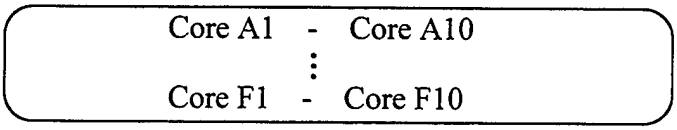

Figure 6. Core-to-Task Fit by Core Requirement

Based on the expert opinion of the Air Force Institute of Technology faculty and the experience of previous survey mailings, a return rate between 20 and 40 percent is anticipated. Therefore, we can expect between 60 and 120 completed surveys to be

returned for analysis. We can also anticipate a greater percentage of the completed surveys to come from the IT officers as they possesses a greater knowledge of the subject area and should take a greater interest in the issue.

Pilot Study

In order to validate the survey instrument, a pilot study was conducted using graduate school students within the Air Force Institute of Technology School of Logistics and Acquisition Management. A group of 15 students in the information management program and 15 students in non-information technology related fields of study were surveyed. All participants were given the survey with no additional instructions or guidance in order to simulate the actual survey environment and conditions. In addition, feedback was requested from participants to identify areas for instrument improvement.

As a result of the pilot study, minor alterations were made to the cover sheet instructions. Also, demographic formatting suggestions were incorporated in the final survey to clarify what information was being requested. Responses from the participants indicated that the survey was somewhat lengthy and moderately difficult to complete for both IT and non-IT groups. Although useful for future analysis and findings, this information did not lead to any changes in the survey itself as unaltered task descriptions and competency requirements were necessary to maintain content validity.

Summary

This chapter described the planned methodology to be followed including justification for approach, procedures, and instrument validation. Chapter IV will outline the results of the survey and multiple statistical analyses. Chapter V will discuss the significance of those results, develop conclusions, and propose recommendations to include potential areas for further study.

IV. Results and Analysis

Chapter Overview

Chapter IV presents the results of the *Information Superiority and Outsourcing Survey* and the descriptive and parametric statistics of the data. First, the general demographics and distribution of responses will be discussed. Next, the results of the core-to-task fit data will be analyzed in conjunction with the investigative questions and hypotheses. And then the outsourcing decision statistics will be highlighted using the full regression model across the six core competency requirements and ten task areas. Conclusions based on this data will be presented in Chapter V.

Survey Results

General Demographics. The *Information Superiority and Outsourcing Survey* (Appendix A), was sent to 300 Air Force officers in the grades of second lieutenant through lieutenant colonel. As shown in Table 5, a small percentage of those 300 respondents (14 surveys or 4.7%), could not be reached using the AFPC database address.

Table 5. Survey Results

SURVEY RESULTS		
ITEM	NUMBER	PERCENT OF TOTAL
SURVEYS SUCCESSFULLY DISTRIBUTED	286	95.3
COMPLETED SURVEYS RECEIVED	79	26.3

Of the 79 total surveys returned, almost 60 percent of the respondents were currently in the information technology field. Likewise, approximately 60 percent were performing supervisory duties. As expected, the rate of return for officers in the

information technology career field was higher (by nearly 50 percent) than that of non-IT officers. This disparity is most likely due to the difficulty of completing the survey for those not currently in the career field, combined with the fact that those in the career field have a vested interest in the subject and are therefore more likely to respond.

Table 6. Results Based on Occupation

SURVEY RESULTS		
ITEM	NUMBER	PERCENT OF TOTAL
INFORMATION TECHNOLOGY OCCUPATIONS	47	59.5
NON-INFORMATION TECHNOLOGY OCCUPATIONS	32	40.5

As can be seen in Table 7, a reasonable cross-section of grade levels was achieved. While captains comprise 52 percent of the sample, the senior and more junior officer categories were also well represented.

Table 7. Results Based on Rank

SURVEY RESULTS		
ITEM	NUMBER	PERCENT OF TOTAL
RANK O1 - 02	20	25.3
RANK O3	41	51.9
RANK O4 - O5	18	22.8

Table 8 shows that most respondents had some level of experience in the information technology field, while just less than a third had no experience at all. The distribution across these categories is a fairly even cross-section of the sample population.

Because non-information technology respondents made up over 40 percent of the sample, a 31.6 percent rate for the "no information technology experience" category is well within expected range.

Table 8. Results Based on Experience

SURVEY RESULTS		
ITEM	NUMBER	PERCENT OF TOTAL
NO INFORMATION TECHNOLOGY EXPERIENCE	25	31.6
0 - 3 YEARS EXPERIENCE	14	17.7
4 - 8 YEARS EXPERIENCE	22	27.8
OVER 8 YEARS EXPERIENCE	18	22.9

Distribution of Responses. The pattern of response for each of the six information superiority core requirements (A - F) is presented in the following section. As described in Chapter III and shown again below, the requirements are the component parts of the

Table 9. Core Competency Requirement

	CORE COMPETENCY REQUIREMENT
A	Provide joint force commanders with the capability to keep pace with information crucial to the campaign plan.
B	Provide joint force commanders the capability to incorporate information into the campaign plan.
C	Provide military leaders with an integrated and interactive picture of the entire battle space.
D	Provide global and theater representation of air, space, and surface battle spaces.
E	Provide the capability to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination.
F	Provide interoperable, integrated, and seamless information systems.

core competency (and the "core" portion of "core-to-task fit") of information superiority, taken directly from *Global Engagement*. These core requirement identifiers with the associated explanation at the right are listed in the rows of Table 9. The task descriptions, shown in Table 10 below are taken verbatim from AFMAN 36-2105, and are the "task" component of the "core-to-task fit." In the survey, each respondent was asked to rate how well each of the ten tasks supported each core competency requirement. For example, the respondent would rate how well the task, "Plans for communications-computer systems resources, and performs system requirements definition, funding, and acquisition (Task 1)," supports the requirement, "Provide joint force commanders with the capability to keep pace with information crucial to the campaign plan (Requirement A)." The value assigned then represented the perceived core-to-task fit.

Table 10. AFMAN 36-2105 Task Descriptions

Task	AFMAN 36-2105 TASK DESCRIPTIONS
1	Plans for communications-computer systems resources, and performs system requirements definition, funding, and acquisition.
2	Manages and coordinates communications-computer systems activities.
3	Manages communications-computer systems software development and maintenance.
4	Directs communications-computer systems activities.
5	Performs engineering functions.
6	Coordinates communications-computer systems engineering activities.
7	Develops communications-computer systems software and firmware.
8	Implements software engineering discipline into Air Force software systems.
9	Provides communications-computer systems security support.
10	Maintains knowledge of current communications-computer systems commercial practices.

In Table 11, the rate of response for each core-to-task fit based on the specific requirement is presented in columns using the 5 point Likert scale from the survey. Of note is the central tendency effect for each of the requirements separately and in total,

with over 85 percent of the responses falling in the 2 - 4 range. Item three ("partially") illustrates this point, garnering over one third of the responses suggesting that the core-to-task fit while items two through four each received nearly three quarters of the possible selections for the outsourcing decision. As explained in Chapter III, each respondent was also asked the question, "Would you recommend this task be outsourced?" The distribution of those 790 outsourcing decisions (79 respondents, 10 tasks) is provided at the bottom of the table.

Table 11. Categorized Survey Results

DISTRIBUTION OF RESPONSES						
	NOT AT ALL	MARGINALLY	PARTIALLY	CLOSELY	COMPLETLY	MEAN
REQUIREMENT	(1)	(2)	(3)	(4)	(5)	SCORE
A	84	165	301	216	24	2.913
	10.6%	20.9%	38.1%	27.3%	3.0%	
B	68	196	290	210	26	2.911
	8.6%	24.8%	36.7%	26.6%	3.3%	
C	88	217	286	174	25	2.786
	11.1%	27.5%	36.2%	22.0%	3.2%	
D	109	222	271	172	16	2.701
	13.8%	28.1%	34.3%	21.8%	2.0%	
E	158	207	267	145	13	2.554
	20.0%	26.2%	33.8%	18.4%	1.6%	
F	35	138	323	234	60	3.185
	4.4%	17.5%	40.9%	29.6%	7.6%	
TOTALS	542	1145	1738	1151	164	2.842
	11.4%	24.2%	36.7%	24.3%	3.5%	
	ABSOLUTELY NOT	PROBABLY NOT	POSSIBLY	PROBABLY	DEFINITELY	MEAN
	(1)	(2)	(3)	(4)	(5)	SCORE
OUTSOURCING	133	179	193	187	98	2.922
DECISION	16.8%	22.7%	24.4%	23.7%	12.4%	

Additionally, each set of responses for the outsourcing decision and the core-to-task fits were normally distributed with a slight skew to the left of the scale. The only exception was that of requirement E which was more heavily skewed to the left.

Investigative Questions and Hypotheses

The results of the analysis will now be highlighted in order to address the three investigative questions and associated hypotheses.

Investigative Question One. Is there a significant relationship between the stated IT officer skill set and the skill set needed to meet the Air Force's core competency of information superiority?

Hypothesis 1: *A significant difference exists between core-to-task fits (perceived level of support) for each core requirement.*

The core competency requirements are shown in Table 12; those with the highest degree of perceived fit are listed first. Significant differences in perceptions were apparent across all six core requirements with the exception of requirements A and B. Based on the perceptions of respondents, the core competency requirement of "providing interoperable, integrated, and seamless information systems" (requirement F) was found to be the one best supported by the current 33XX task descriptions. Following F, requirements A and B, which were rated at a statistically comparable degree of fit, were seen to be the next best supported. The similar fit response for requirements A and B is most likely due to their close wording of the descriptions. Requirements C and D, respectively were considered to be somewhat less supported by the tasks but still considerably more than that of E. Requirement E ("Provide the capability to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination.") was perceived to be the least supported requirement of the information superiority core competency.

Table 12. Requirements Ordered by Level of Core-to-Task Fit

	CORE COMPETENCY REQUIREMENT
F	Provide interoperable, integrated, and seamless information systems.
A and B	Provide joint force commanders with the capability to keep pace with information crucial to the campaign plan. Provide joint force commanders the capability to incorporate information into the campaign plan
C	Provide military leaders with an integrated and interactive picture of the entire battle space.
D	Provide global and theater representation of air, space, and surface battle spaces.
E	Provide the capability to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination.

Looking from the perspective of the core requirements in the first column shown in Table 13, fifteen difference of mean comparisons were made to determine the significance of the mean values of each perceived fit. The fourth column "significant difference" indicates whether the difference between the two means is significant at the alpha equals 0.10 level. As illustrated, all but one of the differences between individual core-to-task fits did prove to be significant. One other interesting point is the fact that all but one of the mean fits fell within the 2 ("marginally") to 3 ("partially") range. Only the mean for requirement F began to approach a 4 ("close") fit rating.

From the results, we can conclude at the alpha equals 0.10 level that a significant difference exists between core-to-task fits (perceived level of support) for each core requirement. From the distribution of the responses, the general perception is that the stated skill set of the 33XX officers at best, only partially coincide with that needed to meet the information superiority core competency requirements.

Table 13. Perceived Core-to-Task Fit

PERCEIVED CORE-TO-TASK FIT BASED ON CORE REQUIREMENTS				
CORE REQUIREMENT	FIRST MEAN	SECOND MEAN	SIGNIFICANT DIFFERENCE	p-VALUE
A - B	2.913	2.911	NO	0.979
A - C	2.913	2.786	YES	0.012
A - D	2.913	2.701	YES	< 0.001
A - E	2.913	2.554	YES	< 0.001
A - F	2.913	3.185	YES	< 0.001
B - C	2.911	2.786	YES	0.0129
B - D	2.911	2.701	YES	< 0.001
B - E	2.911	2.554	YES	< 0.001
B - F	2.911	3.185	YES	< 0.001
C - D	2.786	2.701	YES	0.097
C - E	2.786	2.554	YES	< 0.001
C - F	2.786	3.185	YES	< 0.001
D - E	2.701	2.554	YES	0.005
D - F	2.701	3.185	YES	< 0.001
E - F	2.554	3.185	YES	< 0.001

Investigative Question Two. Is there a significant difference in the way IT professionals and non-IT professionals evaluate the correlation between these skill sets?

Hypothesis 2: *Information technology professionals will perceive a higher correlation between the specified tasks than non-IT professionals.*

As illustrated in Table 14, there was generally a statistically significant difference between the perceptions of "fit" between IT and non-IT officers. Both groups viewed the fit for requirement F to be the strongest and that of requirement E, the weakest. For five of the six requirements, information technology officers saw a significantly better fit than did those officers outside the IT career field, as expected. Even though non-IT officers perceived a better fit for requirement E, the difference was not statistically significant at the 90% confidence level. Of note is that the recommendation to outsource those tasks was much higher for IT-officers than non-IT officers. In conclusion, the results support the hypothesis that information technology professionals will perceive a higher

correlation between the specified tasks and the core competency requirements than non-IT professionals.

Table 14. Perceived Core-to-Task Fit by Occupation

PERCEIVED CORE-TO-TASK FIT BASED ON OCCUPATION					
CORE REQUIREMENT	INFORMATION TECHNOLOGY MEAN	NON-INFORMATION TECHNOLOGY MEAN	t-STAT	SIGNIFICANT 90% (1.67)	p-VALUE
A	3.002	2.781	2.965	YES	0.0031
B	2.968	2.828	1.913	YES	0.0561
C	2.874	2.656	2.978	YES	0.0029
D	2.768	2.603	2.213	YES	0.0272
E	2.548	2.562	-0.175	NO	0.8605
F	3.234	3.112	1.735	YES	0.0831
OUTSOURCE	3.010	2.791	2.395	YES	0.0168

When based on rank, the differences between the perceived core-to-task fits were less dramatic. Only half of the requirements indicated a difference between junior and senior officers. Junior officers were identified as those in grades O1 through O3 while the remaining officers, O4 through O5, were stratified into the senior officer category. Interestingly, five of the six requirements showed a less than midpoint average for the perceived fit, regardless of seniority. Furthermore, the senior ranking officers were nearly 10 percent more likely to recommend the outsourcing option. One possible reason for this contrast may be a greater level of job security for senior officers. Whereas junior officers may view the outsourcing option as a threat to individual jobs or a sustained way of life, senior officers may look upon it as a post-Air Force contracting opportunity. These types of biases could account for some of the unexplained variance in the model.

Table 15. Perceived Core-to-Task Fit Based on Rank

PERCEIVED CORE-TO-TASK FIT BASED ON RANK					
CORE REQUIREMENT	JUNIOR OFFICER O1-O3	SENIOR OFFICER O4-O5	t-STAT	T-CRITICAL 90% (1.65)	p-VALUE
A	2.914	2.898	0.192	NO	0.847
B	2.890	2.982	-1.177	NO	0.239
C	2.775	2.822	-0.597	NO	0.551
D	2.669	2.816	-1.846	YES	0.066
E	2.483	2.811	-3.957	YES	< 0.001
F	3.211	3.089	1.658	YES	0.098
OUTSOURCE	2.861	3.136	-2.618	YES	0.009

Investigative Question Three. Does the degree to which these skill sets correlate, indicate or predict a tendency to outsource these tasks and capabilities?

Hypothesis 3a: *The tendency to outsource an IT function will be inversely related to the strength of the core-to-task fit (information superiority core competency requirement and AFMAN 36-2105 task).*

Results of the multiple regression run against the six core requirements across the full set of ten tasks is summarized in Table 16. The model was evaluated at the alpha equals 0.10 level using 790 values from respondents' perceptions of fit and tendency to outsource. Overall, the full ten-task model receives an analysis of variance F-value of 16.09 with $p < 0.001$. Therefore, the conclusion that at least one of the coefficients is useful and that the overall model is useful at the alpha equals 0.10 level is supported. Further study indicates that three of the six core-to-task fits were significant at the alpha equals 0.10 level. A more telling point is that one of the significant core-to-task fits actually provides a positive (or direct) influence on the tendency to outsource. From a core competency requirements perspective "core", this finding does not support the

hypothesis of inverse relationship between core-to-task fit and the outsourcing recommendation across all requirements. The model does however, provide both direct and inverse predictive capabilities depending on the requirement being considered.

Table 16. Full Multiple Regression Model Across Core Requirements

FULL TEN TASK MODEL MULTIPLE REGRESSION						
SUMMARY OUTPUT						
Statistics						
Multiple R	0.331					
R Square	0.109					
Adj R Square	0.103					
Std Error	1.209					
Observations	790					
	Coefficients	*Standard Error*	*t-Stat*	*p-value*	*Lower 90.0%*	*Upper 90.0%*
Intercept	4.203	0.167	25.074	< 0.001	3.927	4.48
A	-0.415	0.083	-5.014	< 0.001	-0.550	-0.278
B	0.021	0.091	0.228	0.819	-0.129	0.171
C	0.191	0.083	2.307	0.021	0.055	0.327
D	-0.160	0.078	-2.047	0.041	-0.289	-0.031
E	-0.001	0.055	-0.017	0.986	-0.092	0.09
F	-0.073	0.052	-1.386	0.166	-0.159	0.014

In contrast, when viewed from the task side of the core-to-task fit, the results are somewhat different. As stated previously, the task side of the core-to-task fit answers the question, "How well does each task support the entire range of six core competency requirements?"

Table 17 gives the rank order of core-to-task fit based on the multiple R values. The rankings do not isolate the positive and negative coefficients, but do indicate the degree to which the tasks contribute to the predictive value of the model.

Table 17. Abbreviated Task Descriptions

TASK	DESCRIPTION	MULTIPLE R
8	Implements software engineering discipline into Air Force software systems.	0.4927
2	Manages and coordinates communications-computer systems activities.	0.4634
10	Maintains knowledge of current communications-computer systems commercial practices.	0.4328
4	Directs communications-computer systems activities.	0.4279
3	Manages communications-computer systems software development and maintenance.	0.4012
1	Plans for communications-computer systems resources, and performs system requirements definition, funding, and acquisition.	0.3812
6	Coordinates communications-computer systems engineering activities.	0.3546
9	Provides communications-computer systems security support.	0.3513
7	Develops communications-computer systems software and firmware.	0.3489
5	Performs engineering functions.	0.3217

Table 18 shows how the degree of core-to-task fit significantly affected the resulting outsourcing recommendation. The "N" indicates a negative or inverse relationship whereas a "P" indicates a positive or direct relationship between the fit and the subsequent recommendation. Only those highlighted intersections were statistically significant at an alpha of 0.10. Perfect correlation, as hypothesized, would be depicted with all fits (row/column intersections) as negative ("N") and significant (shaded). As reflected in the table, this is not the case. Of the 60 core-to-task fits (6 core requirements for each of 10 tasks), 22 provide a positive correlation with the remaining 38 providing a negative influence on the outsourcing decision. Furthermore, one third of the 60 could not be considered statistically significant at an alpha of 0.10.

To illustrate, Task 1 is shaded across all requirements (A - F) which indicates significant contribution of all six core-to-task fits to the dependent variable (tendency to recommend outsourcing the task). As can been seen, requirements A, B, C, D and F provide a negative or inverse contribution ("N") to the dependent variable, with E as the only positive component. All six fits were also statistically significant for task ten, although half of them provided a positive influence on the outcome.

Table 18. Relationship of Core-to-Task Fit and Outsourcing Decision

SIGNIFICANCE OF THE RELATIONSHIP BETWEEN CORE-TO-TASK FIT AND THE OUTSOURCING DECISION						
	CORE COMPETENCY REQUIREMENT					
TASK	A	B	C	D	E	F
1	N	N	N	N	P	N
2	N	P	P	N	N	P
3	P	N	P	N	P	N
4	N	N	N	N	P	N
5	N	N	N	P	P	N
6	N	N	P	P	N	N
7	N	P	P	P	N	N
8	N	N	P	N	N	P
9	N	P	P	N	N	N
10	N	P	P	N	N	P

Key	N	= negative (or inverse) relationship
	P	= positive (or direct) relationship
		= significant relationship ($p < 0.10$)

One conclusion which may be drawn from these results would be that certain requirements, such as A and F provide strong negative correlation across tasks which may mean either the tendency to outsource where a loose fit exists or to not recommend outsourcing when a close fit is perceived. In both of these examples, the fit was

considered "close," yet the outsourcing decision leaned toward retaining the skills in-house.

Hypothesis 3b: *Information technology professionals will recommend outsourcing of IT functions at a lower rate than non-IT professionals.*

Surprisingly, the evidence from the survey did not support this hypothesis. By returning to the bottom of Table 14, one can see that information technology officers were most likely to recommend outsourcing (mean 3.01 to 2.79). The possible rationale for this unexpected result will be presented in Chapter V.

Summary

Chapter IV has been a presentation and analysis of the results of this exploratory study. In summary, the findings supported hypotheses 1 and 2, but did not support hypotheses 3a or 3b. This means a significant difference exists between the core-to-task fits for each core competency (1) and that IT professionals will perceive a higher correlation than non-IT officers (2). But that the inverse relationship between core-to-task fit and the subsequent outsourcing decision (3a) and the hypothesized higher rate of non-IT officers to recommend outsourcing (3b) were not supported. In Chapter V, a discussion of the significance of these findings along with limitations, conclusions, and recommendations will be addressed.

V. Discussion

Chapter Overview

In Chapter IV, results and analyses of the collected data in the framework of the investigative questions was presented. Chapter V will now discuss the significance of these findings, identify potential limitations of the research, and offer conclusions and recommendations. In addition, possible related areas for future research are considered.

Significance of Findings

Investigative Question One. Is there a significant relationship between the stated IT officer skill set and the skill set needed to meet the Air Force's core competency of information superiority?

Answering this question provides an indication of whether the current Air Force 33XX officer is perceived to have the skills necessary to accomplish the strategic mission of information superiority and, whether the requirements of information superiority are viewed as valid.

As viewed from the core requirements side of the core-to-task fit value, significant differences are identified between the mean fits. Only requirements A and B were viewed as having comparable fits (2.913 and 2.911), with all other comparative differences viewed as significant. Even though these correlations are based on perceptions, it is often perceptions which dictate policy. Therefore, understanding the way people view the capabilities of 33XX officers to meet the mission requirements could provide useful information when deciding on a personnel sourcing alternative.

Obviously, the next step based on these identified differences is to attempt to understand why certain requirements are viewed to be better supported by the current set

of 33XX tasks (duties and responsibilities). For instance, the ranking of these correlations imply 33XX officers support the requirement to "provide interoperable, integrated, and seamless information systems" to a greater degree than they support the requirement to "provide the capability to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination. This may indicate a true shortcoming in the match between support needed ant support provided. Another explanation could be that officers do not have a clear understanding of the actual core competency requirements or of the skills necessary to fulfill these requirements? Further research will be needed to isolate these effects.

The core competency which received the highest core-to-task fit value was requirement F (Provide interoperable, integrated, and seamless information systems). Because this requirement is stated in broad terms, it is reasonable to perceive that this capability is currently being provided. Also, this requirement matches well with many of the duties and responsibilities (task descriptions) as outlined in AFMAN 36-2105. Unfortunately, while this was seen as the best supported core competency requirement, its mean score of 3.185 was only slightly higher than the mid point. What this means is that none of the core requirements, on average, were seen to be "completely" or even "closely" supported by 33XX officers. Undoubtedly, this lack of perceived support across the range of requirements should be an area of great concern for the 33XX career field managers and Air Force decision makers.

Assuming the Air Force leadership has accurately defined the core competencies and aligned them with national defense strategy, officers must become better educated in the requirements to accomplish these missions. In addition, the Air Force Personnel Center (AFPC) must immediately validate the 33XX task descriptions or risk hiring on additional officers who do not have the skill set necessary to support the stated missions.

Investigative Question Two. Is there a significant difference in the way IT professionals and non-IT professionals evaluate the correlation between these skill sets?

Although the information technology officers believed 33XX officers supported each of the requirements better than did the non-information technology officers did, both groups had nearly the same relative rankings This is illustrated by the fact requirement F received the highest fit rating from both groups and requirement E received the lowest. This comparable observation adds validity to the rankings and the relative support, or lack thereof, for each requirement.

As mentioned before, perceptions are often more important in decision making than reality. Because many decisions directly affecting the communications, computer and information field will be made by those outside of the career field, the accuracy of their perceptions will be vital to executing informed sourcing decisions. This study points to the fact that not only do non-IT officers perceive a disconnect between requirements and necessary support provided by 33XX officers, but IT officers do as well.

Investigative Question Three. Does the degree to which these skill sets correlate indicate or predict a tendency to outsource these tasks and capabilities?

One observation can be made with regard to the predictive capability of the model. The model does provide a predictive capability based on the fact five of the six factors contribute significantly to the dependent variable (outsourcing decision). But, contrary to the hypothesis, the relationship of that tendency (direct or inverse) was not always inverse. Because a close fit (i.e., good support for the requirement) sometimes led to a higher tendency to outsource, it seems as though additional factors outside of the model are involved. One primary factor may be the perception of whether the Air Force should employ officers to do that particular skill or not in the first place. How this relationship is perceived may be more predictive of the outsourcing decision than how

well the current missions are being supported. Given the overall tendency to avoid recommending the outsourcing option, this may merely point to a lack of understanding of what outsourcing really entails or possibly even a philosophical difficulty with the concept.

One additional explanation for this significant difference in the tendencies to recommend outsourcing, may be that the IT officer has a better understanding of what could be safely outsourced and therefore would be more likely to feel comfortable recommending that option. This disconnect, regardless of the underlying reason, provides a logical explanation of why the 33XX career field is being targeted for personnel cuts of over 25 percent.

Additional Observations

Some of the most telling observations came from actual comments on the returned surveys. One comment from a 33XX major or lieutenant colonel read, "These are not tasks. They are more like objectives and are very poorly worded at that!" Other comments referring to the task descriptions such as, "Where did you come up with these?," leads one to believe some 33XX officers have not recently reviewed their career field job descriptions. These comments are interesting given the descriptions provided on the survey were taken directly from AFMAN 36-2105.

One other comment from a more senior officer signifies an area of potentially serious concern. This particular respondent's survey was returned with only demographic information completed, but did contain a bolded statement written across the top saying simply, "I don't believe in outsourcing!!!" Quoting once again from AMR Corporation senior vice president Max Hopper, he said, "...the question is not *whether* to outsource, but *how much* to outsource, and *to whom* (Currid, 1994:133)." To **not** consider one of these sourcing options, which in the right circumstance may be beneficial to

accomplishing the Air Force mission is obviously an emotional response to a charged issue.

Unfortunately, clarification of these comments could not be obtained as the respondents did not provide the means to contact them. The bottom line is that the Air Force needs officers, both within and outside of the career field, who understand the personnel options, can weigh the merits of each option, and make informed decisions, focusing on effective accomplishment of the Air Force's core missions.

Limitations of the Study

Probably the most limiting factor of this study was the long and complicated survey. It was important to use the task descriptions directly from the Air Force Manual, even though quite lengthy, and the exact terminology of the information superiority core competency requirements. Because these descriptions are intended to be comprehensive, trying to grasp the major component of each of the ten tasks proved to be very difficult. Also, the technical nature of some of the expanded descriptions made the assignment that much more difficult for non-information technology officers.

Another limitation was assessing the respondents' understanding of personnel sourcing in general and the concept of *out*sourcing specifically. Gathering this baseline information beforehand could have shed light on where a respondent stood on the issue, but might also have induced bias when completing the survey. With this in mind, it was decided to provide very little background on the subject in order to avoid this effect.

Finally, one additional limiting factor was the exploratory nature of the research. This study used a significance level of alpha equals 0.10. While many studies often use a more conservative level such as alpha equals 0.05, it was felt that 0.10 was appropriate given the exploratory nature of this research. This limitation is somewhat mitigated by

the fact that almost all statistically significant findings would also have been significant at an alpha equal to 0.05.

Conclusions and Recommendations

Based on the pattern of responses across most of the returned surveys, a few general observations can be made. First, many officers have neither an understanding of the strategic core competency requirements of information superiority nor the duties and responsibilities of the communication, computer, and information field. In the era of tight budgets and personnel reductions, this ignorance could lead to uniformed recommendations which, in turn, could adversely affect the combat readiness of the Air Force. Without a complete understanding of how 33XX officers contribute to the strategic mission, accurate input to those officials deciding how best to structure the force to accomplish that mission cannot be provided.

Second, once the requirements are properly defined, qualified officers must be trained with a focus on skills specifically defined to meet these core competency requirements. Because the Air Force leadership has outlined a specific strategy for information, it is incumbent upon everyone in the information field to develop their skills (AFMAN 36-2105) around that strategy. The skill set must be identified and aligned to coincide with that high-level Air Force strategy—not just a laundry list of every possible information-related duty. Most importantly, these steps must be taken now due to the long lead time necessary to bring qualified personnel on board.

Suggestions for Future Research

Because this paper touched on three crucial areas pertinent to the future of the Air Force (core competencies, personnel skill set evaluation, and sourcing alternatives),

numerous questions can be forwarded for future investigation. The following list identifies some of those areas:

1. To what degree is information superiority truly perceived and understood to be a core competency? What business is the Air Force as an organization actually in and should we outsource what are determined not to be AF core competencies?

2. How do we best determine whether a duty position supports a stated core requirement (the core-to-task fit)?

3. Does information warfare (IW) align better with military operations than information technology and hence better describe the AF core competency of information superiority?

4. To what degree should the decision to outsource IT functionality be cost driven or core competency focused?

5. What is the correlation between the degree to which wartime and peacetime duties coincide (mission essentiality) and the tendency to outsource those duties and positions?

6. How significant are mobility, security, and commander flexibility as factors to consider for the outsourcing decision? Is the need for enhanced security for military operations a factor to maintain a "blue suit" or "in-house" IT capability and are military security requirements greater than those in the commercial sector? How can the AF expand existing commercial outsourcing decision models to include such military-specific factors?

Summary

Secretary of Defense William S. Cohen states in the 1997 Quadrennial Defense Review (QDR) sent to Congress, "The time has come to step into the future, to look at the world ahead and ask, what will America's role be (Cohen, 1997b)?" The same question can be asked to understand what strategic role the 33XX officer will play in defining the

future of Air Force core competencies. Secretary Cohen issues an obvious warning to those officers not focused on the strategic core competencies. He points out,

> We need to cut our support tail in order to preserve our combat tooth and protect our people and their quality of life. Our infrastructure is still too large for our force structure today. Our purchasing system is still too cumbersome, slow and expensive. We still do too many things in-house that we can do better and cheaper through outsourcing. (Cohen, 1997b)

The message is clear. Understand the strategic missions of the Air Force and align the individual unit mission with those missions. The more closely individual tasks, duties, and responsibilities fit within the requirements of the core competencies and strategic vision, the closer the association with the operational "tooth." In essence, this study explored how the defined core requirements and supporting tasks aligned more closely with "tail" than with "tooth" as defined by Secretary Cohen. In this regard, the research highlights the need to validate information superiority core competency requirements and then develop, train, and manage 33XX officers to support those requirements. The alternative to this mission accomplishment focus is to be left holding the "tail" of the cumbersome and unresponsive infrastructure and thus become a prime target for the outsourcing option!

Appendix A: Information Superiority and Outsourcing Survey

Air Force
Core Competency Survey
Information Superiority and Outsourcing

Instructions:

You have been selected to assist in an Air Force authorized (SCN 97-59) survey. This survey consists of a group of seven questions applied to ten task descriptions. Please complete the information on the form below. Then read the task definition and complete the associated questions on the bubble sheet provided. This survey requires approximately 20 minutes to complete. All responses will remain confidential. Thank you for your assistance.

Please check the appropriate response (one per block).

1. Current Occupation:

☐ Information Technology Field (33SX) ☐ Non Information Technology Field

2. Grade:

☐ O1-O2 ☐ O3 ☐ O4-O5

3. Supervisory status:

☐ Currently a supervisor ☐ Not currently a supervisor

4. Experience in an Information Technology Occupation:

☐ None ☐ 0-3 years ☐ 4-8 years ☐ More than 8 years

5. Organizational Affiliation:

☐ AFSPC ☐ AETC ☐ AFMC ☐ ACC ☐ AMC ☐ USAFE ☐ AFIA ☐ USAFA

☐ PACAF ☐ AFCA ☐ AFPC ☐ AWS ☐ AU ☐ AFSOC ☐ STRATCOM

☐ AFNA ☐ AFOSI ☐ AFRS ☐ ANG ☐ AFSA ☐ AFROTC ☐ AFRC ☐ OTHER

For the purpose of this survey, consider the following terms to synonymously refer to transferring execution of a current capability to a non-Air Force agency. ***Outsourcing*** is defined as the transfer of a function performed in-house to an outside provider while retaining control and responsibility via a service contract. ***Privatization*** is the transfer of the ownership of function(s) and/or business assets (HQ USAF/SC, 1996).

Task 1. Plans for communications-computer systems resources, and performs system requirements definition, funding, and acquisition.

Task Expansion: Identifies and analyzes communications-computer systems resources needed for command, control, communications, and intelligence flight operations; Joint; and other mission areas. Develops programming documents such as mission need statements, communications-computer systems requirements document, and inputs into the five year defense plan. Develops and implements policies and plans for mission requirements. Chairs or participates in boards which perform technical review and evaluation of contractor proposals.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

1. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

2. ...the ability for joint force commanders to incorporate information into the campaign plan?

3. ...military leaders with an integrated and interactive picture of the entire battle space?

4. ...global and theater representation of air, space, and surface battle spaces?

5. ...capabilities to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

6. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

7. Would you recommend this task be outsourced?

Task 2. Manages and coordinates communications-computer systems activities.

Task Expansion: Coordinates with system users to meet operational needs. Develops customer education programs. Develops and coordinates procedures for operation during system outages and degraded operations, or downtimes for maintenance. Reviews operations and maintenance data, evaluates systems, and projects future requirements. Prepares annexes to operations plans and orders, commanders' estimates of situations, operations orders, and programming plans. Coordinates with other agencies to ensure effective communications-computer systems planning, implementation, operation, logistics, support, and use of communications-computer systems. Advises commanders on the status and capabilities of communications-computer systems.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

8. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

9. ...the ability for joint force commanders to incorporate information into the campaign plan?

10. ...military leaders with an integrated and interactive picture of the entire battle space?

11. ...global and theater representation of air, space, and surface battle spaces?

12. ...capabilities to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

13. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

14. Would you recommend this task be outsourced?

Task 3. Manages communications-computer systems software development and maintenance.

Task Expansion: Manages the software development effort through the life cycle from requirement analysis to implementation and fielding. Translates system operational concepts, requirements, architectures, and designs into detailed engineering specifications and criteria for acquisition and installation of standard equipment and facilities into operating systems. Prepares engineering plans for installing, modifying, and removing communications-computer systems facilities.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

15. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

16. ...the ability for joint force commanders to incorporate information into the campaign plan?

17. ...military leaders with an integrated and interactive picture of the entire battle space?

18. ...global and theater representation of air, space, and surface battle spaces?

19. ...capabilities to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

20. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

21. Would you recommend this task be outsourced?

Task 4. Directs communications-computer systems activities.

Task Expansion: Directs investigations and solution of electromagnetic interference problems, including electronic countermeasure problems and radiation hazards. Defines workload requirements and priorities, and allocates resources for operation and maintenance of communications-computer systems. Identifies and resolves problems involving siting, installation, operation, maintenance, or modification of communications-computer systems. Evaluates system capabilities, and oversees operations, maintenance, and logistics support. Directs commercial contractors or vendors activities. Establishes and implements frequency management programs. Approves and directs upgrade and replacement of communications-computer systems resources.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

22. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

23. ...the ability for joint force commanders to incorporate information into the campaign plan?

24. ...military leaders with an integrated and interactive picture of the entire battle space?

25. ...global and theater representation of air, space, and surface battle spaces?

26. ...capabilities to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

27. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

28. Would you recommend this task be outsourced?

Task 5. Performs engineering functions.

Task Expansion: Develops and engineers architectures for communications-computer systems. Participates in system equipment design. Provides engineering support to develop detailed hardware, software, and firmware design. Serves as technical representative to the contracting officer on specified contracts, and as technical consultant on communications-computer systems engineering matters.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

29. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

30. ...the ability for joint force commanders to incorporate information into the campaign plan?

31. ...military leaders with an integrated and interactive picture of the entire battle space?

32. ...global and theater representation of air, space, and surface battle spaces?

33. ...capability to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

34. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

35. Would you recommend this task be outsourced?

Task 6. Coordinates communications-computer systems engineering activities.

Task Expansion: Coordinates system matters with research and development, logistics, civil engineering, and other support agencies during definition, acquisition, and acceptance of system facilities and equipment. Coordinates interpretations of requirements between system operations and maintenance agencies, and development and acquisition agencies. Maintains liaison between system operations and maintenance agencies, and research and development engineers to solve problems. Confers with agencies to ensure interface and inter-operability of systems.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

36. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

37. ...the ability for joint force commanders to incorporate information into the campaign plan?

38. ...military leaders with an integrated and interactive picture of the entire battle space?

39. ...global and theater representation of air, space, and surface battle spaces?

40. ...capabilities to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

41. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

42. Would you recommend this task be outsourced?

Task 7. Develops communications-computer systems software and firmware.

Task Expansion: Programs in machine, assembly, high order, special purpose, and retrieval languages. Modifies and maintains existing software and firmware. Documents and evaluates software and firmware. Responsible for cost, schedule, and performance of development effort. Sets objectives policy and plans to meet operational requirements. Develops communications-computer systems data communication techniques. Designs software interfaces with system circuits to accommodate distributed processing, networking, and other protocols.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

43. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

44. ...the ability for joint force commanders to incorporate information into the campaign plan?

45. ...military leaders with an integrated and interactive picture of the entire battle space?

46. ...global and theater representation of air, space, and surface battle spaces?

47. ...capabilities to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

48. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

49. Would you recommend this task be outsourced?

Task 8. Implements software engineering discipline into Air Force software systems.

Task Expansion: Provides automated tools assessment to assist in managing software system development. Selects metrics to measure productivity in software development process and to assess quality of software development process, design, and functionality is considered during requirements definition. Assesses post-operation deployment software support requirements.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

50. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

51. ...the ability for joint force commanders to incorporate information into the campaign plan?

52. ...military leaders with an integrated and interactive picture of the entire battle space?

53. ...global and theater representation of air, space, and surface battle spaces?

54. ...capabilities to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

55. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

56. Would you recommend this task be outsourced?

Task 9. Provides communications-computer systems security support.

Task Expansion: Designs and maintains software and firmware used to control and process classified or sensitive information. Provides analysis and documentation to support risk analysis, and secure software and firmware certification.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

57. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

58. ...the ability for joint force commanders to incorporate information into the campaign plan?

59. ...military leaders with an integrated and interactive picture of the entire battle space?

60. ...global and theater representation of air, space, and surface battle spaces?

61. ...capabilities to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

62. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

63. Would you recommend this task be outsourced?

Task 10. Maintains knowledge of current communications-computer systems commercial practices.

Task Expansion: Maintains currency in commercial system developments. Advises users on alternative software and firmware support capabilities. Analyzes commercial system products. Maintains liaison with industry, lateral units, research and development activities, and other services and agencies to coordinate improvements, security, and inter-operability.

1	2	3	4	5
Not at all	Marginally	Partially	Closely	Completely

Please use this scale to answer the following six questions.

How well does this task description provide...

64. ...the ability for joint force commanders to keep pace with information crucial to the campaign plan?

65. ...the ability for joint force commanders to incorporate information into the campaign plan?

66. ...military leaders with an integrated and interactive picture of the entire battle space?

67. ...global and theater representation of air, space, and surface battle spaces?

68. ...capabilities to exploit unmanned aerial vehicles for information gathering, retrieval, and dissemination?

69. ...interoperable, integrated, and seamless information systems?

1	2	3	4	5
Absolutely Not	Probably Not	Possibly	Probably	Definitely

Please use this scale to answer the following question

70. Would you recommend this task be outsourced?

Appendix B: Task Descriptions

Task	Description
1	**Plans for communications-computer systems resources, and performs system requirements definition, funding, and acquisition**. Identifies and analyzes communications-computer systems resources needed for command, control, communications, and intelligence flight operations; Joint; and other mission areas. Develops programming documents such as mission need statements, communications-computer systems requirements document, and inputs into the five year defense plan. Develops and implements policies and plans for mission requirements. Chairs or participates in boards which perform technical review and evaluation of contractor proposals.
2	**Manages and coordinates communications-computer systems activities.** Coordinates with system users to meet operational needs. Develops customer education programs. Develops and coordinates procedures for operation during system outages and degraded operations, or downtimes for maintenance. Reviews operations and maintenance data, evaluates systems, and projects future requirements. Prepares annexes to operations plans and orders, commanders' estimates of situations, operations orders, and programming plans. Coordinates with other agencies to ensure effective communications-computer systems planning, implementation, operation, logistics, support, and use of communications-computer systems. Advises commanders and staff on the status and capabilities of communications-computer systems.
3	**Manages communications-computer systems software development and maintenance**. Manages the software development effort through the life cycle from requirement analysis to implementation and fielding. Translates system operational concepts, requirements, architectures, and designs into detailed engineering specifications and criteria for acquisition and installation of standard equipment and facilities into operating systems. Prepares engineering plans for installing, modifying, and removing communications-computer systems facilities.
4	**Directs communications-computer systems activities.** Directs investigations and solution of electromagnetic interference problems, including electronic countermeasure problems and radiation hazards. Defines workload requirements and priorities, and allocates resources for operation and maintenance of communications-computer systems. Identifies and resolves problems involving siting, installation, operation, maintenance, or modification of communications-computer systems. Evaluates system capabilities, and oversees operations, maintenance, and logistics support. Directs commercial contractors or vendors activities. Establishes and implements frequency management programs. Approves and directs upgrade and replacement of

	communications-computer systems resources.
5	**Performs engineering functions.** Develops and engineers architectures for communications-computer systems. Participates in system equipment design. Provides engineering support to develop detailed hardware, software, and firmware design. Serves as technical representative to the contracting officer on specified contracts, and as technical consultant on communications-computer systems engineering matters.
6	**Coordinates communications-computer systems engineering activities.** Coordinates system matters with research and development, logistics, civil engineering, and other support agencies during definition, acquisition, and acceptance of system facilities and equipment. Coordinates interpretations of requirements between system operations and maintenance agencies, and development and acquisition agencies. Maintains liaison between system operations and maintenance agencies, and research and development engineers to solve problems. Confers with agencies to ensure interface and inter-operability of systems.
7	**Develops communications-computer systems software and firmware.** Programs in machine, assembly, high order, special purpose, and retrieval languages. Modifies and maintains existing software and firmware. Documents and evaluates software and firmware. Responsible for cost, schedule, and performance of development effort. Sets objectives policy and plans to meet operational requirements. Develops communications-computer systems data communication techniques. Designs software interfaces with system circuits to accommodate distributed processing, networking, and other protocols.
8	**Implements software engineering discipline into Air Force software systems**. Provides automated tools assessment to assist in managing software system development. Selects metrics to measure productivity in software development process and to assess quality of software development process, design, and functionality is considered during requirements definition. Assesses post-operation deployment software support requirements.
9	**Provides communications-computer systems security support**. Designs and maintains software and firmware used to control and process classified or sensitive information. Provides analysis and documentation to support risk analysis, and secure software and firmware certification.
10	**Maintains knowledge of current communications-computer systems commercial practices.** Maintains currency in commercial system developments. Advises users on alternative software and firmware support capabilities. Analyzes commercial system products. Maintains liaison with industry, lateral units, research and development activities, and other services and agencies to coordinate improvements, security, and inter-operability.

Appendix C: Core-to-Task Fit Based on Requirements

CORE TO TASK FIT t-Test: Two-Sample Assuming Unequal Variances		
	A	*B*
Mean	2.912658228	2.911392405
Variance	1.022779997	0.983266753
Observations	790	790
Hypothesized Mean Difference	0	
df	1577	
t Stat	0.025119786	
P(T<=t) one-tail	0.489981298	
t Critical one-tail	1.282088533	
P(T<=t) two-tail	0.979962597	
t Critical two-tail	1.645821612	
	A	*C*
Mean	2.912658228	2.786075949
Variance	1.022779997	1.022619563
Observations	790	790
Hypothesized Mean Difference	0	
df	1578	
t Stat	2.487696386	
P(T<=t) one-tail	0.006479957	
t Critical one-tail	1.282088533	
P(T<=t) two-tail	0.012959914	
t Critical two-tail	1.645819339	

	A	D
Mean	2.912658228	2.701265823
Variance	1.022779997	1.043724631
Observations	790	790
Hypothesized Mean Difference	0	
df	1578	
t Stat	4.133183951	
P(T<=t) one-tail	1.8828E-05	
t Critical one-tail	1.282088533	
P(T<=t) two-tail	3.7656E-05	
t Critical two-tail	1.645819339	

	A	E
Mean	2.912658228	2.55443038
Variance	1.022779997	1.114270588
Observations	790	790
Hypothesized Mean Difference	0	
df	1575	
t Stat	6.887561485	
P(T<=t) one-tail	4.08752E-12	
t Critical one-tail	1.28208967	
P(T<=t) two-tail	8.17505E-12	
t Critical two-tail	1.645821612	

	A	F
Mean	2.912658228	3.184810127
Variance	1.022779997	0.918907125
Observations	790	790
Hypothesized Mean Difference	0	
df	1573	
t Stat	-5.489531597	
P(T<=t) one-tail	2.34549E-08	
t Critical one-tail	1.28208967	
P(T<=t) two-tail	4.69099E-08	
t Critical two-tail	1.645821612	

	B	*C*
Mean	2.911392405	2.786075949
Variance	0.983266753	1.022619563
Observations	790	790
Hypothesized Mean Difference	0	
df	1577	
t Stat	2.48695823	
P(T<=t) one-tail	0.006493397	
t Critical one-tail	1.282088533	
P(T<=t) two-tail	0.012986793	
t Critical two-tail	1.645821612	

	B	*D*
Mean	2.911392405	2.701265823
Variance	0.983266753	1.043724631
Observations	790	790
Hypothesized Mean Difference	0	
df	1577	
t Stat	4.148285047	
P(T<=t) one-tail	1.76414E-05	
t Critical one-tail	1.282088533	
P(T<=t) two-tail	3.52828E-05	
t Critical two-tail	1.645821612	

	B	*E*
Mean	2.911392405	2.55443038
Variance	0.983266753	1.114270588
Observations	790	790
Hypothesized Mean Difference	0	
df	1572	
t Stat	6.92756664	
P(T<=t) one-tail	3.11125E-12	
t Critical one-tail	1.28208967	
P(T<=t) two-tail	6.2225E-12	
t Critical two-tail	1.645823886	

	B	F
Mean	2.911392405	3.184810127
Variance	0.983266753	0.918907125
Observations	790	790
Hypothesized Mean Difference	0	
df	1576	
t Stat	-5.572051206	
P(T<=t) one-tail	1.47803E-08	
t Critical one-tail	1.28208967	
P(T<=t) two-tail	2.95606E-08	
t Critical two-tail	1.645821612	

	C	D
Mean	2.786075949	2.701265823
Variance	1.022619563	1.043724631
Observations	790	790
Hypothesized Mean Difference	0	
df	1578	
t Stat	1.658287873	
P(T<=t) one-tail	0.04872906	
t Critical one-tail	1.282088533	
P(T<=t) two-tail	0.09745812	
t Critical two-tail	1.645819339	

	C	E
Mean	2.786075949	2.55443038
Variance	1.022619563	1.114270588
Observations	790	790
Hypothesized Mean Difference	0	
df	1575	
t Stat	4.453961364	
P(T<=t) one-tail	4.51202E-06	
t Critical one-tail	1.28208967	
P(T<=t) two-tail	9.02405E-06	
t Critical two-tail	1.645821612	

	C	F
Mean	2.786075949	3.184810127
Variance	1.022619563	0.918907125
Observations	790	790
Hypothesized Mean Difference	0	
df	1574	
t Stat	-8.0431344	
P(T<=t) one-tail	8.5313E-16	
t Critical one-tail	1.28208967	
P(T<=t) two-tail	1.70626E-15	
t Critical two-tail	1.645821612	

	D	E
Mean	2.701265823	2.55443038
Variance	1.043724631	1.114270588
Observations	790	790
Hypothesized Mean Difference	0	
df	1576	
t Stat	2.809436397	
P(T<=t) one-tail	0.002512058	
t Critical one-tail	1.28208967	
P(T<=t) two-tail	0.005024116	
t Critical two-tail	1.645821612	

	D	F
Mean	2.701265823	3.184810127
Variance	1.043724631	0.918907125
Observations	790	790
Hypothesized Mean Difference	0	
df	1572	
t Stat	-9.701310536	
P(T<=t) one-tail	5.93807E-22	
t Critical one-tail	1.28208967	
P(T<=t) two-tail	1.18761E-21	
t Critical two-tail	1.645823886	

	E	*F*
Mean	2.55443038	3.184810127
Variance	1.114270588	0.918907125
Observations	790	790
Hypothesized Mean Difference	0	
df	1564	
t Stat	-12.4259078	
P(T<=t) one-tail	3.54426E-34	
t Critical one-tail	1.282093081	
P(T<=t) two-tail	7.08851E-34	
t Critical two-tail	1.645828434	

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Vita

Captain Hugh J. McTernan is from Kansas City, Missouri. He graduated from the University of Arizona in 1988 with a Bachelor of Science degree in Management Information Systems. After receiving his commission into the United States Air Force through the Officer Training School (OTS), he completed the Basic Communications-Computer Officer Training. Captain McTernan was first assigned to the Strategic Air Command (SAC) at Offutt AFB, Nebraska. During his tour at Offutt, Captain McTernan worked on flight simulation code in support of the Strategic Integrated Operations Plan (SIOP), the nation's nuclear war plan. Additionally, he served as the executive officer for the War Planning System's Division.

In 1992, Captain McTernan transferred to the 3423 Technical Training Squadron, Peterson AFB, Colorado. He served in numerous positions including Ada computer language instructor, Chief of Computer Training, and Deputy Flight Commander for Space and Computer Training. From there he moved to the Space and Warning Systems Center (SWSC) as a system test officer for the Space Defense Operation's Center (SPADOC) program. During this time, he became crew commander qualified at the 1st Command and Control Squadron (1CACS) in Cheyenne Mountain AS and completed the advanced communications-computer officer training (ACOT) at Keesler AFB, MS. Upon graduation, Capt McTernan will be assigned to the Air Force Operational Test and Evaluation Center (AFOTEC), Kirtland AFB, NM as a C4 Systems Test Manager.

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13. ABSTRACT (*Maximum 200 Words*)

The information age is upon us. More businesses are relying on access to immediate and accurate information just to survive in the global marketplace. This reliance has caused most companies to take a closer look at what core business the firm is actually in, how information impacts those strategic areas, and how best to obtain the needed information. *Joint Vision 2010* identifies *information superiority* as the foundation for joint war fighting doctrine and concepts moving toward the year 2010.

This thesis explores the perceived relationship between the core competency requirements for information superiority and the tasks defined for the Air Force communication, computer, and information career field. Then, the results of the relationships and the tendency to outsource positions based on those evaluations are investigated.

With this perspective, Air Force leaders will be relying on the commanders and line officers to provide a critical assessment of the skills needed to provide the information essential for mission success. Once these skills are accurately assessed, determining the best means of acquiring the qualified personnel will be of utmost importance. Gaining an understanding of the probability of accurate assessment should be extremely useful in quantifying the validity of subsequent sourcing recommendations.

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