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**AN INVESTIGATION OF ENVIRONMENTAL
FACTORS THAT INFLUENCE
KNOWLEDGE TRANSFER IN THE AIR
FORCE**

THESIS

Darin A. Ladd, Captain, USAF

AFIT/GIR/ENV/02M-03

DEPARTMENT OF THE AIR FORCE

AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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Abstract

This research asked the following question: is there a correlation between types of organizational culture and factors influencing knowledge transfer? It hypothesized that organizations scoring high on the cultural factors of openness to change/innovation, and task-oriented organizational growth would be fertile to knowledge transfer. Second, it hypothesized that organizations scoring high on the factors of bureaucratic and competition/confrontation would be infertile to knowledge transfer. The research looked at Air Force squadrons, surveying a representative sample of the 1,495 active-duty squadrons included in the study with a 62-item, 5-point Likert-type instrument. Overall, 51 squadrons were surveyed, and 22 produced usable results. Both squadron and individual results were analyzed and both were similar. Squadron results showed that organizations scoring high on the factors of openness to change/innovation and task-oriented organizational growth appeared to score consistently high on three of the four measures of fertility to knowledge transfer. Organizations scoring high on the factors of competition/confrontation appeared to score consistently low on three of the four measures of fertility to knowledge transfer. The factor bureaucratic produced no significant correlations. In every case, the measure of fertility to knowledge transfer known as partner similarity did not behave as expected. The research concluded that there appears to be a correlation between organizational culture and factors influencing the transfer of knowledge, but concludes that the factors influencing the transfer of knowledge should be further explored, and a longitudinal study performed, before inferring any causal relationship.

Subject Terms

Knowledge Management, Information Theory, Culture, Transfer, Learning, Knowledge Based Systems, Corps Level Organizations, Air Force, Costs, Distribution(Economics), Demand(Economics), Business Process Reengineering

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KNOWLEDGE TRANSFER IN THE AIR FORCE

THESIS

Presented to the Faculty

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In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Information Resource Management

Darin A. Ladd, B.S.

Captain, USAF

March 2002

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AN INVESTIGATION OF ENVIRONMENTAL FACTORS THAT INFLUENCE
KNOWLEDGE TRANSFER IN THE AIR FORCE

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Abstract

This research asked the following question: is there a correlation between types of organizational culture and factors influencing knowledge transfer? It hypothesized that organizations scoring high on the cultural factors of openness to change/innovation, and task-oriented organizational growth would be fertile to knowledge transfer. Second, it hypothesized that organizations scoring high on the factors of bureaucratic and competition/confrontation would be infertile to knowledge transfer.

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The research concluded that there appears to be a correlation between organizational culture and factors influencing the transfer of knowledge, but concludes that the factors influencing the transfer of knowledge should be further explored, and a longitudinal study performed, before inferring any causal relationship.

AN INVESTIGATION OF ENVIRONMENTAL FACTORS THAT INFLUENCE KNOWLEDGE TRANSFER IN THE AIR FORCE

I. Introduction

One might make the claim that an organization's knowledge is one of its most important resources. In fact, numerous authors have pointed to knowledge as an organization's best sustainable source of competitive advantage (Drucker 1988; Nonaka, 1991; Morey and Frangioso, 1997; Zwass, 1999; Argote and Ingram, 2000; Argote, Ingram, Levine, and Moreland, 2000; Davenport and Prusak, 2000; Lahti and Beyerlein, 2000; Rulke, Zaheer and Anderson, 2000). Recent academic and popular media attention on organizational knowledge creation, capture, and transfer attest to a widespread acceptance of this idea (Costa, 1999; Davenport, DeLong, and Beers, 1998; Marchand and Davenport, 2000).

If knowledge is indeed as important as some argue it is, perhaps an organization might wish to increase its use of the knowledge it already possesses. One interim step towards realizing this goal is to identify factors that encourage or discourage knowledge transfer in organizations, and explain their interactions. Once knowledge transfer is understood in the context of an organization, managers may begin to better plan to increase the use of knowledge in their organizations.

Background

Recently, with the realization of the importance of "knowledge organizations," and "learning organizations," organizations have begun looking at how to increase

organizational knowledge to gain a strategic advantage (Nonaka and Takeuchi, 1995; Bresman, Birkinshaw, and Nobel, 1999; Davenport and Prusak 2000). Thus far, interest has centered on knowledge creation and codification, primarily for two reasons. First, the idea that a competitive advantage stems from new inventions and innovations has led to interest in knowledge creation (Nonaka and Takeuchi, 1995). Second, a recently competitive job market for technology professionals coupled with an aging technical workforce has led to numerous attempts to codify and capture knowledge before it leaves an organization in the minds of the employees (Rueve, 2000).

In these regards, the Air Force is no different from its civilian counterparts. Not only must it fill numerous technical positions to operate its current weapons systems, but it must also fill research and development positions to create future weapons systems (Norman, 2000). Recent correspondence within Air Force channels has noted that, not only is the current workforce aging, but also the organization is having an increasingly difficult time recruiting and retaining a competent workforce (Norman, 2000; Ryan, 2000, 2001).

Complicating the above problems is the apparent failure of many early knowledge management efforts—at great cost in some cases (Davenport, DeLong and Beers, 1998). Some authors have argued one of the main reasons for this failure is that many knowledge management efforts treated knowledge either as no different from information and data, or as an asset that could be generated, codified, and transferred with essentially no friction (Von Hippel, 1994; Pan and Scarbrough, 1999; Szulanski, 2000). Many authors note that a mismatch between a knowledge project's goals and organizational culture might be a major friction reducing the effectiveness of knowledge projects

(Davenport, DeLong, and Beers, 1998; Kostova, 1999; Pan and Scarbrough, 1999; Davenport and Prusak, 2000; Marchand and Davenport, 2000; King, 2001); indeed, some even name it as the “biggest obstacle” (Costa, 1999). In spite of this, however, no research was found investigating any relationship between the constructs of knowledge transfer and organizational culture.

At the same time, researchers and practitioners alike have begun to understand that knowledge transfer within an organization might represent a lower-cost alternative to the creation, codification and capture of new knowledge. One practitioner put it this way, “We used to say knowledge is power. Now we say sharing is power.” (Miller from Pederson, 1998b:20) In this respect, how can a company increase its use of the knowledge it already contains? Increased use of knowledge might create the benefits of increased organizational knowledge without having to expend the energy or cost associated with creating, codifying, or capturing more knowledge.

Clearly, knowledge management is a powerful tool. Increasing the amount of knowledge transferred within an organization has the potential to save an organization’s money while positioning it better to face future challenges; however, organizational culture is a strong force—one that may hinder the implementation of knowledge management in an organization. Specifically, organizational culture may affect an organization’s ability to transfer knowledge because that culture may encourage individuals to either resist searching out and receiving knowledge or to resist efforts to move knowledge out of their heads.

Problem Statement

As shown earlier, it appears that successful knowledge management efforts may be critical to the long-term success of an organization. Also shown earlier, many recent knowledge management efforts have failed, and organizational culture may be to blame. Considering this, one might argue it is worthwhile to study the correlation between knowledge transfer and organizational culture; however, to date, there does not appear to be any research into an interaction between these two constructs.

Research Question

This research asks the following question: is there a correlation between types of organizational culture and factors influencing knowledge transfer?

Significance of this Study

In the short-term, the ability to identify an organization as “fertile” or “infertile” to the transfer of knowledge will allow the management of an organization to determine whether it is worth their time, energy, and assets to invest in sometimes costly knowledge management efforts. This research parallels that done to determine the initial success of information technology efforts based on organizational culture variables (Leonard-Barton and Deschamps, 1998; Hoffman and Klepper, 2000), but expands the scope to knowledge management efforts—which often include major management change efforts in addition to the information technology efforts (Davenport and Prusak, 2000). Additionally, in the long-term, it will show management what environmental factors they might be able to manipulate to change an organization’s culture over the long-term—to begin to “grow” an organization that is predisposed to knowledge transfer.

Scope and Assumptions

Within the knowledge management domain, this research is limited to the construct of knowledge transfer, and the factors that facilitate or hinder knowledge transfer from the perspective of the individual sender and the receiver. Within the management and sociology domains, this research is limited to the construct of organizational culture, the different types of organizational cultures, and the indicators of organizational culture. This research is limited to investigating whether or not a correlational relationship exists between the operationalized variables shown in the literature to represent the constructs of knowledge transfer and organizational culture; causality is not investigated. Finally, both the study and implications of this research are limited in application to United States Air Force (hereafter called Air Force) units and personnel.

Thesis Structure

The next chapter investigates the constructs of knowledge transfer and organizational culture. It pays specific attention to the interaction between knowledge transfer and organizational culture, and formulates specific hypotheses as to their interaction. Chapter three describes the research methodology developed to measure the constructs of knowledge transfer and organizational culture, and their interaction. Chapter four describes the results of the research performed to investigate the relationship between knowledge transfer and organizational culture, noting which hypotheses were supported and which hypotheses were not supported. Finally, chapter five discusses conclusions drawn from the research, limitations of the current study, and directions for future research in this area.

II. Literature Review

Chapter Overview

This chapter contains three sections: “knowledge,” “organizational culture,” and “knowledge and organizational culture.” The first section explores the definition of knowledge, with an explanation of the complexity of the concept and its importance to an organization’s sustained performance. Next, the discipline of knowledge management is explained, with an overview given of its purpose within the context of an organization. Finally, knowledge transfer is explored as a sub-discipline of knowledge management, with an investigation of the known factors influencing knowledge transfer.

The second section explores the definition of organizational culture, explaining the complexity of the concept. Next, the importance of organizational culture to an organization’s sustained performance is explained. Finally, the different types of organizational culture are explored.

Within the knowledge and organizational culture section, the link between knowledge transfer—an individual phenomenon, and organizational culture—a group phenomenon, is explained. The issue is first put in context by explaining the concept of organizational economics, with specific attention paid to the two major propositions of organizational economics: agency theory, and transaction cost economics. Next, the constructs of knowledge transfer and organizational economics are evaluated in the context of organizational economics to define the terms “fertile” and “infertile” with respect to knowledge transfer. Finally, the constructs of knowledge transfer and organizational culture are juxtaposed to define the hypotheses studied.

Knowledge

Knowledge Defined

The question, “what is knowledge,” is not new to humanity. In the realm of philosophy, the study of knowledge has its own name, epistemology: one of the four core questions (unanswered) facing humanity (Sober, 1991). In epistemology, the traditionally accepted definition, attributed to Socrates and Plato, is that knowledge is a “justified true belief.” (Sober, 1991:142) This definition, though it enjoys wide distribution, does not enjoy wide acceptance (Nonaka and Takeuchi, 1995).

Additionally, this definition fails to address some important aspects of knowledge critical to a thorough understanding of its relevance to business. Unfortunately, many business-oriented definitions of knowledge fail to satisfy some of the basic philosophical implications of their use. Therefore, quite unsurprisingly, there still exists considerable divergence in the definition of knowledge (Spiegler, 2000). With a complete understanding that any research is dependent upon premises as well as argumentation, it is important to begin with a definition of knowledge that is both philosophically sound and useful to practitioners.

To converge on a useful definition of knowledge, it is important to first discuss what it is not, or more accurately what it is not only. According to much current literature, knowledge is not information, nor is it data, but it is comprised of them both (Tuomi, 1999; Spiegler, 2000; Davenport and Prusak, 2000). Data is commonly defined as facts at the atomic level, devoid of both structure and context, or stripped of previously existing structure and context (Tuomi, 1999). Information is commonly defined as data endowed with meaningful structures (Tuomi, 1999). Knowledge, on the other hand, is

information endowed with context (Tuomi, 1999). Therefore, knowledge, while being comprised of data or information, is something more. Additionally, many definitions of knowledge add that it must be in the mind of a human (Polanyi, 1958; Davenport and Prusak, 2000). In other words, whereas a computer can store and transmit both data and information, only a human can store and transmit knowledge.

Another view of knowledge sees it as either explicit or tacit. First described by Michael Polanyi (1958) in his book, *Personal Knowledge*, and further defined in his (1966) book *The Tacit Dimension*, explicit knowledge is knowledge that can be explained, whereas tacit knowledge cannot be explained. This distinction will become important in the forthcoming discussion of knowledge transfer, but it is important to note that it is not a mutually exclusive distinction; rather, it is helpful to view the explicit-tacit distinction as a continuum. Both Polanyi (1966), and more recently, Ikujiro Nonaka and Hirotaka Takeuchi (1995) in their book, *The Knowledge Creating Company*, point out that knowledge may be either explicit or tacit or a combination of the two. Further, knowledge may become either more tacit or more explicit as an individual learns or is better able to articulate what is in his or her head (Polanyi, 1966; Nonaka and Takeuchi, 1995).

Finally, it is useful to understand the personal nature of knowledge. In fact, Polanyi (1966) described all knowledge as inherently personal. The way he described it, all knowledge in fact has a tacit component when it resides in the mind of a person. Therefore, he argued, when transferring this knowledge from one person to another, the knowledge changes in the sense that the other individual must interpret the knowledge in the context of his or her own person. In fact, Nonaka and Takeuchi (1995), using this

same framework, argue that the traditional philosophical definition of knowledge as a justified true belief becomes irrelevant in practice because knowledge means different things to different people. They argue for a revised definition, “Knowledge [is] a dynamic human process of justifying personal belief toward the ‘truth’ (Nonaka and Takeuchi, 1995:58).”

Therefore, to be considered useful to an organization, a representative definition of knowledge must include three concepts: first, it must point out that knowledge is more than data or information; second, it must describe the tacit or explicit nature of knowledge; third, it must describe the personal nature of knowledge. Davenport and Prusak offer the following definition:

Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms. (Davenport and Prusak, 2000:5)

Though the above definition is somewhat wordy, it encompasses all the important qualities of knowledge of interest to an organization defined above; therefore, this definition of knowledge is adopted for the purposes of this study. As will be shown, this definition contains key components of organizational cultures: mixed experience, values, and a framework for evaluating and incorporating new experiences and information, and embedded within routines, processes, practices and norms, and hence is inextricably linked to organizational culture.

Knowledge Management

One question arising from the previous description of knowledge is, “how can it be managed?” Clearly, knowledge is a complicated, and intensely personal phenomenon and any attempt to manage it will be complicated as well. Perhaps this leads to another legitimate question, “why would an organization even want to manage the knowledge in its employees?” For a long time, most organizations answered these questions by saying, essentially, “not only can knowledge not be managed, but even if it could be we would not want to.” Indeed, most organizations were content to simply manage their data and information—both of which are more easily stored and transferred using modern data and information processing systems (Drucker, 1988).

However, the data and information management paradigm led to three unintended consequences. First, as both data and information stores began to fill up, and became interconnected, the realization came that there was probably more data and information than it was possible to interpret. This is commonly called “information overload.” (Davenport and Prusak, 2000:xiv) Second, as companies downsized in the latter decades of the Twentieth Century, they relied on their data and information stores to maintain a competitive market edge, while viewing their employees as expendable capital (Womack, Jones, and Roos, 1990). Last, the increased investments in information apparently provided little or no business benefit, defined in the literature as the “productivity paradox.” (Brynjolfsson, 1993; Kolekofski, 1997) These interconnected consequences led to organizations that were less flexible than before. In other words, the original knowledge that created systems and processes was gone, but the systems and processes remained—in some cases representing significant investments. Effectively, this forced

organizations to do business the same way as 10 or 20 years previous, with processes that did not exploit current technology, without knowing exactly why.

In the midst of the confusion, a few voices began to call for a new paradigm. Instead of worshipping at the false idols of data and information, the new standard for measuring worth in a corporation would be knowledge, and its corollary, learning.

A learning organization is an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights. (Garvin, 1998:51)

This definition is echoed in Davenport and Prusak's (2000) book, *Working Knowledge*.

This text defines the three main components of knowledge management as: knowledge generation, knowledge codification and coordination, and knowledge transfer (Davenport and Prusak, 2000). Delving into the two definitions offered above, it is possible to consolidate them into a combined definition of components:

- 1) Creation, Generation, and Acquisition of New Knowledge
- 2) Codification and Coordination of Knowledge
- 3) Transfer of Knowledge (includes absorption and modification of behavior)

As described in Chapter 1, the main emphasis in business has been on the second component, codification and coordination of knowledge—making tacit knowledge more explicit. Research into expert systems abounded, at significant cost (Odom and Dorr, 1995). Quite secondarily, significant efforts at the first component, creation, generation, and acquisition of new knowledge, abounded (Leonard-Barton, 1995; Nonaka and Takeuchi, 1995). Perhaps unfortunately, the discipline of knowledge transfer was de-emphasized in favor of the other two. Evidence of the problems business now faces because of this decision abounds in the popular media, with perhaps the most frequent

mention made of situations involving consultants and outsourcing arrangements (Chien-Ai, 1991; Horwitt, 1996; Anonymous, 1998; Pederson, 1998a; Kerr, 1998).

Knowledge Transfer

As described above, knowledge transfer is just one of three aspects of knowledge management—one that has perhaps received the least attention of the three in recent years. In individual psychology, however, the study of knowledge transfer predates the study of knowledge management by several decades (Argote, Ingram, Levine, and Moreland, 2000). Indeed, the concept that knowledge transfer represents not only a competitive advantage within a firm, but that it represents a less expensive alternative to knowledge creation and acquisition is well documented in economics literature:

. . . Opportunities for profitable team production by inputs already within the firm may be ascertained more economically and accurately than for resources outside the firm. Superior combinations of inputs can be more economically identified and formed from resources already used in the organization than by obtaining new resources (and knowledge of them) from the outside. . . . Efficient production with heterogeneous resources is a result not of having *better* resources but in *knowing more accurately* the relative productive performances of those resources. (Alchian and Demsetz, 1972:793)

Interestingly, this concept recently gained attention in organizational behavior literature as well (Argote and Ingram, 2000).

One of the phenomena related to knowledge is that, “unlike material assets, which decrease as they are used, knowledge assets increase with use: ideas breed new ideas, and shared knowledge stays with the giver while it enriches the receiver.” (Davenport & Prusak, 2000:17) Knowledge transfer, then, is a corollary to knowledge creation. Once knowledge is created, it acts as an economy of scale as it is shared—both because more than one individual can use knowledge at the same time, and because shared knowledge

stimulates the creation of new knowledge. Further, knowledge transfer appears to reduce overall organizational costs by preventing a second group of individuals from repeating the mistakes of a first group of individuals (Gruenfeld, Martorana, and Fan). In fact, it appears that increased knowledge transfer contributes to overall organizational success (Baum and Ingram, 1998). For these reasons, it should be apparent that knowledge transfer is every bit as important as knowledge generation—perhaps even more so if one considers overall organizational costs.

The theory of knowledge transfer assumes the knowledge to be transferred already exists (i.e., is separate from knowledge creation—even though the two are related). Knowledge transfer is concerned with the two-step process of moving it from one individual to another, though some sources talk to the ability to aggregate these transfers at the organizational level (Mahler, 1997). To achieve transmission, the knowledge must first be transmitted by the knowledge sender, and then absorbed by the knowledge receiver (Davenport & Prusak, 2000:101). If this sounds familiar, it is because this is an extension of communication theory (Gibson, Ivancevich & Donnelly, 1997:424). Within the domain of knowledge management, however, a further dimension is added to the concept of knowledge transfer. Knowledge, once received, must then be used to be considered useful to an organization (Davenport and Prusak, 2000:101).

Previous literature has shown numerous examples of organizations successful at the transfer of knowledge (Zairi and Whymark, 2000), but most offer little insight into how those companies became successful. To fully understand how to “grow” knowledge transfer capability, it is first important to understand what factors tend to affect knowledge transfer. According to the literature, knowledge transfer may often be

influenced by environmental factors (Marchand and Davenport, 2000; Davenport and Prusak, 2000), also termed “frictions,” but again, the extent to which it is influenced is incompletely explored in previous literature. It is to this issue we now turn.

Factors Affecting Knowledge Transfer

We now explore in detail the various frictions that might influence successful transfer of knowledge in an organization. Davenport and Prusak note the following:

Many knowledge initiatives have been based on the utopian assumption that knowledge moves without friction or motivating force, that people will share knowledge with no concern for what they may gain or lose by doing so. (Davenport and Prusak, 2000:26)

From the above analyses of the intensely personal nature of knowledge and the failure of so many recent knowledge management efforts, it appears the assumption they refer to proves untrue; however, to fully understand why this assumption proves untrue, we must examine those factors that might influence knowledge transfer.

Kitchen (1999) pointed to four factors that might influence information transfer: personal, interpersonal, architectural, and administrative. A more recent literature review within the knowledge domain provided the following five factors that might influence knowledge transfer: relational channels (Rulke, Zaheer, and Anderson, 2000), partner similarity (Almeida and Kogut, 1999; Darr and Kurtzberg, 2000), depreciation (Argote, Beckman, and Epple, 1990; Darr, Argote and Epple, 1995), organizational self-knowledge (Rulke, Zaheer, and Anderson, 2000), and divergence of interests (Alchian and Demsetz, 1972; Jensen and Meckling, 1976; Donaldson, 1990).

As shown in Figure 1, the factors influencing information transfer and those influencing knowledge transfer appear to overlap. This is somewhat unsurprising,

considering both types of transfer occur in the same context, within the same organizations, and using the same channels.

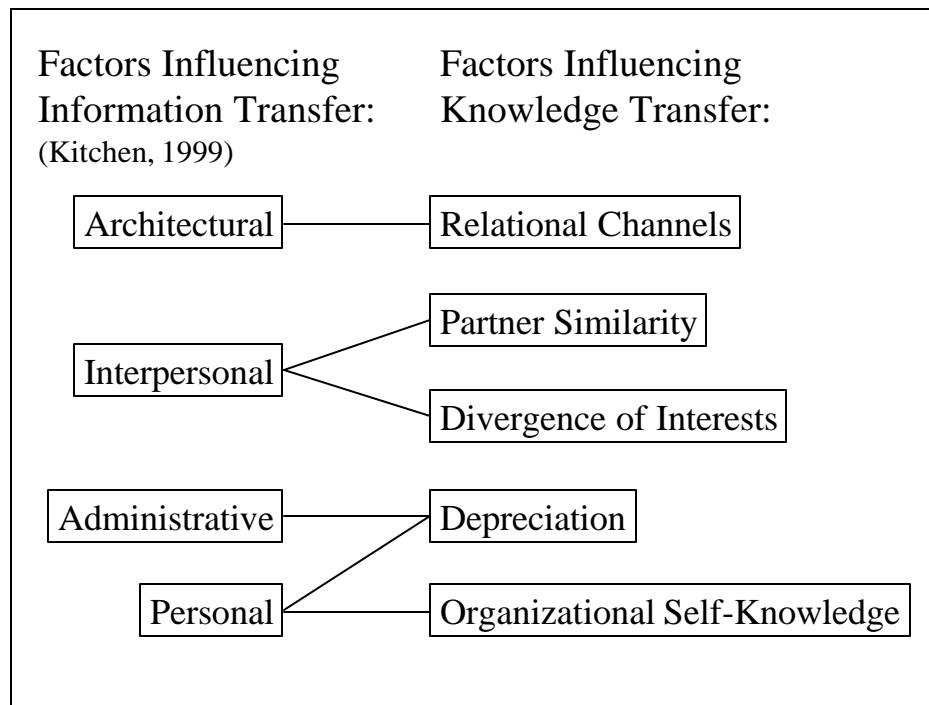


Figure 1: Comparison of Information Transfer and Knowledge Transfer

Factor 1: Relational Channels

First, as examined earlier, the quality of the knowledge to be transferred (tacit versus explicit) affects knowledge transfer (Nonaka and Takeuchi, 1995). Specifically, the more tacit the knowledge is, the more difficult it will be to transfer that knowledge. However, if all knowledge has a tacit component, as Polanyi argues it does, then some form of relational channel, defined broadly as two-way human-to-human contact, is necessary to transfer knowledge effectively. If this is the case, it is possible to argue that the tacit-explicit continuum becomes less relevant, as the true predictor of knowledge transfer success becomes whether the channel chosen for transfer is relational (Morey and Frangioso, 1997; Rulke, Zaheer, and Anderson, 2000). Instead, the degree to which

knowledge is tacit, in concert with the richness of communication channels, appears only to affect the speed by which knowledge is diffused (Almeida and Kogut, 1999; Cisse, 2001). Finally, relational channels only appear to increase transfer of knowledge on the individual level; a group face-to-face discussion may in fact reduce overall pooling of information (Stasser, Vaughan, and Stewart, 2000).

Factor 2: Partner Similarity

Second, one might imagine that, much like the tacit-explicit continuum, the complexity of the knowledge to be transferred influences its transfer. In fact, it is more likely that the similarity of individuals attempting the transfer will influence the transfer (Almeida and Kogut, 1999). Further examination shows this a reasonable explanation, as to individuals with similar interests, backgrounds, or educations, complexity begins to seem a relative term. In fact, a recent study showed partner similarity to be a strong predictor of knowledge transfer between organizations—especially strategic similarity (Darr and Kurtzberg, 2000).

Factor 3: Depreciation

Third, if we accept the definition of “transfer plus absorption,” it is clear that “depreciation” of knowledge transferred—defined as loss of knowledge after it is transferred—affects knowledge transfer success (Argote, Beckman, and Epple, 1990; Darr, Argote and Epple, 1995). However, depreciation becomes less explanatory as the effects of turnover are accounted for, and is therefore removed from the subsequent discussions.

Factor 4: Organizational Self-Knowledge

Fourth, the concept of organizational self-knowledge refers to the degree to which individuals have knowledge of what they as individuals know, and likewise for those

individuals surrounding them. It is a key prerequisite to knowledge transfer because without this self-knowledge, the knowledge sender and receiver will most likely never meet to make a transfer (Moreland and Myaskovsky, 2000; Rulke, Zaheer, and Anderson, 2000).

Factor 5: Divergence of Interests

Fifth, it seems clear that any breakdown on the part of the sender or receiver of the knowledge to be transferred with respect to the will to transfer the knowledge will preclude the occurrence of a knowledge transfer. It has been established that individual interests and organizational interests tend to diverge (Alchian and Demsetz, 1972; Jensen and Meckling, 1976; Donaldson, 1990). For this reason, it seems apparent that market forces will work within an organization to influence the transfer of knowledge, and that divergence of interests will tend to inhibit knowledge transfer.

As shown earlier, environmental factors, also called frictions, appear to influence the transfer of knowledge within an organization. With the exception of depreciation, there appears to be one item shared in common between each of the four remaining frictions: that of the influence of organizational culture. Before explaining this commonality, though, it is necessary to answer the larger question of what the term “organizational culture” means, and its implications.

Organizational Culture

Organizational Culture Defined

It is nearly axiomatic to state that values and beliefs exist at the individual level; numerous management and leadership texts speak to the diversity of values and beliefs existing in the minds of an organization’s personnel (Gibson, Ivancevich, and Donnelly,

1997; Yukl, 1998). In fact, as explored earlier, values and beliefs are imbedded into individual knowledge. One group of authors explains the importance of values in an organization: “Values affect the perceptions not only of appropriate ends but also of appropriate means to those ends.” (Gibson, Ivancevich, and Donnelly, 1997:105) Academics and practitioners alike agree that, to the leadership in an organization, therefore, it is imperative to attempt to understand individual values and beliefs as they relate to the job at hand because they will affect employees’ work performance (Ott, 1989; Gibson, Ivancevich, and Donnelly, 1997; Anonymous, 2000).

How much more important is it, then, to understand an organizations’ values and beliefs, if there is such an entity? Understandably, if an organization’s members share a common set of values and beliefs, it might be easier for leadership to attempt to understand and make use of the shared values rather than each individuals’ values.

From an organizational perspective, the collective values and beliefs of the individual members of that organization represent a phenomenon called, “organizational culture.” Noted researcher Edgar Schein puts it this way:

Culture can now be defined as (a) a pattern of basic assumptions, (b) invented, discovered, or developed by a given group, (c) as it learns to cope with its problems of external adaptation and internal integration, (d) that has worked well enough to be considered valid and, therefore (e) is to be taught to new members as the (f) correct way to perceive, think, and feel in relation to those problems. (Schein, 1990:111)

What Schein further points out is that an organization’s culture, much like values and beliefs at the individual level, is an anxiety reduction mechanism—a way to cope with uncertainty (Schein, 1990:111). Much like a type of tacit knowledge, an organization’s culture resides not only in its written documents (called “artifacts”), but also in the minds of its individuals—affecting their perception and actions. In fact, when one compares the

above definition to that of knowledge, presented earlier, it appears as though culture and knowledge are similar concepts, perhaps influenced by some of the same forces.

One aspect of organizational culture that Schein leaves out of his definition, but mentions in explanation of it, is the fact that organization's culture grows over a long period, and is unlikely to change quickly (Schein, 1990; Lundberg, 1996). Because of this and other factors, Schein further notes that an organization measured at a point in time might not have any discernable culture, or even that organizational cultures might exist at numerous levels within an organization (Schein, 1990:111).

An idea attributed to Schein, and expanded in J. Ott's (1989) book, *The Organizational Culture Perspective*, is that there are three levels at which organizational culture resides, with each level more hidden than the previous. These levels are artifacts/patterns of behavior, beliefs and values, and basic underlying assumptions (Ott, 1989:54). It is useful to explain these levels, as they are important to consider when one decides to measure (and how to measure) organizational culture.

Artifacts/Patterns of Behavior

The most obvious level of organizational culture, artifacts include,

“... Material and nonmaterial objects and patterns that intentionally or unintentionally communicate information about the organization's technology, beliefs, values, assumptions, and ways of doing things.” (Ott, 1989:24)

Examples of artifacts include reports, operating instructions, and physical layout of office space, but also include language used in the workplace, including both jargon and metaphors, and may also include myths or organizational hero stories, sagas and legends, and even ceremonies and celebrations. Artifacts are easier to measure than behaviors and values because they are often visible. However, artifacts tend to give a researcher the

least insight into an organization's culture (Ott, 1989), and may require qualitative techniques to identify and measure (Barclay and York, 1996). Further, some argue a degree of caution is advisable to the researcher wishing to measure culture using artifacts as surrogates; after all, an organization's espoused culture may not always coincide with their actual culture (Hawkins, 1997; Darrah, 1997).

Sometimes harder to observe than artifacts, patterns of behavior are routine activities that “communicate information about the organization's technology, beliefs, values, assumptions, and ways of doing things.” (Ott, 1989:36) Examples of patterns of behavior include rites and rituals, which differ from ceremonies in that they are habits that occur more often (e.g., daily), and behavioral norms, which represent a consensus of “the way things should be done around here.” Behavior may prove a more reliable measure of culture than artifacts—perhaps because over time they are harder to “fake” (Hawkins, 1997). Patterns of behavior may also be measured qualitatively, and there is evidence that attempting to measure them quantitatively produces misleading results (Ott, 1989).

Beliefs and Values

“Beliefs are consciously held, cognitive (mental) views about truth and reality . . . values are conscious, affective (emotion-laden) desires or wants.” (Ott, 1989:39) Examples of beliefs and values include ethical codes and ideologies. Quite interestingly, it is difficult to infer values and beliefs from qualitative research, as they tend to resist direct observation (Ott, 1989). Also interesting is that beliefs and values seem to avail themselves to quantitative techniques. Though counterintuitive at first, this can be explained by the fact that values and beliefs are often consciously held—and therefore

react well to overt questioning (Ott, 1989). This said, Ott (1989) qualifies his approval of quantitative measures by saying they will make little sense without the context provided by qualitative measures. In his study, the beliefs and values questionnaire was most valuable in that it stimulated discussion that led to a more thorough understanding of the organization's culture (Ott, 1989).

Basic Underlying Assumptions

Basic underlying assumptions are the aspects of individual (and organizational) personality that have grown over such a long time, and perhaps so subtly, as to be considered tacit. Since underlying assumptions are seen as a tacit manifestation of organizational culture, Ott (1989) argues they tend to resist measurement by any technique, either qualitative or quantitative. Unfortunately, this is also the level with which an organizational culture researcher holds the most interest, since presumably a shared organizational culture resides mostly at this level.

Ott (1989) posits the best way to access this level of organizational culture is by way of proxy—measuring other levels as close to this level as possible, then making a logical inference as to the best explanation for the observations. This is commonly called making an abductive inference (Sober, 1991). Though one cannot argue with Ott's conservative approach to measuring basic underlying assumptions, Polanyi (1966) gives hope for the quantitative researcher when he proposes:

. . . All our thought contains components of which we are subsidiarily aware in the focal content of our thinking, and that all thought dwells in its subsidiaries, as if they were parts of our body. Hence, thinking is not only necessarily intentional . . . it is also necessarily fraught with the roots that it embodies. (Polanyi, 1966:x)

This statement indicates it may indeed be possible to measure an organization's basic underlying assumptions, if one is cautious in his or her approach. Indeed, many

quantitative survey instruments claim to do just this—reliably (Xenikou and Furnham, 1996).

The Importance of Organizational Culture

As seen above, an organization's culture is an important (if subconscious) guiding force in an organization. It grows and remains stable over relatively long periods, and may exist at numerous different levels of an organization. The stability of an organizational culture makes it a potentially powerful force within an organization. One question that remains unanswered is whether organizational cultures are beneficial or detrimental forces in an organization.

In her book, *Wellsprings of Knowledge*, Dorothy Leonard-Barton (1995) notes that shared values and norms of an organization represent one of its core capabilities. According to Leonard-Barton, core capabilities are those capabilities an organization has grown over time that it knows better than any other organization—and are therefore essential to its success (Leonard-Barton, 1995). Shared values and norms are, therefore, a type of tacit organizational knowledge that incorporate years of learning how to best perform tasks. When business remains stable, shared values and norms help a company gain a competitive advantage by avoiding the mistakes of the past, for example. In many cases, they are shaped from the earliest days of an organization's existence, and usually an organization retains some of its "personality" from the early days of its existence almost indefinitely (Leonard-Barton, 1995).

However, Leonard-Barton (1995) also notes the following: "every core capability is also inherently a core rigidity." By acknowledging that past successes and failures taint an organization's perception of the present and future, it becomes evident that a

shared values and norms might lead to the following deleterious effects: limited problem solving, sterile implementation/inability to innovate, limited experimentation, and most importantly, screening out new knowledge (Leonard-Barton, 1995; Levine, Higgins, and Choi, 2001). Put another way, an organization's culture may be seen as a link to a tacit power structure, grown over time; when the old power structure is threatened, "The resistance is subtle and covert—and it is often successful." (Kotter and Heskett, 1992:79)

The above analysis shows organizational culture to be similar to the mythical Gemini—a two-faced being that can both help and hurt at the same time. The important item to note is that organizational culture affects organizational performance—both overtly, through its influence over standards and behavior, and less overtly, through its influence over basic underlying assumptions. It is now important to turn to the question of what types of organizational cultures have been identified. Only through classifying an organization's culture is it possible to begin to answer the question of whether that culture is "fertile" or "infertile" with respect to our construct of interest, knowledge transfer.

Types of Organizational Culture

Since the concept of organizational culture is derived from the concept of values and beliefs, it is should come as no surprise that there are as many different organizational cultures as there are organizations. For example, in a multidimensional survey of 20 international units of IBM, every unit mean score was significantly different (Hofstede and Neuijen, 1990).

This fact notwithstanding, a number of research efforts have identified distinct types of organizational culture that appear to explain most of the variance between

organizations—with each researcher using different terminologies and methods to describe a few seemingly similar concepts. A recent study consolidated much of this research using a factor analysis (Xenikou and Furnham, 1996). Because this study considered, and then summarized much of the major research over the past 20 years, it is explained here in some detail.

The authors of this study identified six interdependent factors explaining just over seventy percent of the variance between four of the most common measures of organizational culture. They also measured internal reliability of the measures to ensure the applicability of their results back to the original questionnaires (all of which were previously validated). The six factors identified, hereafter referred to as types of organizational culture, are now discussed.

Type 1: Openness to Change/Innovation

This organizational culture type groups the following concepts together: humanistic orientation, affiliation, achievement, self-actualization, task support, task innovation, and hands-on management (further defined as: managers should not just plan, but participate) (Xenikou and Furnham, 1996:363). They are explained as by the authors as follows:

These concepts seem to stress openness to change, innovation, and achievement within a humanistic social environment where cooperation is highly valued and members are expected to be supportive and open to influence in their dealings with one another. (Xenikou and Furnham, 1996:362).

An organization scoring high on this factor might be considered “friendly,” and “open to change.” Put negatively, one might call this an organization of “nosey neighbors.”

Type 2: Task-Oriented Organizational Growth

This organizational culture type groups the following concepts together: being the best, innovation, attention to detail, quality orientation, profit orientation, and shared philosophy (Xenikou and Furnham, 1996:363). The authors compare this to the “Kaisen” philosophy espoused by successful Japanese companies that stress cautious, incremental improvement. An organization scoring high in this factor might be considered “task-oriented” versus “people-oriented.” Put negatively, one might call this an organization of “strivers,” or “impersonal.”

Type 3: Bureaucratic

This organizational culture type groups the following concepts together: approval, conventionality, dependence, avoidance, and [lack of] personal freedom (Xenikou and Furnham, 1996:363). The authors describe this culture as formal, with centralized decision-making. An organization scoring high on this factor might be considered “conservative” or “prudent.” Put negatively, one might call this an organization that is “passive,” or “defensive.”

Type 4: Artifacts

This organizational culture type groups the following concepts together: values, heroes, rituals, and cultural network (Xenikou and Furnham, 1996:363). These items measure whether or not members of an organization recognize the concepts listed above as part of their culture. For this reason, the authors make the point that this factor probably does not measure a type of organizational culture so much as it measures whether or not an organization has a strong culture. An organization scoring high on this factor might be considered one that has a discernable culture. An organization scoring low on this factor might be considered one that does not have a discernable culture.

Since this factor does not appear to prescribe any behavior, it is eliminated from the subsequent analysis and discussion of correlation with knowledge transfer.

Type 5: Competition/Confrontation

This organizational culture type groups the following concepts together: oppositional orientation, power, competition, and perfectionism (Xenikou and Furnham, 1996:363). The authors describe this culture as one where perfection is the goal, and where individuals might tend to react negatively towards the ideas of others and/or resist new ideas. An organization scoring high on this factor might be considered a “perfectionist” organization. Put negatively, one might call this organization a “dog-eat-dog” organization.

Type 6: Positive Relations

This organizational culture type groups the following concepts together: social relations, “work should be fun,” the value of people, and communication (Xenikou and Furnham, 1996:363). The authors describe this culture as one where friendship with coworkers is encouraged, as are social activities and socializing. An organization scoring high on this factor might be considered “a fun place to work,” or “a family environment.” Put negatively, one might call this organization, “lazy,” or “touchy-feely.” While important to an organization, this particular item did not explain enough of the variance between the survey items mentioned and had significant overlap with the other factors (such as openness to change/innovation); therefore, it is eliminated from the subsequent analysis and discussion of correlation with knowledge transfer.

Having outlined organizational culture, its importance, and the some of the more commonly measured types of organizational culture, we now may ask what specific types

of organizational culture might be identified as “fertile” or “infertile” with respect to knowledge transfer. It is to this task we now turn.

Knowledge Transfer and Organizational Culture

Organizational Economics: The Linking Mechanism

The above analysis endeavored to make two points: knowledge transfer is likely to be rife with friction, and organizational culture is a likely cause of individual action. However, the method of interaction between knowledge transfer and organizational culture is yet to be explained. To begin this explanation, we begin by discussing “knowledge markets”—defined as a place (either physical or, more likely conceptual) where knowledge is transferred at a cost (Davenport and Prusak, 2000). Knowledge markets affect knowledge transfer, through the costs associated with knowledge, and organizational culture influences an organization’s perception of, and actions in, knowledge markets. With respect to knowledge markets, Davenport and Prusak note the following:

. . . The only way to have a market that works well is, first of all, to recognize that market forces exist; second, to try to understand how it functions; and third, to make it more efficient. (Davenport and Prusak, 2000)

Already, this paper has alluded to the two key components of a management theory called “organizational economics”—an organizational concept that attempts to explain how market forces operate within organizations. These two key components are: agency theory and transaction cost economics (Donaldson, 1990). Understanding these components helps further explain the individual behavior one is likely to find in a knowledge market, as well as how organizational culture might affect knowledge transfer within a knowledge market (through perception of the knowledge market).

Agency Costs

Agency theory states that many social relationships can be understood as interactions between two parties: a principal and an agent. “The principal(s) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent.” (Jensen & Meckling, 1976) Since the interests of the principal and the agent are inclined to diverge, additional costs must be incurred (through monitoring and incentives) to ensure the agent acts in accordance with the principal; these costs are called agency costs. Though the theory concentrates on individuals, it is easy to see that in an organization exhibiting a culture, each individual agent will be affected by that culture, to the extent that, an organizational culture represents the collected interests of multiple agents. At its worst, an organization ignoring agency costs may turn into an “organizational anarchy” where management efforts become entirely ineffective in favor of individual market actions that have no relation to overall strategic goals (Cohen, March, and Olsen, 1972).

In Donaldson’s (1990) analysis of organizational economics, he states an apparent contradiction that might resist the analysis of an organization’s individuals using a concept such as organizational culture. He states that economics uses the concept of “methodological individualism”, which states, “social phenomena . . . should be analyzed as arising from conscious actions of individuals.” (Donaldson, 1990:371) However, he notes, “psychologists and sociologists point out that human behavior is often produced without conscious thought, that is, through habit, emotion, taken-for-granted custom, conditioned reflex, unconditioned reflex, posthypnotic suggestion, and unconscious desires.” (Donaldson, 1990:372) Though this analysis is somewhat tongue-in-cheek, it is

clear this contradiction must be cleared before any analysis is attempted of economic transactions within an organization—especially with regard to the collected interests of multiple agents.

Though Donaldson may have been unaware of his writings, Polanyi (1966) answers this apparent contradiction with his explanation provided earlier of the interaction between the conscious and the subconscious; namely, that the subconscious is under the influence of the conscious. Polanyi extends this explanation by stating:

Any attempts to avoid the responsibility for shaping the beliefs which we accept as true is absurd; but the existentialist claim of choosing our beliefs from zero is now proved absurd too. Thought can live only on grounds which we adopt in the service of a reality to which we submit. (Polanyi, 1966:xi)

In this statement, Polanyi opens the door to the possibility that organizational culture can affect an individual's actions based on previous, conscious, socialization to that organizational culture, while at the same time an individual is still in conscious control of his or her own actions. Put another way, since organizational culture, once accepted, influences perception, subsequent conscious actions may or may not be in the best interests of the principal—or even the individual agent, depending on the degree to which perception is influenced.

As noted in the popular press, the inevitable difference in interests between a principal and an agent is of primary concern to ensuring the success of knowledge management efforts (Manchester, 2001). With respect to knowledge transfer, then, it is possible to say that an organizational culture that is fertile for knowledge transfer will be one that recognizes and incorporates into its structure and understanding of knowledge markets, and the costs (frictions) associated with knowledge transfer.

Transaction Costs

Transaction cost economics refers to the problem inherent in economic transactions, namely that one party might not be inclined to give the other party the full value they “owe” (Donaldson, 1990) in a market transaction. The concept rejects the assumption of simplified economics that buyers and sellers in a market are price-takers. Interestingly, this type of behavior is only possible in a market with incomplete information—exactly what some theorists posit about knowledge markets. They argue that knowledge markets are often inefficient barter markets in which the worth of each side’s contribution is extremely hard to measure (Morey and Frangioso, 1997). As one might imagine, the resulting opportunistic behavior is usually detrimental to overall organizational health.

With respect to knowledge transfer, it is possible to say that an organization fertile for knowledge transfer is one in which endeavors to reduce ambiguity in the marketplace and hence, reduce transaction costs.

Knowledge Transfer Factors and the Fertile Organizational Culture

As shown earlier, knowledge transfer seems to be influenced by four factors: relational channels, partner similarity, organizational self-knowledge, and divergence of interests. For each of these factors, an explanation is offered below as to the type of organizational culture (knowledge transfer fertile, or knowledge transfer infertile) that might be associated with those factors. This section represents a theoretical bridge between the two theories of knowledge transfer and organizational culture, but is as of yet unsupported with research. It is included to illustrate how the two theories might be linked together.

Relational Channels

An organization with many relational channels for transferring knowledge might expect more knowledge to be transferred than one that has few, because transaction costs are likely to be reduced in an organization with many relational channels. Relational channels are a measure of both the number and richness of communication channels. In this case, it is likely that more relational channels represent more and varied sources of market information. The more available market information is, the less likely transaction costs are to be incurred in a market transaction within an organization—to include a knowledge transfer. For this reason, an organizational culture that fosters many relational channels for transferring knowledge might be considered a knowledge transfer fertile organizational culture.

Partner Similarity

An organization with many similar partners might expect more knowledge to be transferred than one that has few because both agency costs and transaction costs are likely to be reduced. In an organization in which all members have similar backgrounds, education levels, and experiences—it is likely they will have the same understanding of a mission and share a strategic similarity (Darr and Kurtzberg, 2000). Strategic similarity among all members of an organization is likely to reduce overall monitoring (agency) costs because agents and principals alike will share the same view of an organization. Further, similar backgrounds and education levels is likely to reduce transaction costs because there will not be as large of a differential in overall information between individuals. Interestingly, knowledge creation may be stymied by this same phenomenon (Gruenfeld, Martorana, and Fan, 2000). For these reasons, an organizational culture

encouraging membership by many similar (strategically aligned) partners might be considered a knowledge transfer fertile organizational culture.

Organizational Self-Knowledge

An organization whose members have organizational self-knowledge might expect more knowledge to be transferred than one whose members have little organizational self-knowledge because transaction costs are reduced. Transaction costs, because they arise from information differentials between individuals, are reduced due to the amount of information individuals know about themselves and those around them. For this reason, an organizational culture encouraging members to maintain or increase their organizational self-knowledge might be considered a knowledge transfer fertile organizational culture.

Divergence of Interests

An organization whose members' interests diverge can expect less knowledge to be transferred than one whose members have converging interests because both agency and transaction costs are likely to be increased. Agency costs, which arise from a divergence of interests between principals and agents in an organization are increased when overall divergence of interests within an organization is increased. Further, a divergence of interests seems to increase the likelihood of self-serving behavior at the expense of overall organizational performance—because individuals either do not understand how organizational performance benefits them personally, or do not care. For these reasons, an organizational culture that does not encourage members to recognize and compensate for the costs of transferring knowledge might be considered a knowledge-transfer infertile organizational culture.

Organizational Culture Types and the Fertile Organizational Culture

As shown earlier, there are four types of organizational cultures of interest with respect to knowledge transfer: openness to change/innovation, task-oriented organizational growth, bureaucratic, and competition/confrontation. In each of these cases, an explanation is offered for the type of organizational culture factors that might be associated with type of organizational culture. As with the previous section, this section represents a theoretical bridge between the two theories of knowledge transfer and organizational culture, but is as of yet unsupported with research. It is included to illustrate how the two theories might be linked together.

Openness to Change/Innovation

An organizational culture that is open to change, innovation, and achievement appears to be one in which agency costs have been properly addressed and transaction costs might be minimized, and the willingness to transfer knowledge might be high. Agency costs might be reduced because of the increased role of individual achievement in an openness to change/innovation culture. Although it is possible to argue that overall organizational performance might suffer because of this focus, it is also likely that monitoring costs will be reduced—or are at the very least properly addressed by the increased focus on individuals. Transaction costs might be minimized because of the overall encouragement of activities such as brainstorming—encouraging the sharing of new ideas by all members without value judgment. The free sharing of new ideas and information is likely to drive down information differentials between individuals. For these reasons, an organizational culture that is open to change, innovation, and achievement might be considered a knowledge-transfer fertile organizational culture.

Task-Oriented Organizational Growth

An organizational culture that is interested in being the best and innovation appears to be one in which agency costs have been properly addressed, and the willingness to transfer knowledge might be high. In an organization that stresses group performance, it is likely that monitoring costs are properly addressed in the form of performance monitoring. An organization willing to pay those monitoring costs is also likely to reap the benefits of that investments. For this reason, an organizational culture that is task-oriented might be considered a knowledge-transfer fertile organizational culture.

Bureaucratic

An organizational culture that is bureaucratic appears to be one in which neither agency costs nor transaction costs have been properly addressed, and the willingness to transfer knowledge might be low. In a bureaucratic culture, avoidance is high and personal freedom is discouraged, which might lead increased overall monitoring costs. It is unclear whether a bureaucratic organization is one that reduces these costs like an openness to change/innovation culture might, or properly addresses these costs, like a task-oriented organizational growth culture might. Transaction costs might not properly addressed in a bureaucratic culture because overall communication is discouraged. Any reduction in communication might lead to an information differential between individuals. For these reasons, an organizational culture that is bureaucratic might be considered a knowledge-transfer infertile organizational culture.

Competition/Confrontation

An organizational culture that is marked by competition and confrontation appears to be one in which both agency costs and transaction costs have not been

properly addressed, and the willingness to transfer knowledge might be low. Agency costs are unlikely to have been addressed in a competition/confrontation culture because it fosters an oppositional orientation and competition between its members. In this case, agents are unlikely to care about the strategic goals of the principal, and overall monitoring costs might be high. It is unclear as to whether this type of organization takes these costs into account. Transaction costs are likely to be increased in a competition/confrontation culture because individual power struggles are likely to reduce the incentive to share market information. For these reasons, an organizational culture that is competitive and confrontational might be considered a knowledge-transfer infertile organizational culture.

Organizational Culture and Knowledge Transfer: Constructs and Variables

Figure 2 lists the constructs and variables defined earlier, as well as the interactions explored in this research. This research concentrated on the operationalized variables and their interactions. It did not measure the constructs themselves or the links between the constructs and the operationalized variables. Finally, organizational economics as a linking mechanism was not measured directly in this research. This was left to future efforts.

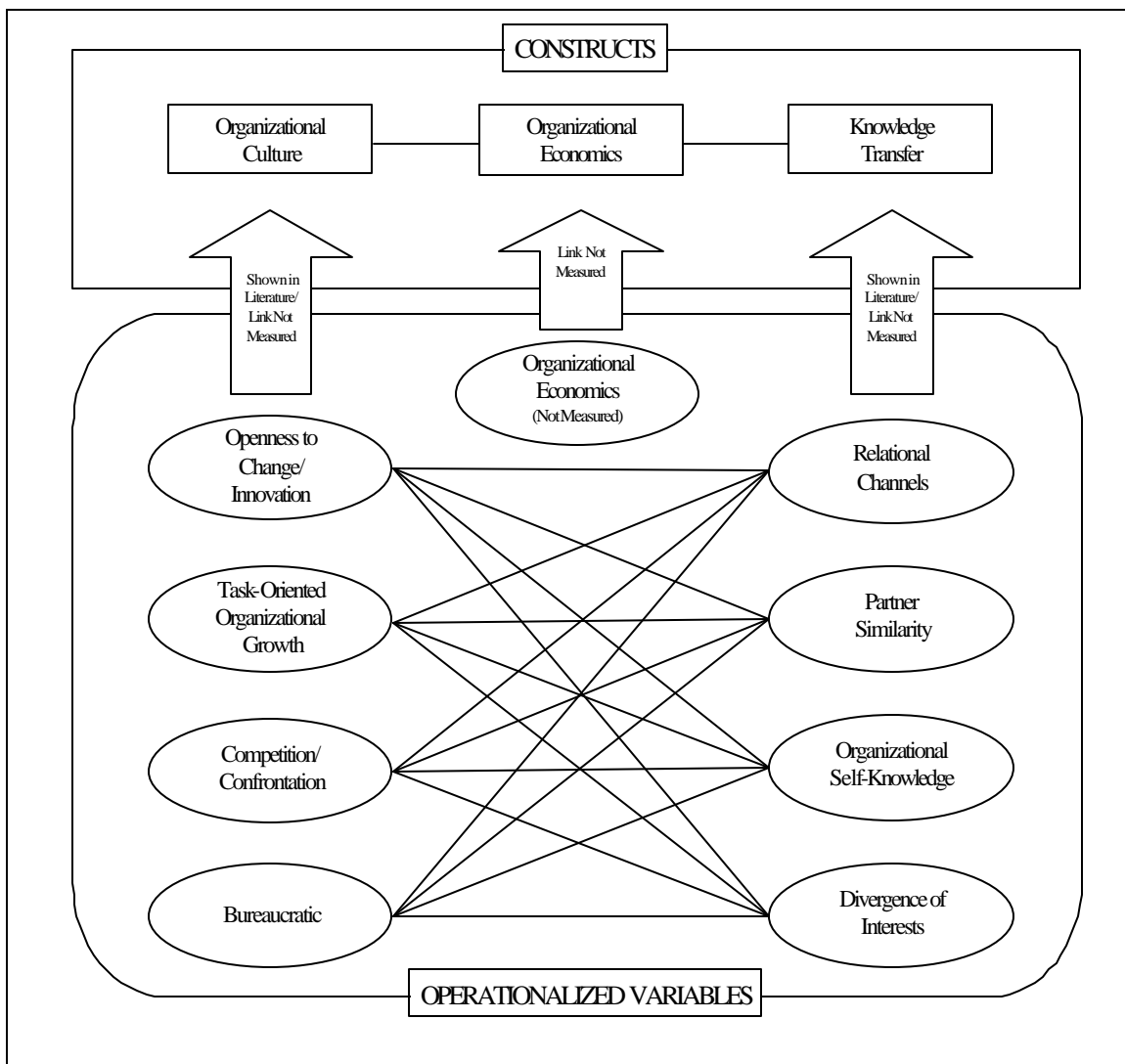


Figure 2: Constructs, Operationalized Variables, and Interactions Explored

Organizational Culture and Knowledge Transfer: The Hypotheses

The four hypotheses investigated in this research are listed below and in Figure 3.

- H1: Organizations exhibiting an “openness to change/innovation” organizational culture will have (a) more relational channels, (b) higher partner similarity, (c) more organizational self-knowledge, and (d) less divergence of interests than those not exhibiting an “openness to change/innovation” organizational culture.
- H2: Organizations exhibiting a “task-oriented organizational growth” organizational culture will have (a) more relational channels, (b) higher partner similarity, (c) more organizational self-knowledge, and (d) less divergence of interests than those not exhibiting a “task-oriented organizational growth” organizational culture.
- H3: Organizations exhibiting a “bureaucratic” organizational culture will have (a) fewer relational channels, (b) lower partner similarity, (c) less organizational self-knowledge, and (d) more divergence of interests than those not exhibiting a “bureaucratic” organizational culture.
- H4: Organizations exhibiting a “competition/confrontation” organizational culture will have (a) fewer relational channels, (b) lower partner similarity, (c) less organizational self-knowledge, and (d) more divergence of interests than those not exhibiting a “competition/confrontation” organizational culture.

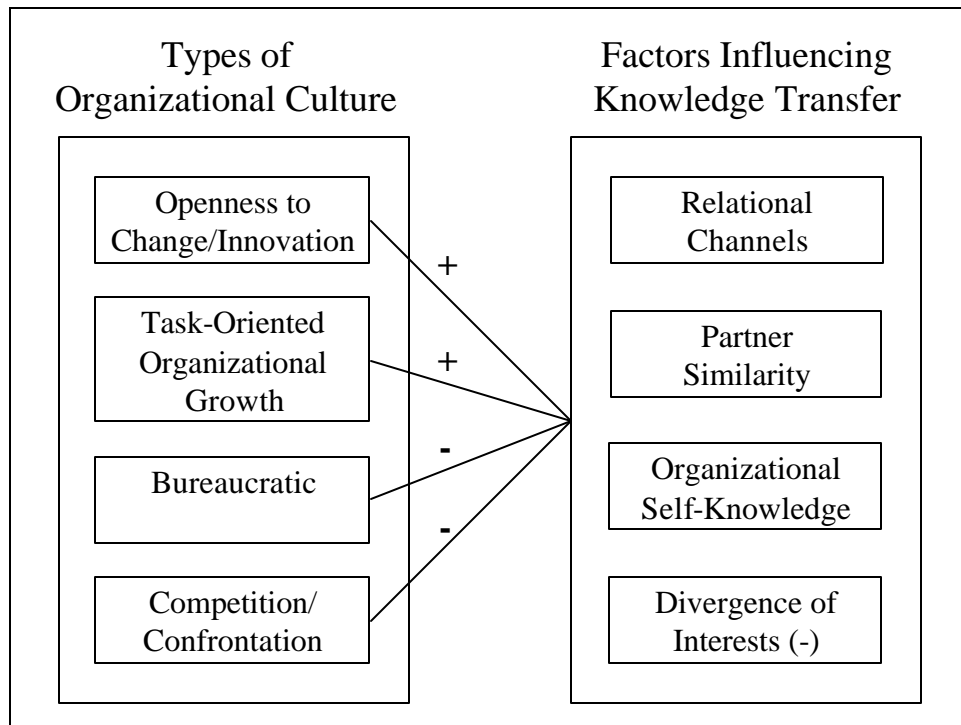


Figure 3: Proposed Correlations between Operationalized Variables

III. Methodology

Chapter Overview

This chapter explains the research methodology used to explore the relationship between the constructs of knowledge transfer and organizational culture. It is divided into seven sections. In the first section, the experimental design and research methods chosen for this research are explained. In the second section, the population of interest is described, as are the various sampling frames used to determine a sample representative of the overall population of interest. In the third section, the methodology used to create the research instrument is described. The fourth section outlines the steps taken to gain permission to conduct the research with the desired sample population. The fifth section outlines the pre-test undertaken to refine the survey instrument. The sixth section outlines a pilot test undertaken to increase the validity of the research instrument before its use. Finally, the seventh section describes the administration of the research instrument.

Experimental Design and Research Method

As noted in Chapter 2, many researchers prefer to measure organizational culture using longitudinal qualitative techniques (Ott, 1989). However, longitudinal qualitative studies, by their nature, do not lend themselves to a large, widely diverse population. For example, the Air Force, with an authorized strength of over 8,350 units located around the globe, staffed by more than 760,000 active duty, civilian, guard, reserve, and ready reserve personnel, is inaccessible to all but the most ambitious longitudinal qualitative

research (Air Force Magazine, 2001; Hallam, 2001). To reach a representative sample of this population, this research used a cross-sectional survey design, as outlined below.

Many authors have noted that, within the confines of established constructs, surveys have shown high reliability in the domains of organizational culture when both quantitative and qualitative techniques were used (Xenikou and Furnham, 1996; Hofstede and Neujen, 1990). One of the reasons this is true is that organizational culture is a phenomenon that persists over time (Schein, 1990). For this reason, a cross-sectional survey design was determined to be acceptable for accurately measuring the four types of organizational culture of interest in this research: openness to change/innovation, task-oriented organizational growth, bureaucratic, and competition/confrontation. The instrument was developed using a mixture of validated research questions and questions developed based on current research. The instrument was partially validated using both a pretest and a pilot study.

In the domain of knowledge transfer, no method exists to qualitatively measure the construct. However, the literature review showed four indicators of knowledge transfer: relational channels, partner similarity, organizational self-knowledge, and divergence of interests; further, it gave indications of how to measure those four indicators. Again, the large sample population favored the decision to use a cross-sectional design with a quantitative survey instrument. The instrument was developed using current research, and partially validated using both a pretest and a pilot study.

It is important to note that the overall instrument (90 questions) was only partially validated. As noted above, some questions were already validated, but some were developed based on current research. Only an in-depth qualitative analysis of each of the

questions developed in this research effort (e.g. interviews plus questionnaires) and their relationship to actual organizational culture and knowledge transfer could provide full validation of how well the questions actually measured the constructs of interest.

Population and Sample

Population

As noted above, the initial population of interest was the more than 8,350 Air Force units (Hallam, 2001). Because the goal of this study was to explore the relationship between organizational culture as an indicator of the various environmental factors influencing knowledge transfer, it was important to access only those organizations that one would expect to have a discernable organizational culture—or more precisely organizations whose dominant culture coincided with the organizational boundaries to be measured. This was important to consider because, as noted in Chapter 2, organizational cultures might exist at numerous levels of an organization (e.g., at the squadron, group, wing, and major command levels). Also noted in Chapter 2, it is possible for an organization not to have a discernable culture within its boundaries—based on the strength of a culture existing at another level, or because a unit has not had the time to develop a culture yet (Ott, 1989).

Recent research in the Air Force showed that the boundaries of organizational cultures are likely to coincide with the boundaries of squadrons—where individuals are likely to be similar, and missions are likely to be focused towards the same goals (Smith, 1998). For this reason, the population of interest was redefined from the 8,350 Air Force units to the 3,881 active duty Air Force squadrons.

To implement this population reduction, the author contacted the Air Force Plans and Programs, Office of Personnel Management. This office provided a database query of more than 8,350 operational units in the Air Force. From this list, a spreadsheet query separated the 4,160 squadrons. There were 156 types of squadrons represented in this listing. Since the query returned squadrons following the standard nomenclature only, equivalent units such as program offices and research laboratories that did not follow the standard nomenclature were excluded from further analysis. From this list of squadrons, another spreadsheet query separated the 279 reserve squadrons from the original list of 4,160 squadrons, leaving 3,881 active duty squadrons. 153 types of squadrons were represented in this final list of active duty Air Force squadrons.

Sampling Frame 1

Because neither the subpopulations of Air Force Guard and Reserve units were accessible for the purposes of this survey, their members were excluded from the sample population. Additionally, Air Force civilian personnel were excluded from the sample population due to the administrative difficulty of requesting approval from each local personnel unit to poll its members.

Sampling Frame 2

Next, units unrepresentative of the operational Air Force because of unique or singular missions were eliminated from the sample population. This was done because units with unique and singular missions are often small and extremely specialized; their cultures might not generalize to other squadrons in the Air Force. First, squadron types from the list of 153 types that had 15 or fewer units categorized under them were excluded from the sample population. This left 36 types of squadrons. Next, squadron

types that were likely categorized as squadrons simply because of geographically specific or otherwise unique missions were excluded from the sample population. There were six of these squadron types: 1,531 recruiting squadrons, 54 Air Combat Command program management squadrons, 30 aerospace medicine squadrons, 22 aeromedical dental squadrons, 142 training squadrons, 9 component repair squadrons, and 27 flying training squadrons. This left 1,495 squadrons comprising 30 overall squadron types, as shown in Table 1.

Table 1: Types and Number of Squadrons in the Air Force

Types	Number in USAF:
Air Base	16
Air Mobility	23
Air Refueling	23
Air Support Operations	35
Aircraft Generation	18
Airlift	36
Civil Engineer	88
Communications	123
Comptroller	55
Contracting	64
Dental	33
Equipment Maintenance	18
Fighter	88
Flight Test	25
Intelligence	32
Logistics Support	66
Maintenance	48
Medical Operations	79
Medical Support	74
Mission Support	84
Operations Support	101
Security Forces	96
Services	60
Space Operations	21
Special Operations	18
Supply	59
Test	20
Transportation	60
Weather	32
Total:	1,495

Sampling Frame 3

The required sample size to achieve a representative sampling of the 1,495 squadrons remaining in the study, using a 90 percent confidence interval with a width of three-quarters of one point (less than one point on the Likert-type scale), was determined using Equation 1 (McClave and Benson, 1991:320).

Equation 1 : Sample Size Required to Represent Air Force Squadrons

$$n = \frac{4 \cdot (z_{\text{crit}})^2 \cdot \left(\frac{R}{4}\right)^2}{W^2}$$
$$n := \frac{4 \cdot (1.645)^2 \cdot \left(\frac{4}{4}\right)^2}{(.75)^2}$$
$$n = 19.243$$

Where n = Sample size required
Z_{crit} = Critical z value for a 90% confidence interval (1.645)
R = Range of values for 5-point Likert-type scale (4)
W = Width of confidence interval (.75)

The results of this equation required that 20 squadrons be polled. A forty percent return rate was anticipated, since some squadrons might not return a statistically significant number of responses due to deployment, leave, problems in contacting, or any other factor. Accounting for the anticipated return rate required contacting 50 squadrons. One squadron was added to this number for the pilot study, leaving a requirement to contact 51 squadrons of sufficient size to return statistically significant results.

Sampling Frame 4

The final sampling frame was used to choose a sample size sufficient to represent each of the squadrons randomly chosen within the types of squadrons using a 90 percent confidence interval. An example of the equation used to implement this sampling frame is shown in Equation 2 (HQ USAF/ACM: 11-14). This example uses the information

collected for the squadron randomly chosen out of the 51 squadrons to be used for the pilot study.

Equation 2: Determination of Sample Size Required to Represent A Squadron

$n = \frac{N \cdot (z^2) \cdot p \cdot (1 - p)}{(N - 1) \cdot (d^2) + (z^2) \cdot p \cdot (1 - p)}$	$n := \frac{529 \cdot (1.645^2) \cdot .5 \cdot (1 - .5)}{(529 - 1) \cdot (.1^2) + (1.645^2) \cdot .5 \cdot (1 - .5)}$ <p style="text-align: center;">n = 60</p>
<p>Where: n = Sample size required N = Population (529) p = Maximum sample size factor (.5) d = Desired tolerance (.1) z = Factor of assurance, 90% confidence (1.645)</p>	

Equation 2 was formulated specifically for attitude and opinion surveys, and hence set the standard for a representative sample above that of conventional analytical statistics. In this case, for a total population of 529, almost 11 percent of the population was required to reach the desired statistic—in the example listed in Equation 2 this represented 60 returned surveys. A comparison to more traditional statistics shows that, regardless of population size, an estimator may be considered normally distributed and representative of the true population mean to the same tolerance as above if more than about 30 data points are collected.

In each case, a twenty-five percent return rate was anticipated—and accounted for. In the example listed in Equation 2, surveys were sent to 240 of the 529 members of the squadron in order to collect 60 responses. Equation 2 presented a challenge in that it made surveying squadrons with less than 80 active duty members prohibitive, because the required response rate was above fifty percent. For this reason, squadrons generated during random selection with less than 80 active duty members were excluded from the

survey administration. In their place, alternate squadrons with more than 80 active duty members, also generated during random selection, were used.

Table 2 lists the number of squadrons contacted by type, the number excluded for small size, and the number unable to survey.

Table 2: Number of Squadrons Contacted by Type

Types	Number Contacted	Number Excluded for Size	Number Unable to Survey
Air Base	2	0	1
Air Mobility	2	0	0
Air Refueling	1	2	0
Air Support Operations	0	2	0
Aircraft Generation	0	0	0
Airlift	4	0	1
Civil Engineer	3	2	0
Communications	6	0	0
Comptroller	0	2	0
Contracting	0	3	0
Dental	0	0	0
Equipment Maintenance	1	0	0
Fighter	9	0	0
Flight Test	0	1	1
Intelligence	2	1	1
Logistics Support	2	3	0
Maintenance	2	0	0
Medical Operations	2	3	0
Medical Support	1	6	0
Mission Support	1	7	0
Operations Support	4	1	1
Security Forces	3	1	1
Services	0	4	0
Space Operations	1	1	1
Special Operations	1	0	0
Supply	2	0	0
Test	0	0	0
Transportation	2	0	0
Weather	0	3	0
Total Units Contacted:	51	42	7

Fifty-one squadrons were contacted. Forty-two squadrons were excluded for size; under-representing air refueling, air support, comptroller, contracting, logistics support, medical support, mission support, services and weather squadrons in the analysis of results.

Finally, seven squadrons were either not found during a personnel search or were

consolidated with another unit, and therefore were unable to be surveyed. The distribution in this category was apparently random.

Survey Development

As identified in Chapter 2, the five types of organizational culture most likely to be found in organizations are: openness to change/innovation, task-oriented organizational growth, bureaucratic, and competition/confrontation. None of the four instruments listed by Xenikou and Furnham were available for use in this research (Xenikou and Furnham, 1996). For this reason, a previously validated instrument was sought with similar domains measured. The FOCUS questionnaire (van Muijen, Koopman, De Witte, De Cock, Susanj, Lemoine, Bourantas, Papalexandris, Branyicski, Spaltro, Jesuino, Das Neves, Pitariu, Konrad, Peiró, González-Romá and Turnipseed, 1999) captured two of the four types of organizational culture, Openness to Change/Innovation, and Task-Oriented Organizational Growth. Twenty-three questions were derived or adapted directly from this source. To capture the other two types of organizational culture, Bureaucratic and Competition/Confrontation, questions were devised using the FOCUS questionnaire as a start, with heavy emphasis on the descriptions of those factors identified in Xenikou and Furnham's (1996) research. Twenty-four questions were written in this manner. Finally, a third source of questions was consulted to assist in phrasing of specific questions to capture items not covered by the FOCUS questionnaire (Hofstede and Neujen 1990), though none of the questions were used verbatim.

To capture the four indicators of knowledge transfer, the author used the descriptions of the indicators given in the original research documents referenced in

Chapter 2. Ten questions were written based on the research on Relational Channels (Morey and Frangioso, 1997; Rulke, Zaheer, and Anderson, 2000). Ten questions were written based on the research on Partner Similarity (Almeida and Kogut, 1999; Darr and Kurtzberg, 2000). Twelve questions were written based on the research on Organizational Self-Knowledge (Moreland and Myaskovsky, 2000; Rulke, Zaheer, and Anderson, 2000). Finally, eleven questions were written based on the research on Divergence of Interests (Alchian and Demsetz, 1972; Jensen and Meckling, 1976; Donaldson, 1990).

The initial survey consisted of 90 items using a 5-point Likert-type scale. The 5-point scale was chosen to keep the survey consistent with the FOCUS questionnaire, which used a 5-point Likert-type scale. The 90 items were randomly ordered to reduce any interaction between similar questions—reducing the ability of the respondent to guess the expected answers based on previous ones.

The survey collected the following additional data on each respondent: squadron name (masked from the researcher), rank/grade, highest level of schooling attained, age, and gender. This data was used to test any effects on the operationalized variables other than those hypothesized. Finally, the survey gave each respondent the option to add comments (up to 11,000 characters). Comments were used primarily to find any potential problems with the survey—whether they be administrative or philosophic.

The survey was implemented using a web-based electronic format. Franke (2001) showed that as long as an electronic implementation of a survey held true to the intent of the original survey, and was relatively easy to use, reliability of a survey was not affected by its electronic implementation. Every response was input directly into a database that

automatically inverted the responses to the negatively scored questions. The entire survey as it appeared on the web site for the pilot test, with the exception of the radio buttons for each Likert-type item selection, is located in Appendix A. The survey as administered to the entire population was similar to this instrument, except for the 28 deleted questions (noted in Appendix B).

Permission to Conduct Survey

Permission to conduct the survey was requested 21 December 2001. It was granted by Air Force Personnel Center Surveys Branch 15 January 2002, and was assigned the survey control number USAF SCN 02-0017, valid until 31 May 2002.

Pre-Test

Ten students enrolled in the Air Force Institute of Technology's Information Resources program pre-tested the survey. Each student provided information about how long the survey took to complete, confusing or misplaced items, as well as misspellings and format errors. Their input was incorporated into the survey before conducting the pilot study.

Pilot Study

The pilot study was conducted using one squadron, alias "Maintenance Squadron 1," and was conducted from 22 to 29 January 2002—before the survey was administered to the entire sample. The pilot test again identified any confusing or misplaced items, as well as misspellings and format errors, but also tested the reliability of each question as it measured the construct of interest. The goal was to achieve at least a .80 reliability coefficient for each construct, a common standard for academic research (Straub, 1989).

As noted in Appendix B, reliability for all constructs except Bureaucratic (.6172) and Competition/Confrontation (.7179) were brought above .80 by eliminating 28 questions from the survey.

As noted in Appendix C, factor analysis indicated there were some problems with construct overlap—but these results could be partially explained if there were, indeed, high correlations between the constructs. Further, factor analysis sorted out twenty-two factors—indicating that some questions measured slightly different factors. Overall, considering the high reliability achieved for most of the questions, this was not seen as a problem—in fact, it added to the richness of the questions asked—capturing more of the potential variance. The actual results of the pilot study are listed with the aggregate results in Appendix D and Appendix E, and are noted by italics.

Survey Administration

The survey was administered from 30 January 2002 to 14 February 2002. An electronic mail message was generated for each squadron chosen using an organizational account at the Air Force Institute of Technology. This message held a link to the web address of the survey, a brief explanation and motivation statement, and encouraged any questions or comments be sent to the organizational account. A reminder message was transmitted on 6 February 2002.

One item the pre-test and pilot study's both failed to identify was a problem with the scrolling frame containing the Likert-type selections—built to allow users to move down the list of 90 questions while continually showing the five choices at the top of the screen. On some browsers, this frame did not resize as the window containing it shrank to fit the viewable area on different computer screens. This item was identified midway

through survey administration and corrected by removing the frame. Instead, the five choices were incorporated into the text of the survey. They were repeated before every group of eleven questions—ensuring respondents would always have a listing of the five choices on-screen as they scrolled through the 62-item survey. Users who could not access the survey or could not view all five options were offered the option of filling out an electronic document version of the survey. Only one individual took this option. This individual's results were then added directly to the database holding the results by the researcher.

IV. Analysis and Results

Chapter Overview

This chapter explores the results of the survey described in Chapter 3. Section one outlines the analytical methods and approach used to interpret the research results. Section two outlines the results and analysis of the first hypothesis, first for the squadron unit of analysis, next for the individual perception unit of analysis. Section three outlines the results and analysis of the second hypothesis, using the same format as section two. Section four outlines the results and analysis of the third hypothesis, using the same format as section two. Section five outlines the results and analysis of the fourth hypothesis, using the same format as section two. Section six outlines the different demographics collected during the research, and explains their interactions with the results. Finally, section seven provides an overview of the research results.

Analytical Methods (Statistics)

The survey data described in Chapter 3 were analyzed using two units of analysis: overall squadron culture and individual perception. Testing the four main hypotheses at the squadron level was useful to measure interactions where an organizational culture was likely most measurable, while it was also useful to compare squadron results to individuals' perceptions to see if there might be a difference between the two.

Within the overall squadron culture unit of analysis, squadron mean scores were calculated for each of the 23 squadrons included for each of the eight constructs. The 23 squadrons included in this analysis, representing 1116 responses, were those who met or exceeded an 88 percent level of confidence, based on Equation 2. This confidence

interval was used instead of 90 percent because it allowed the inclusion of more squadrons, which increased the posterior probability of squadrons in the Air Force multiplied by the members in each squadron (.92 x .88 = .81). Relevant information regarding each squadron's size, number required for 90 percent statistical power, actual number returned, and actual statistical power achieved is listed in Appendix D. Mean scores for each squadron used in the analysis are listed in Appendix E. Each of the constructs' mean scores was used to produce a correlation and linear fit plot corresponding to each of the sixteen sub-hypotheses. The fit was compared to the sixteen initial sub-hypotheses, and a determination made whether the empirical data either supported or did not support each hypothesis. The sub-hypotheses are listed below in Table 2, to show how each of the 16 fits were run, and expected to turn out.

Table 3: Description of the 16 "Fit Y by X" Tests and Hypothesized Correlations

	Relational Channels	Partner Similarity	Organizational Self-Knowledge	Divergence of Interests
Openness to Change/Innovation	+	+	+	-
Task-Oriented Organizational Growth	+	+	+	-
Bureaucratic	-	-	-	+
Competition/Confrontation	-	-	-	+

Within the second unit of analysis, individual scores were correlated directly for each of the sixteen sub-hypotheses, ignoring squadron mean scores. This unit of analysis included 741 additional respondents whose 27 squadrons failed to meet the level of significance for inclusion in the squadron level of analysis. The total number of respondents for this item was 1857. Each of the constructs' mean scores was used to produce a correlation and linear fit plot corresponding to each of the sixteen sub-

hypotheses. The constructs' correlation and linear fit then was compared to the initial hypotheses, and a determination made whether the empirical data either supported, or did not support those hypotheses.

Finally, reliability and factor analyses were conducted on all 1857 respondents to confirm questionnaire reliability. Summary results are listed in Appendix F and Appendix G, and are discussed in each hypothesis section below. An analysis was conducted on each remaining question represented in Appendix F to investigate whether any one question or group of questions proved unreliable, much the same as was done in Appendix B, but this analysis did not return any significant information. Because results did not show any significant findings, this in-depth analysis is not included.

Hypothesis 1: Openness to Change/Innovation

Overview

Overall, hypothesis one was strongly supported with the data collected, with the exception of partner similarity, which showed no significant correlation with openness to change/innovation. In other words, a squadron exhibiting an openness to change/innovation culture tended to be fertile to the transfer of knowledge.

Each sub-hypothesis result is summarized in the tables below, with the sub-hypothesis statement appearing above each table. Within each table, the results of the squadron level of analysis are listed in column a, and the results of the individual perception level of analysis are shown in column b. Each column contains the correlational plot, with a fit line and 90 percent oval drawn. Next, each column contains the respective correlations, the significance value of each correlation, and the number of units of analysis represented. A critical value (α) of .054 was chosen to represent a 95

percent level of confidence to two significant digits. Therefore, a significance (p) value of .054 or lower (meaning there was at least a 95 percent chance that the result was not due to random chance) was considered significant. Next, each column contains the linear fit equation for each correlational plot. Finally, the R-square, adjusted R-square, error of calculation, and mean of response (y-axis) is shown, as well as the number of observations used in calculating these numbers (same as the number of units of analysis represented). After each table, a brief explanation of the results is given.

Hypothesis 1a:

Organizations exhibiting an “openness to change/innovation” organizational culture will have more relational channels than those not exhibiting an “openness to change/innovation” organizational culture.

Table 4: Hypothesis 1a Squadron and Individual Results

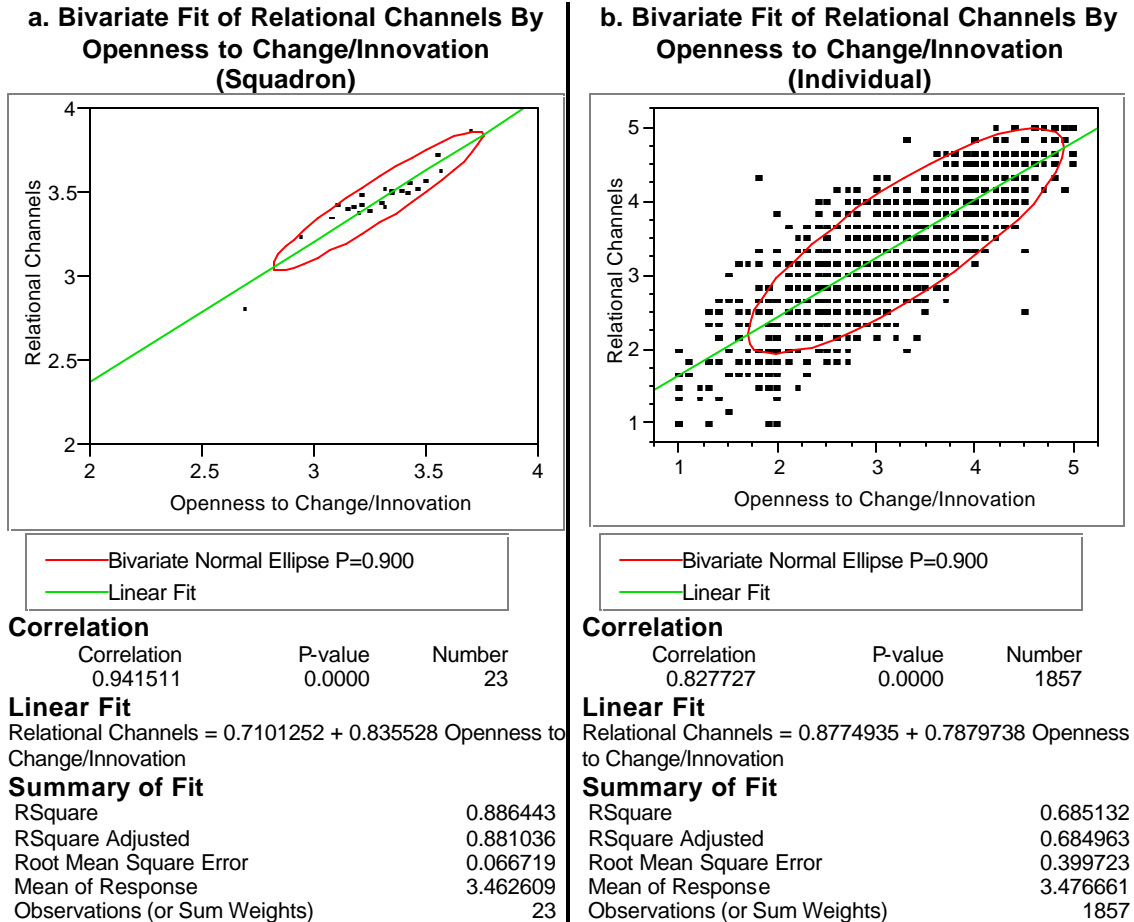


Table 4a shows a strong, significant, positive correlation at the squadron level of analysis between openness to change/innovation and relational channels. This result tends to support hypothesis 1a.

Table 4b also shows a strong, significant, positive correlation at the individual perception level of analysis between openness to change/innovation and relational channels. This result, while not as strong as the result for the squadron unit of analysis,

seems to indicate an interaction at the individual level as well. It also highlights the fact that, although organizational cultures may be strong, individual perceptions still vary from person to person.

Hypothesis 1b:

Organizations exhibiting an “openness to change/innovation” organizational culture will have higher partner similarity than those not exhibiting an “openness to change/innovation” organizational culture.

Table 5: Hypothesis 1b Squadron and Individual Results

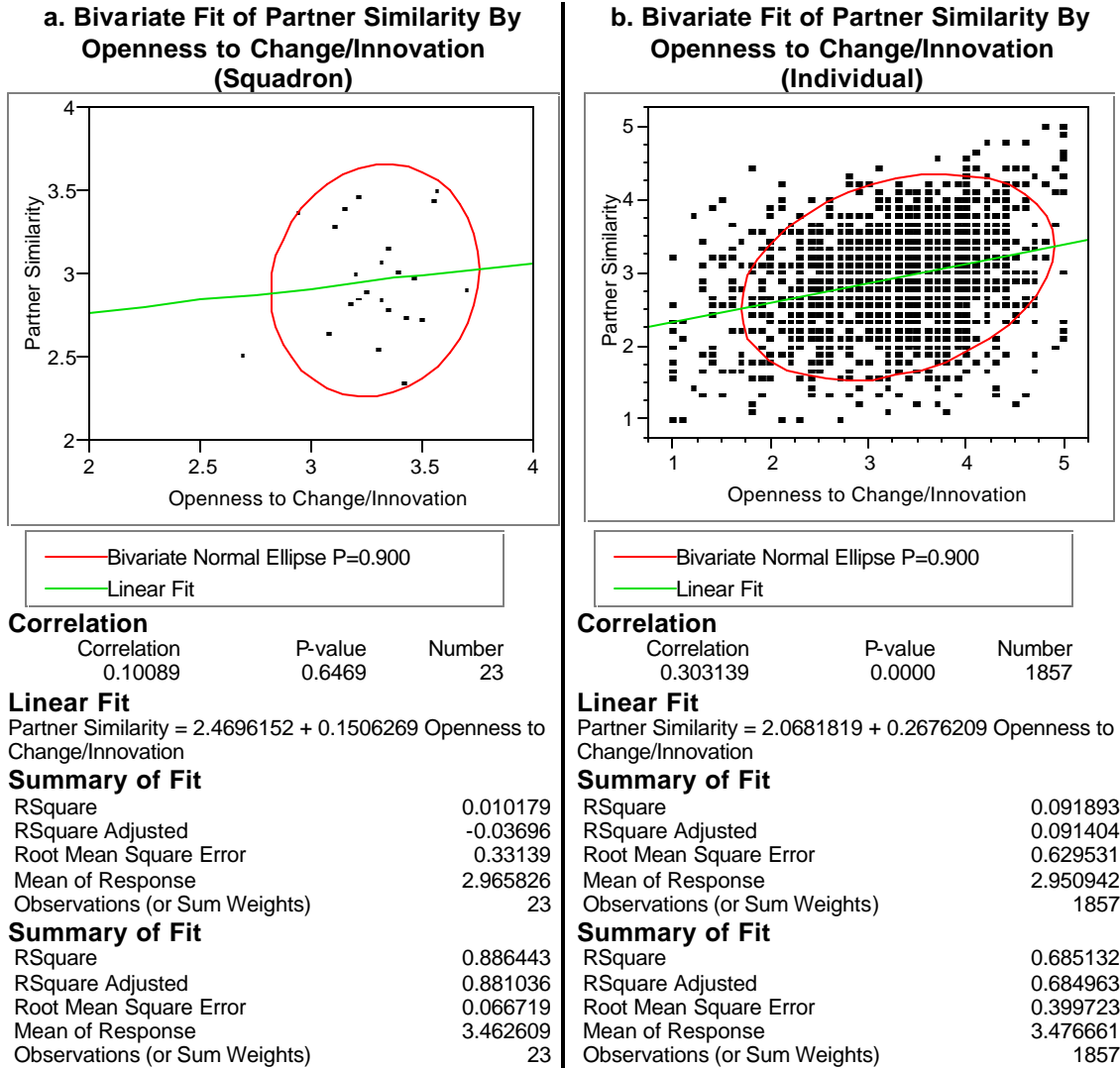


Table 5a shows a weak, positive correlation that lacks significance at the squadron level of analysis between openness to change/innovation and partner similarity. This result, while interesting, does not reach a level of significance adequate to lend support to hypothesis 1b.

Table 5b shows a weak, significant, positive correlation at the individual perception level of analysis between openness to change/innovation and partner similarity. In other words, members who have a perception of an openness to change/innovation culture in their squadron also seem to recognize an inherent similarity among squadron members. This difference between individual perception and squadron units of analysis merits further investigation; perhaps there are different types of squadrons in the Air Force, ones in which individuals are primarily similar, and ones in which individuals are primarily dissimilar.

One additional factor that might have contributed to the weak results is the overall reliability of questions measuring partner similarity of .7533, as shown in Appendix F. This reliability differed significantly from the initial reliability of .8367 calculated based on the pilot study, as shown in Appendix B. Finally, as noted in Appendix G, questions measuring the construct of Partner Similarity tended to load on two separate constructs. The extent to which these constructs did not overlap might have reduced the accuracy of this construct.

Hypothesis 1c:

Organizations exhibiting an “openness to change/innovation” organizational culture will have more organizational self-knowledge than those not exhibiting an “openness to change/innovation” organizational culture.

Table 6: Hypothesis 1c Squadron and Individual Results

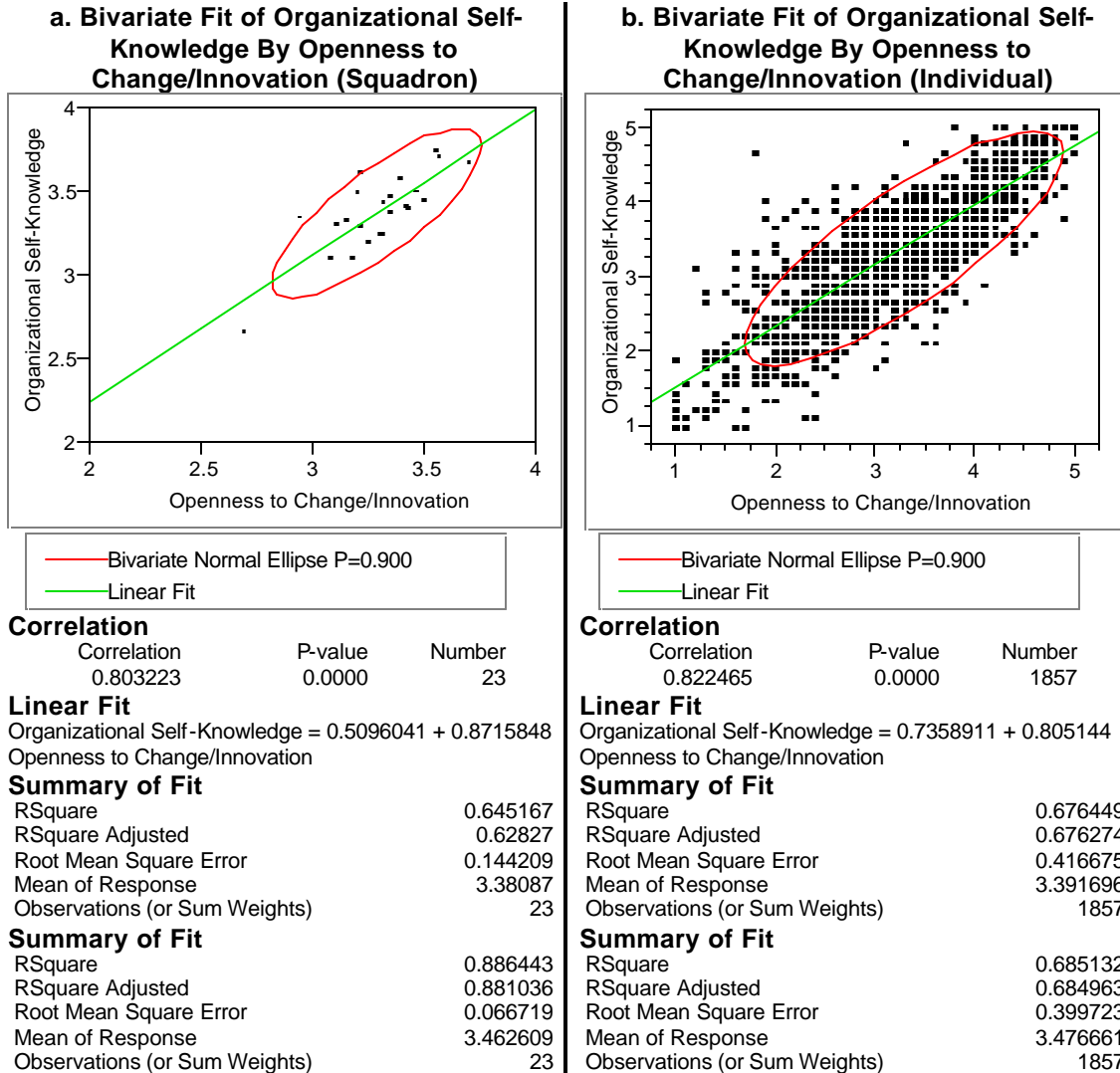


Table 6a shows a strong, significant, positive correlation at the squadron level of analysis between openness to change/innovation and organizational self-knowledge. This result tends to support hypothesis 1c.

Table 6b also shows a strong, significant, positive correlation at the individual perception level of analysis between openness to change/innovation and organizational self-knowledge. This result is, in fact stronger than the result for the squadron unit of analysis, indicating an interaction between the two constructs at the individual level—even if the overall squadron results do not represent this relationship as strongly as individuals perceive it to.

Hypothesis 1d:

Organizations exhibiting an “openness to change/innovation” organizational culture will have less divergence of interests than those not exhibiting an “openness to change/innovation” organizational culture.

Table 7: Hypothesis 1d Squadron and Individual Results

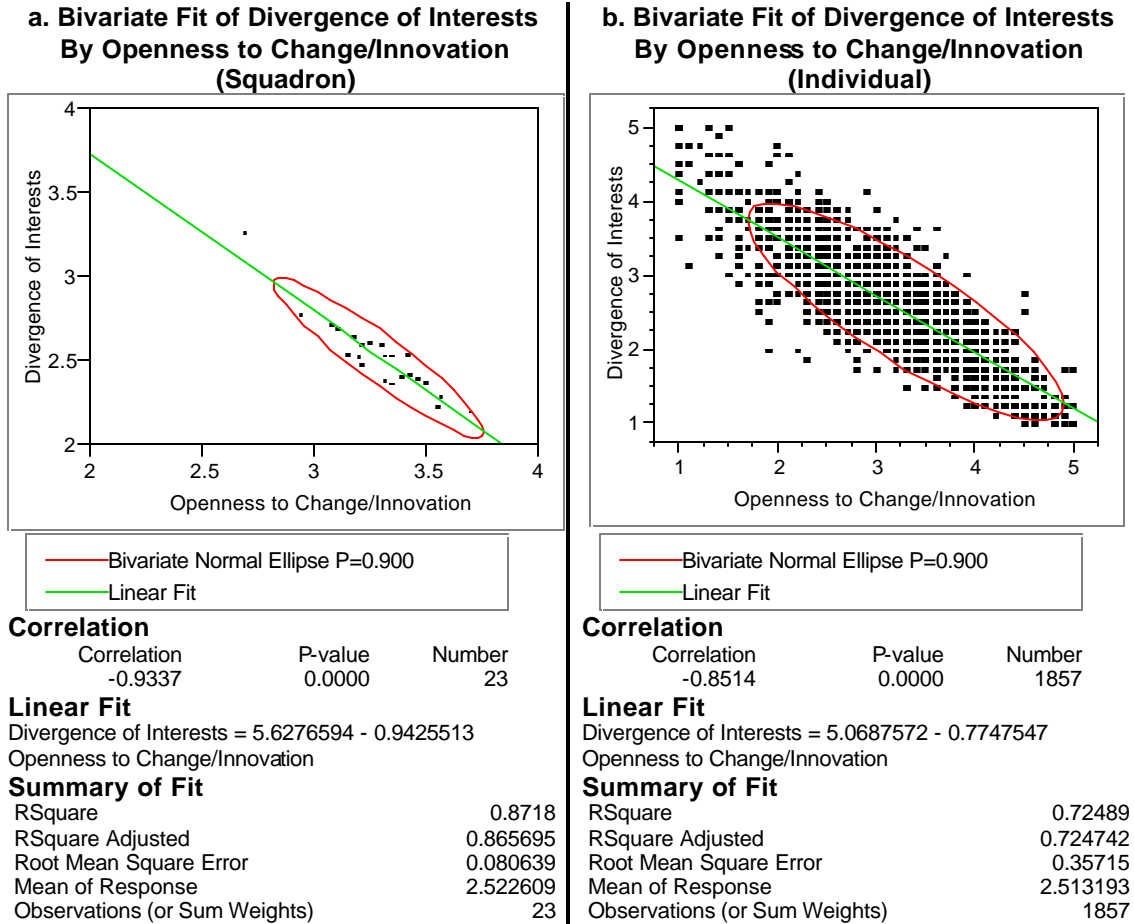


Table 7a shows a strong, significant, negative correlation at the squadron level of analysis between openness to change/innovation and divergence of interests. This result tends to support hypothesis 1d.

Table 7b also shows a strong, significant, negative correlation at the individual perception level of analysis between openness to change/innovation and divergence of interests. This result, while not as strong as the result for the squadron unit of analysis,

shows that unit members appear to be aware that a relationship exists between the two constructs. It also highlights the fact that, although organizational cultures may be strong, individual perceptions still vary from person to person.

Hypothesis 2: Task-Oriented Organizational Growth

Overview

Overall, hypothesis two was strongly supported with the data collected, with the exception of partner similarity, which showed a moderate but significant correlation with openness to change/innovation. In other words, a squadron exhibiting a task-oriented organizational growth culture tended to be fertile to the transfer of knowledge.

Each sub-hypothesis result is summarized in the tables below, with the sub-hypothesis statement appearing above each table. Within each table, the results of the squadron level of analysis are listed in column a, and the results of the individual perception level of analysis are shown in column b. Each column contains the correlational plot, with a fit line and 90 percent oval drawn. Next, each column contains the respective correlations, the significance value of each correlation, and the number of units of analysis represented. A critical value (a) of .054 was chosen to represent a 95 percent level of confidence to two significant digits. Therefore, a significance (p) value of .054 or lower (meaning there was at least a 95 percent chance that the result was not due to random chance) was considered significant. Next, each column contains the linear fit equation for each correlational plot. Finally, the R-square, adjusted R-square, error of calculation, and mean of response (y-axis) is shown, as well as the number of observations used in calculating these numbers (same as the number of units of analysis represented). After each table, a brief explanation of the results is given.

Hypothesis 2a:

Organizations exhibiting a “task-oriented organizational growth” organizational culture will have more relational channels than those not exhibiting a “task-oriented organizational growth” organizational culture.

Table 8: Hypothesis 2a Squadron and Individual Results

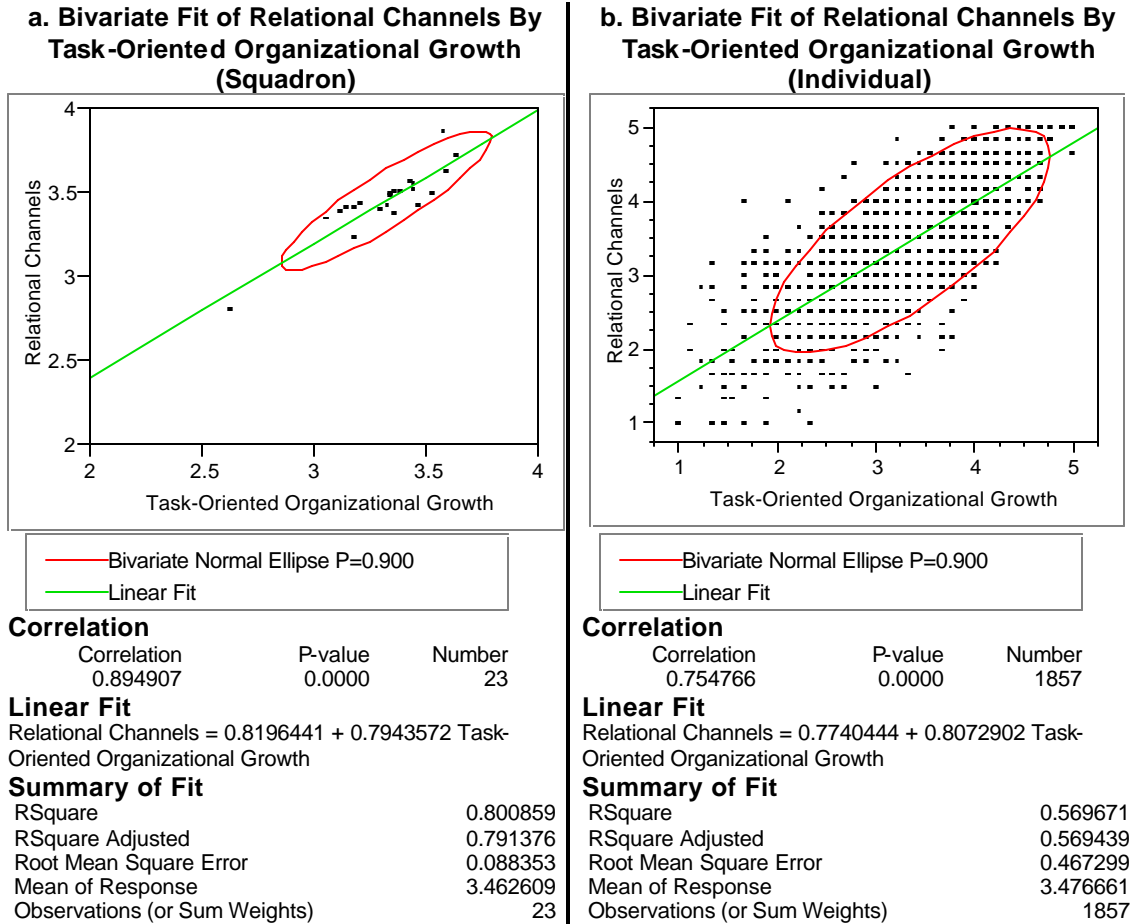


Table 8a shows a strong, significant, positive correlation at the squadron level of analysis between task-oriented organizational growth and relational channels. This result tends to support hypothesis 2a.

Table 8b also shows a strong, significant, positive correlation at the individual perception level of analysis between task-oriented organizational growth and relational channels. This result, while not as strong as the result for the squadron unit of analysis,

shows that unit members appear to be aware that a relationship exists between the two constructs. It also highlights the fact that, although organizational cultures may be strong, individual perceptions still vary from person to person.

Hypothesis 2b:

Organizations exhibiting a “task-oriented organizational growth” organizational culture will have higher partner similarity than those not exhibiting a “task-oriented organizational growth” organizational culture.

Table 9: Hypothesis 2b Squadron and Individual Results

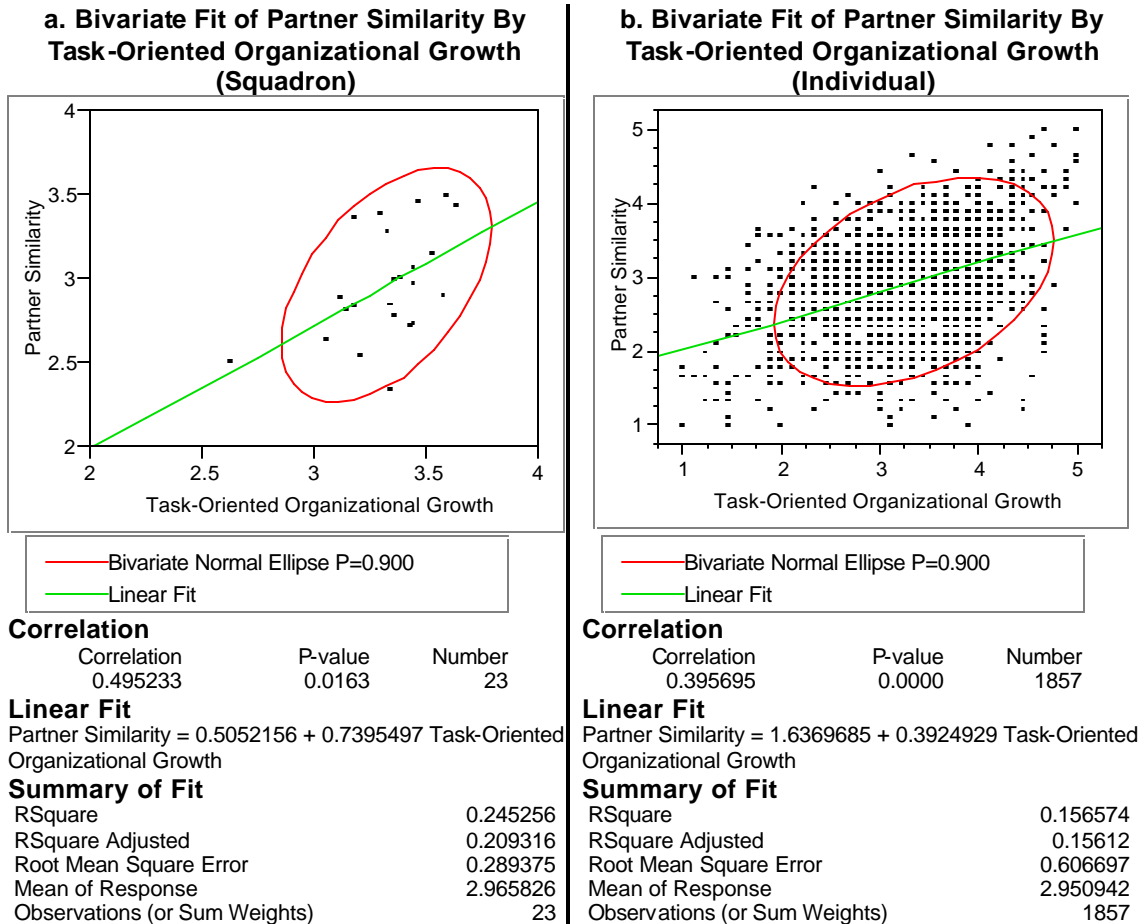


Table 9a shows a significant, positive correlation at the squadron level of analysis between task-oriented organizational growth and partner similarity. This result tends to support hypothesis 2b.

Table 9b also shows a significant, positive correlation at the individual perception level of analysis between task-oriented organizational growth and partner similarity. This result, while not as strong as the result for the squadron unit of analysis, shows that unit

members appear to be aware that a relationship exists between the two constructs. It also highlights the fact that, although organizational cultures may be strong, individual perceptions still vary from person to person.

One factor that might have weakened results in this item is the overall reliability of questions measuring partner similarity of .7533, as shown in Appendix F. This reliability differed significantly from the initial reliability of .8367 calculated based on the pilot study, as shown in Appendix B. Finally, as noted in Appendix G, questions measuring the construct of Partner Similarity tended to load on two separate constructs. The extent to which these constructs did not overlap might have reduced the accuracy of this construct.

Hypothesis 2c:

Organizations exhibiting a “task-oriented organizational growth” organizational culture will have more organizational self-knowledge than those not exhibiting a “task-oriented organizational growth” organizational culture.

Table 10: Hypothesis 2c Squadron and Individual Results

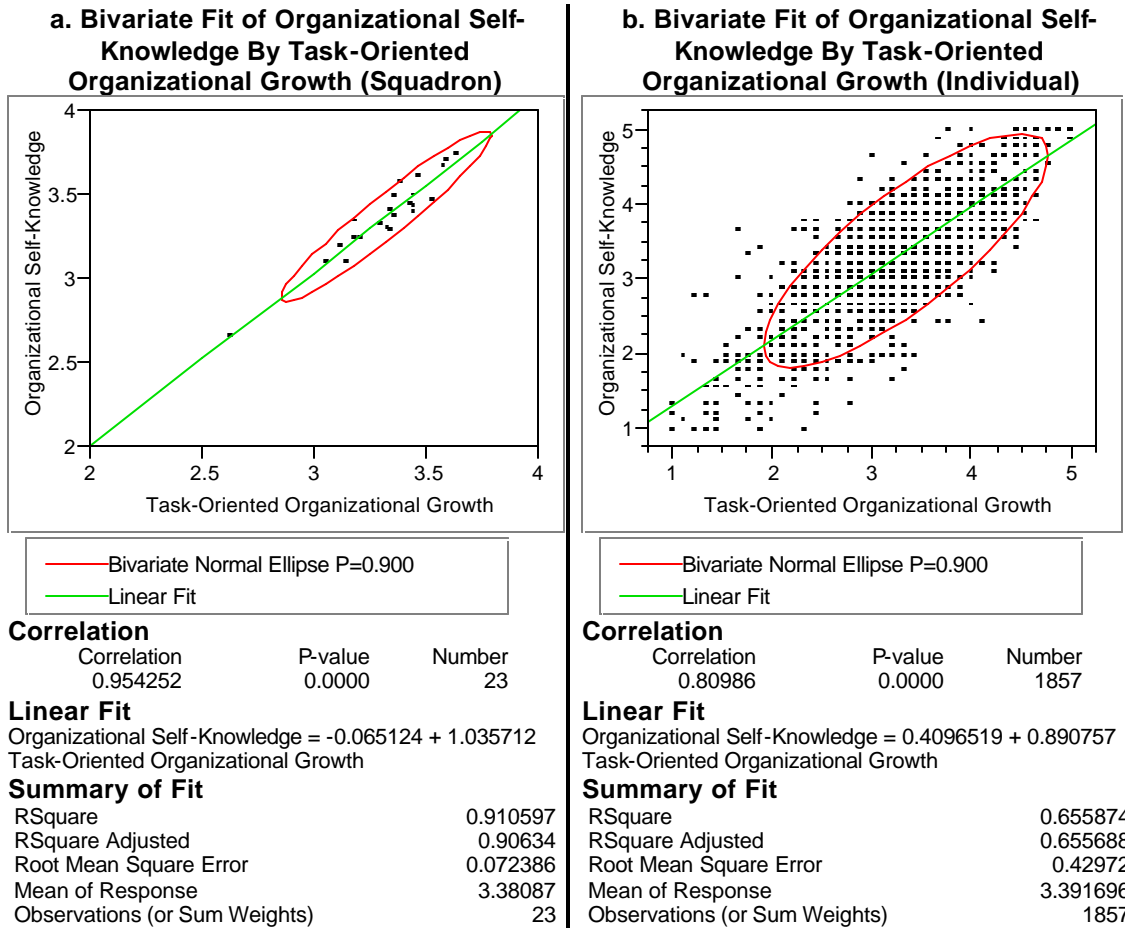


Table 10a shows a strong, significant, positive correlation at the squadron level of analysis between task-oriented organizational growth and organizational self-knowledge. This result tends to support hypothesis 2c.

Table 10b also shows a strong, significant, positive correlation at the individual perception level of analysis between task-oriented organizational growth and organizational self-knowledge. This result, while not as strong as the result for the

squadron unit of analysis, shows that unit members appear to be aware that a relationship exists between the two constructs. It also highlights the fact that, although organizational cultures may be strong, individual perceptions still vary from person to person.

Hypothesis 2d:

Organizations exhibiting a “task-oriented organizational growth” organizational culture will have less divergence of interests than those not exhibiting a “task-oriented organizational growth” organizational culture.

Table 11: Hypothesis 2d Squadron and Individual Results

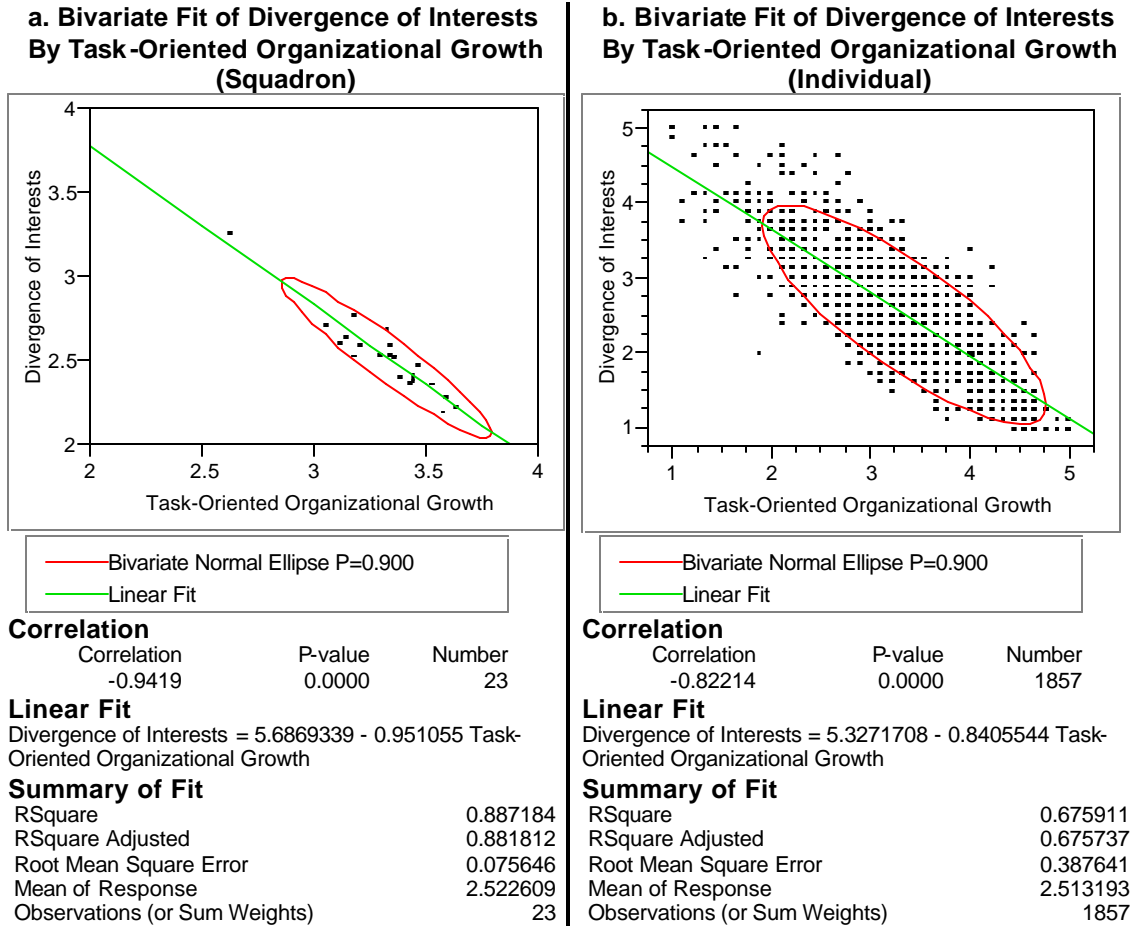


Table 11a shows a strong, significant, negative correlation at the squadron level of analysis between task-oriented organizational growth and divergence of interests. This result tends to support hypothesis 2d.

Table 11b also shows a strong, significant, negative correlation at the individual perception level of analysis between task-oriented organizational growth and divergence of interests. This result, while not as strong as the result for the squadron unit of analysis,

shows that unit members appear to be aware that a relationship exists between the two constructs. It also highlights the fact that, although organizational cultures may be strong, individual perceptions still vary from person to person.

Hypothesis 3: Bureaucratic

Overview

Overall, hypothesis three was not supported with the data collected. In other words, there does not appear to be a correlation between a squadron exhibiting a bureaucratic culture and one that is fertile to the transfer of knowledge.

Results may have been weakened by the reliability of the instrument used to measure the construct of bureaucratic culture, initially shown in Appendix B to be .6172 based on the pilot study, and shown Appendix F to be .3575 once all results were tabulated. In this case, where only 7 of every 20 questions asked in this area were in agreement and only 5 questions were asked, it is clear that this instrument was either poorly worded or interpreted quite differently from individual to individual. An exploration of whether eliminating more questions would have increased overall reliability showed this was not the case.

It is also possible that the assumptions about bureaucratic culture were incorrect, and that bureaucratic cultures do address one or more of agency costs and transaction costs. In the case of agency costs, it is possible that a bureaucratic organization addresses them by its very structure—increasing overall monitoring of agent behavior. It is also possible that a bureaucratic organization addresses transaction costs by providing a standard framework for generating the answers to questions—in essence acting as a surrogate for complete market information. Considering these two possibilities, it is further made clear that individual perception of what the questions were measuring might have been swayed by these alternate interpretations of what was meant by the concept of “bureaucracy.” For example, questions such as “the chain of command is important”

might have directly contradicted with ones such as “conflict is avoided at all costs,” even though they both attempted to measure the same construct.

Each sub-hypothesis result is summarized in the tables below, with the sub-hypothesis statement appearing above each table. Within each table, the results of the squadron level of analysis are listed in column a, and the results of the individual perception level of analysis are shown in column b. Each column contains the correlational plot, with a fit line and 90 percent oval drawn. Next, each column contains the respective correlations, the significance value of each correlation, and the number of units of analysis represented. A critical value (α) of .054 was chosen to represent a 95 percent level of confidence to two significant digits. Therefore, a significance (p) value of .054 or lower (meaning there was at least a 95 percent chance that the result was not due to random chance) was considered significant. Next, each column contains the linear fit equation for each correlational plot. Finally, the R-square, adjusted R-square, error of calculation, and mean of response (y-axis) is shown, as well as the number of observations used in calculating these numbers (same as the number of units of analysis represented). After each table, a brief explanation of the results is given.

Hypothesis 3a:

Organizations exhibiting a “bureaucratic” organizational culture will have fewer relational channels than those not exhibiting a “bureaucratic” organizational culture.

Table 12: Hypothesis 3a Squadron and Individual Results

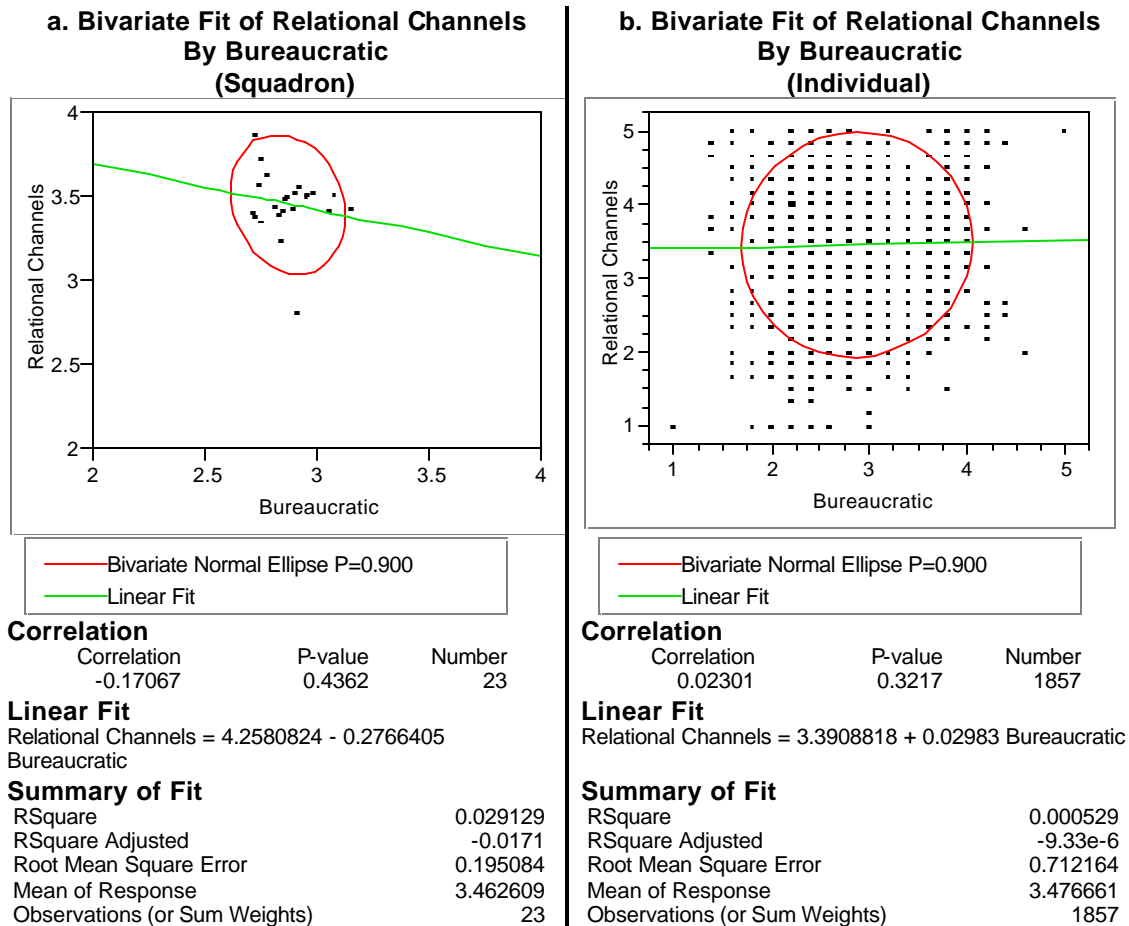


Table 12a shows a weak, negative correlation that lacks significance at the squadron level of analysis between bureaucratic and relational channels. Though interesting, this result is not strong enough to lend support hypothesis 3a, especially considering the questionable reliability of the bureaucratic questions (.3575). What is somewhat surprising is that Air Force squadrons as a whole do not appear overly bureaucratic (mean score less than 3). Again, this result is tempered by the lack of

overall reliability of the measure used, in addition to the apparent confusion generated by this lack of reliability.

Table 12b also shows no significant correlation at the individual perception level of analysis between bureaucratic and relational channels. These results indicate that not only is there significant variance in individual perception of bureaucratic cultures but also that the Air Force as a whole sees itself as less bureaucratic. The weak correlation at the squadron level of analysis and lack of any correlation at the individual perception level of analysis may be because the bureaucratic questions did not achieve the desired level of reliability, and therefore did not accurately measure the construct in question. Recall that the inter-question reliability of the bureaucratic questions was .3575, meaning that only 7 of every 20 responses recorded for this construct agreed. Only a thorough analysis of this construct using a reliable instrument can determine whether the above results were actually significant or not.

Hypothesis 3b:

Organizations exhibiting a “bureaucratic” organizational culture will have lower partner similarity than those not exhibiting a “bureaucratic” organizational culture.

Table 13: Hypothesis 3b Squadron and Individual Results

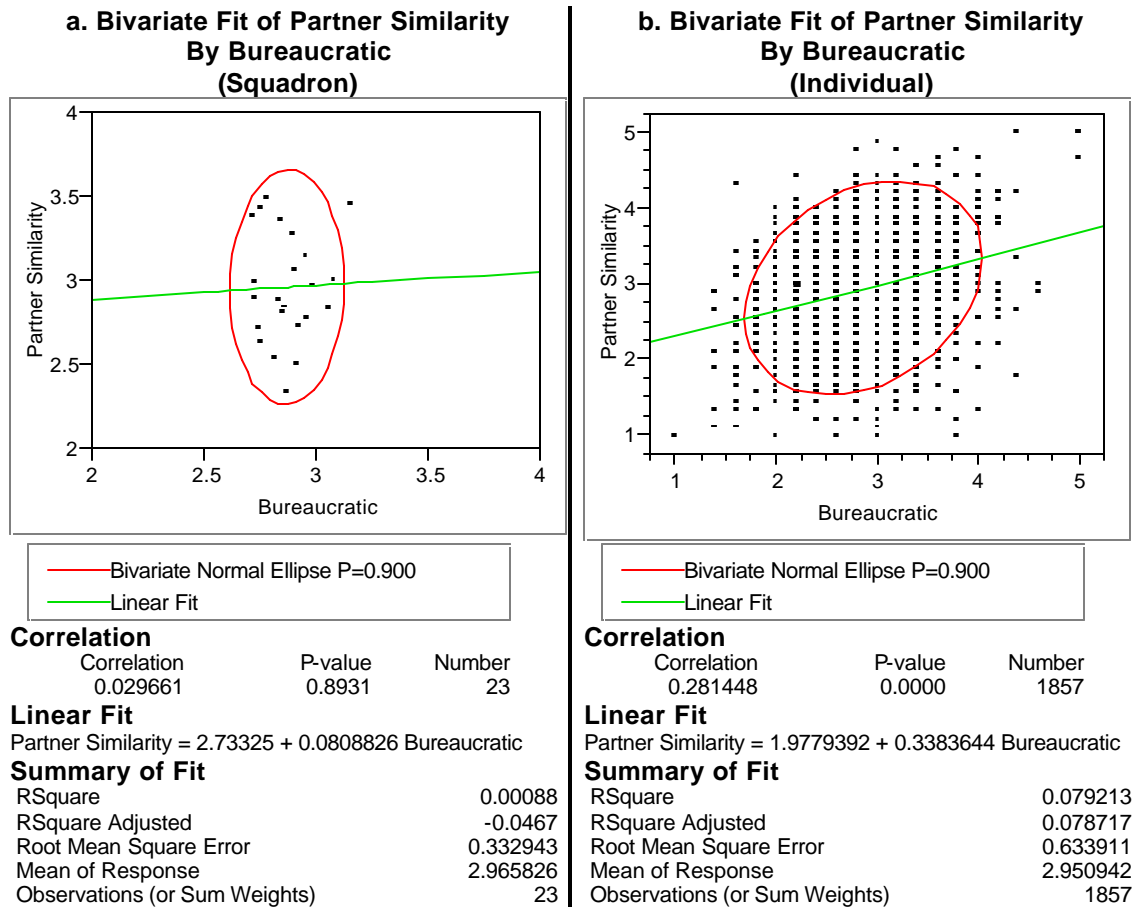


Table 13a shows no significant correlation at the squadron level of analysis between bureaucratic and partner similarity. This result does not lend support to hypothesis 3b. This result is unsurprising, considering the questionable reliability of the bureaucratic questions (.3575). What is somewhat surprising is that Air Force squadrons as a whole do not appear overly bureaucratic (mean score less than 3). Again, this result is tempered by the lack of overall reliability of the measure used, in addition to the apparent confusion generated by this lack of reliability.

Table 13b also shows a weak, significant, positive correlation at the individual perception level of analysis between bureaucratic and partner similarity. These results appear to directly contradict the original hypothesis. Indeed, on the aggregate, the construct of partner similarity did not behave as expected. Perhaps this was because, as hypothesized earlier, there is a mixture of different types of squadrons in the Air Force—those in which the members are primarily similar, and those in which the members were primarily dissimilar.

The lack of correlation at the squadron level of analysis and weak correlation at the individual perception level of analysis may be because the bureaucratic questions did not achieve the desired level of reliability, and therefore did not accurately measure the construct in question. Recall that the inter-question reliability of the bureaucratic questions was .3575, meaning that only 7 of every 20 responses recorded for this construct agreed. Only a thorough analysis of this construct using a reliable instrument can determine whether the above results were actually significant or not.

One additional factor that might have contributed to the weak results is the overall reliability of questions measuring partner similarity of .7533, as shown in Appendix F. This reliability differed significantly from the initial reliability of .8367 calculated based on the pilot study, as shown in Appendix B. Finally, as noted in Appendix G, questions measuring the construct of Partner Similarity tended to load on two separate constructs. The extent to which these constructs did not overlap might have reduced the accuracy of this construct.

Hypothesis 3c:

Organizations exhibiting a “bureaucratic” organizational culture will have less organizational self-knowledge than those not exhibiting a “bureaucratic” organizational culture.

Table 14: Hypothesis 3c Squadron and Individual Results

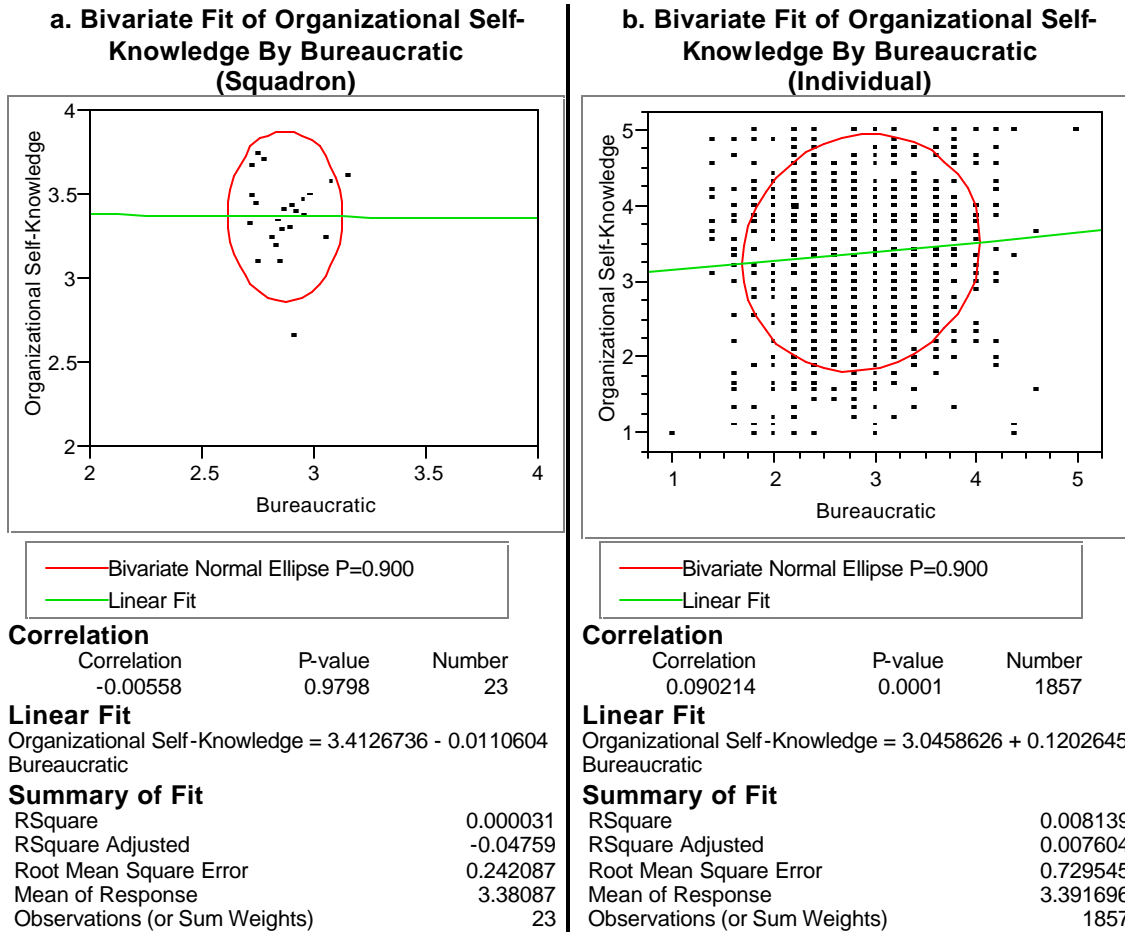


Table 14a shows no significant correlation at the squadron level of analysis between bureaucratic and organizational self-knowledge. This result does not lend support to hypothesis 3c. This result is unsurprising, considering the questionable reliability of the bureaucratic questions (.3575). What is somewhat surprising is that Air Force squadrons as a whole do not appear overly bureaucratic (mean score of less than 3).

Again, this result is tempered by the lack of overall reliability of the measure used, in addition to the apparent confusion generated by this lack of reliability.

Table 14b also shows a weak, significant, positive correlation at the individual perception level of analysis between bureaucratic and organizational self-knowledge. The lack of significant correlation at the squadron level of analysis and weak correlation at the individual perception level of analysis may be because the bureaucratic questions did not achieve the desired level of reliability, and therefore did not accurately measure the construct in question. Recall that the inter-question reliability of the bureaucratic questions was .3575, meaning that only 7 of every 20 responses recorded for this construct agreed. Only a thorough analysis of this construct using a reliable instrument can determine whether the above results were actually significant or not.

Hypothesis 3d:

Organizations exhibiting a “bureaucratic” organizational culture will have more divergence of interests than those not exhibiting a “bureaucratic” organizational culture.

Table 15: Hypothesis 3d Squadron and Individual Results

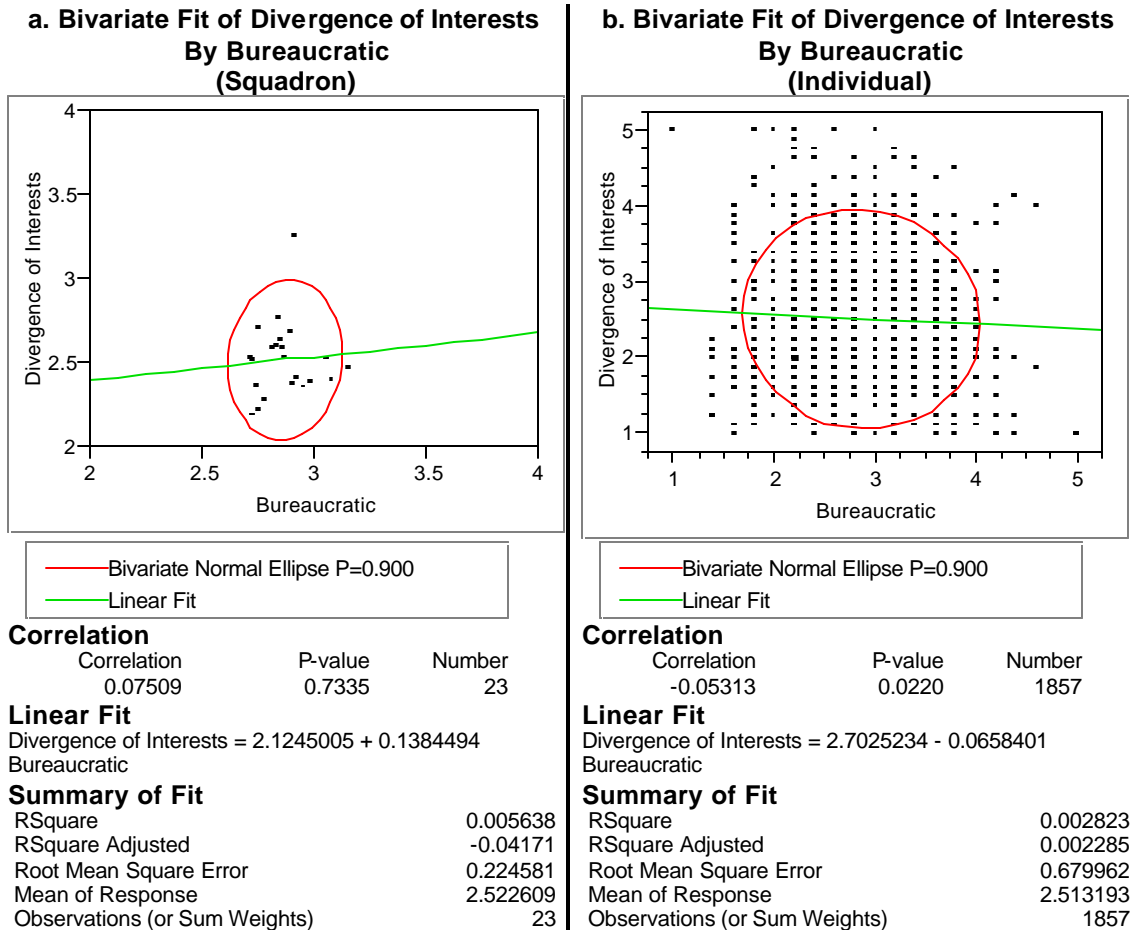


Table 15a shows a weak positive correlation that lacks significance at the squadron level of analysis between bureaucratic and divergence of interests. This result does not lend support to hypothesis 3d. This result is unsurprising, considering the questionable reliability of the bureaucratic questions (.3575). What is somewhat surprising is that Air Force squadrons as a whole do not appear overly bureaucratic (mean score of less than 3). Again, this result is tempered by the lack of overall reliability of

the measure used, in addition to the apparent confusion generated by this lack of reliability.

Table 15b also shows an extremely weak, significant, negative correlation at the individual perception level of analysis between bureaucratic and divergence of interests. The lack of significant correlation at the squadron level of analysis and weak correlation at the individual perception level of analysis may be because the bureaucratic questions did not achieve the desired level of reliability, and therefore did not accurately measure the construct in question. Recall that the inter-question reliability of the bureaucratic questions was .3575, meaning that only 7 of every 20 responses recorded for this construct agreed. Only a thorough analysis of this construct using a reliable instrument can determine whether the above results were actually significant or not.

Hypothesis 4: Competition/Confrontation

Overview

Overall, hypothesis four was moderately supported with the data collected, with the exception of partner similarity, which showed no significant correlation with competition/confrontation. In other words, a squadron exhibiting a competition/confrontation culture tended to be infertile to the transfer of knowledge. Results may have been weakened by the reliability of the instrument used to measure the construct of competition/confrontation, initially shown in Appendix B to be .7179 based on the pilot study, and shown Appendix F to be .6422 once all results were tabulated.

Each sub-hypothesis result is summarized in the tables below, with the sub-hypothesis statement appearing above each table. Within each table, the results of the squadron level of analysis are listed in column a, and the results of the individual perception level of analysis are shown in column b. Each column contains the correlational plot, with a fit line and 90 percent oval drawn. Next, each column contains the respective correlations, the significance value of each correlation, and the number of units of analysis represented. A critical value (a) of .054 was chosen to represent a 95 percent level of confidence to two significant digits. Therefore, a significance (p) value of .054 or lower (meaning there was at least a 95 percent chance that the result was not due to random chance) was considered significant. Next, each column contains the linear fit equation for each correlational plot. Finally, the R-square, adjusted R-square, error of calculation, and mean of response (y-axis) is shown, as well as the number of observations used in calculating these numbers (same as the number of units of analysis represented). After each table, a brief explanation of the results is given.

Hypothesis 4a:

Organizations exhibiting a “competition/confrontation” organizational culture will have fewer relational channels than those not exhibiting a “competition/confrontation” organizational culture.

Table 16: Hypothesis 4a Squadron and Individual Results

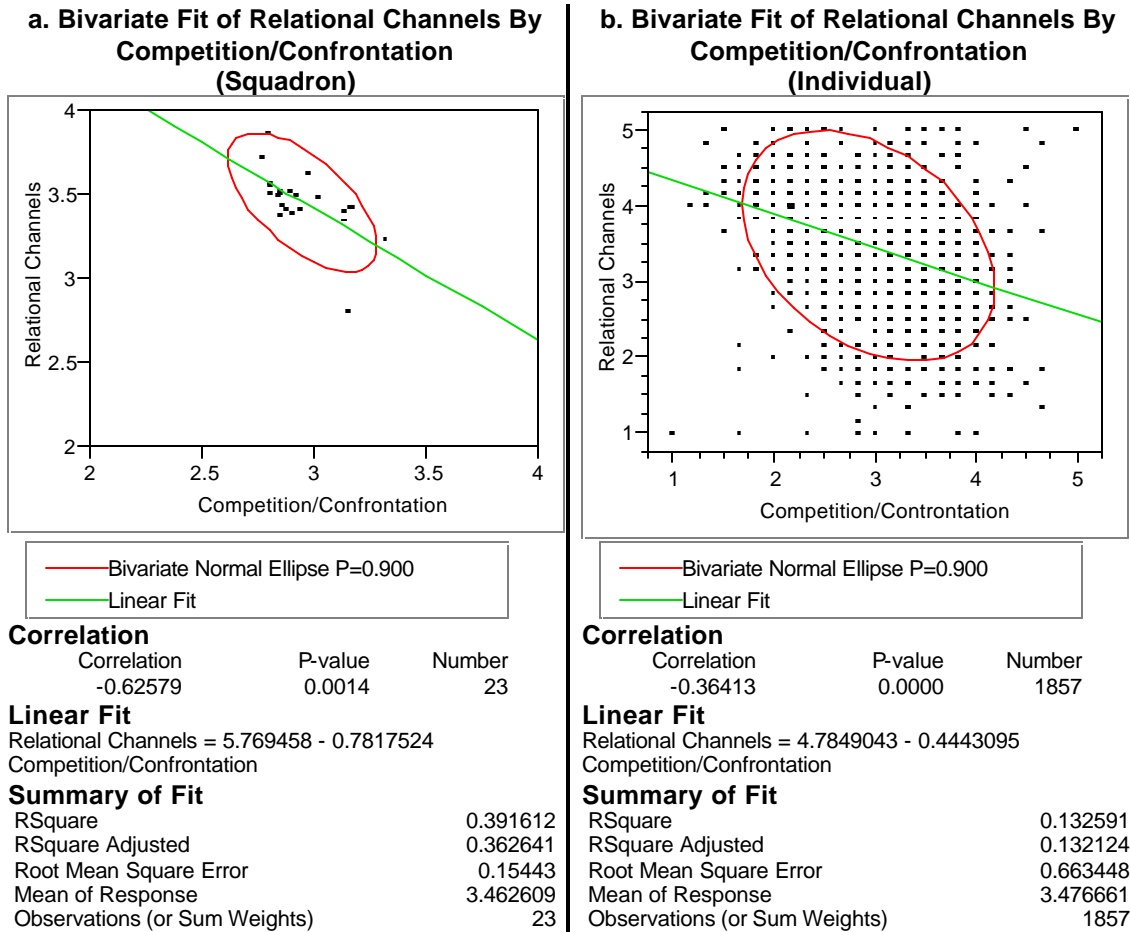


Table 16a shows a significant negative correlation at the squadron level of analysis between competition/confrontation and relational channels. This result tends to support hypothesis 4a.

Table 16b also shows a weak, significant, negative correlation at the individual perception level of analysis between competition/confrontation and relational channels. This result, while not as strong as the result for the squadron unit of analysis, shows that

unit members appear to be aware that a relationship exists between the two constructs. It also highlights the fact that, although organizational cultures may be strong, individual perceptions still vary from person to person. The weak correlation at the individual perception level of analysis may be because the competition/confrontation questions did not achieve the desired level of reliability, and therefore did not accurately measure the construct in question. Recall that the reliability of the competition/confrontation questions was .6422, meaning that only 13 of every 20 responses recorded for this construct agreed.

Hypothesis 4b:

Organizations exhibiting a “competition/confrontation” organizational culture will have lower partner similarity than those not exhibiting a “competition/confrontation” organizational culture.

Table 17: Hypothesis 4b Squadron and Individual Results

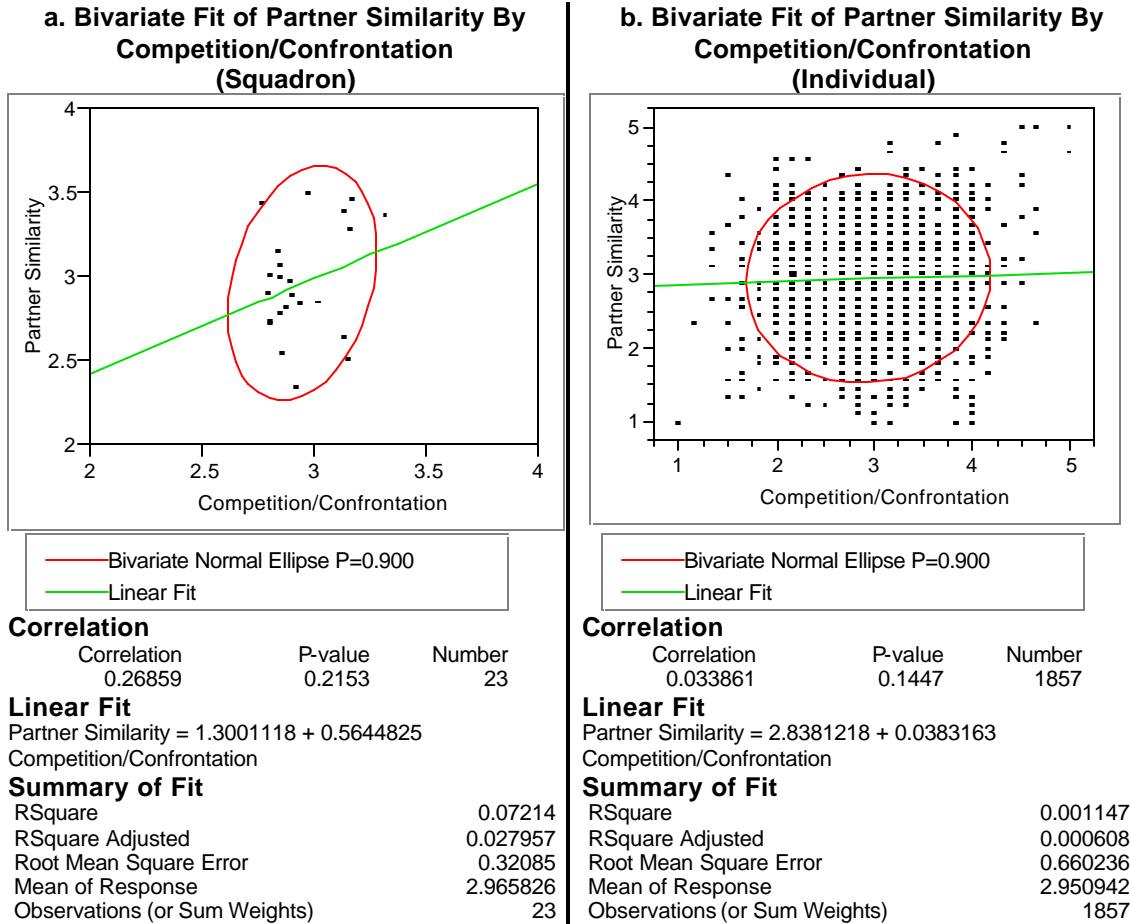


Table 17a shows a weak positive correlation that lacks significance at the squadron level of analysis between competition/confrontation and partner similarity.

This result does not lend support to hypothesis 4b; indeed, this result appears to directly contradict hypothesis 4b.

Table 17b also shows no significant correlation at the individual perception level of analysis between competition/confrontation and partner similarity. The weak

correlation at the squadron level of analysis and lack of correlation at the individual perception level of analysis may be because the competition/confrontation questions did not achieve the desired level of reliability, and therefore did not accurately measure the construct in question. Recall that the reliability of the competition/confrontation questions was .6422, meaning that only 13 of every 20 responses recorded for this construct agreed. However, in this case, as in two of the previous three cases, partner similarity did not behave as expected. As hypothesized previously, this could be because there is a mixture of different types of squadrons in the Air Force—those in which the members are primarily similar, and those in which the members were primarily dissimilar.

One additional factor that might have contributed to the weak results is the overall reliability of questions measuring partner similarity of .7533, as shown in Appendix F. This reliability differed significantly from the initial reliability of .8367 calculated based on the pilot study, as shown in Appendix B. Finally, as noted in Appendix G, questions measuring the construct of Partner Similarity tended to load on two separate constructs. The extent to which these constructs did not overlap might have reduced the accuracy of this construct.

Hypothesis 4c:

Organizations exhibiting a “competition/confrontation” organizational culture will have less organizational self-knowledge than those not exhibiting a “competition/confrontation” organizational culture.

Table 18: Hypothesis 4c Squadron and Individual Results

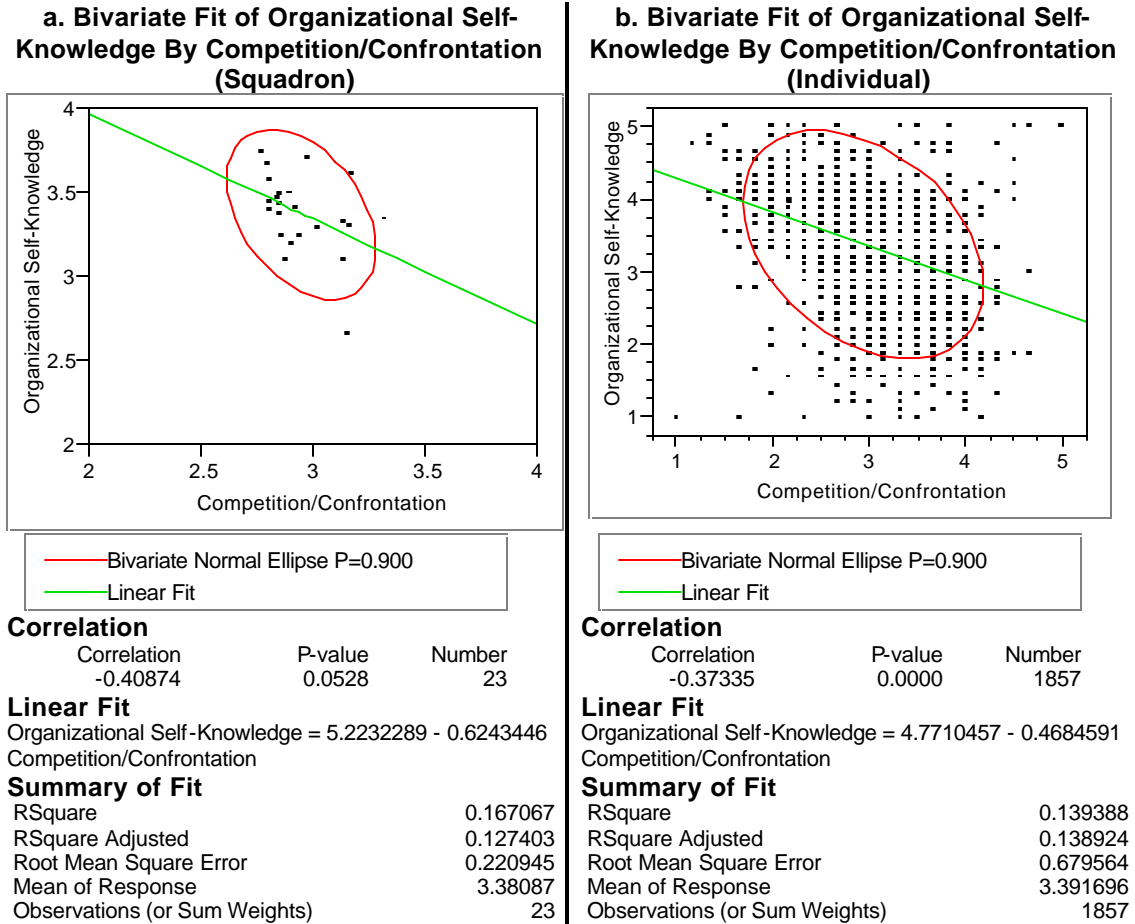


Table 18a shows a significant negative correlation at the squadron level of analysis between competition/confrontation and organizational self-knowledge. This result tends to support hypothesis 4c.

Table 18b also shows a weak, significant, negative correlation at the individual perception level of analysis between competition/confrontation and organizational self-knowledge. This result, while not as strong as the result for the squadron unit of analysis,

shows that unit members appear to be aware that a relationship exists between the two constructs. It also highlights the fact that, although organizational cultures may be strong, individual perceptions still vary from person to person. The weak correlation at the individual perception level of analysis may be because the competition/confrontation questions did not achieve the desired level of reliability, and therefore did not accurately measure the construct in question. Recall that the reliability of the competition/confrontation questions was .6422, meaning that only 13 of every 20 responses recorded for this construct agreed.

Hypothesis 4d:

Organizations exhibiting a “competition/confrontation” organizational culture will have more divergence of interests than those not exhibiting a “competition/confrontation” organizational culture.

Table 19: Hypothesis 4d Squadron and Individual Results

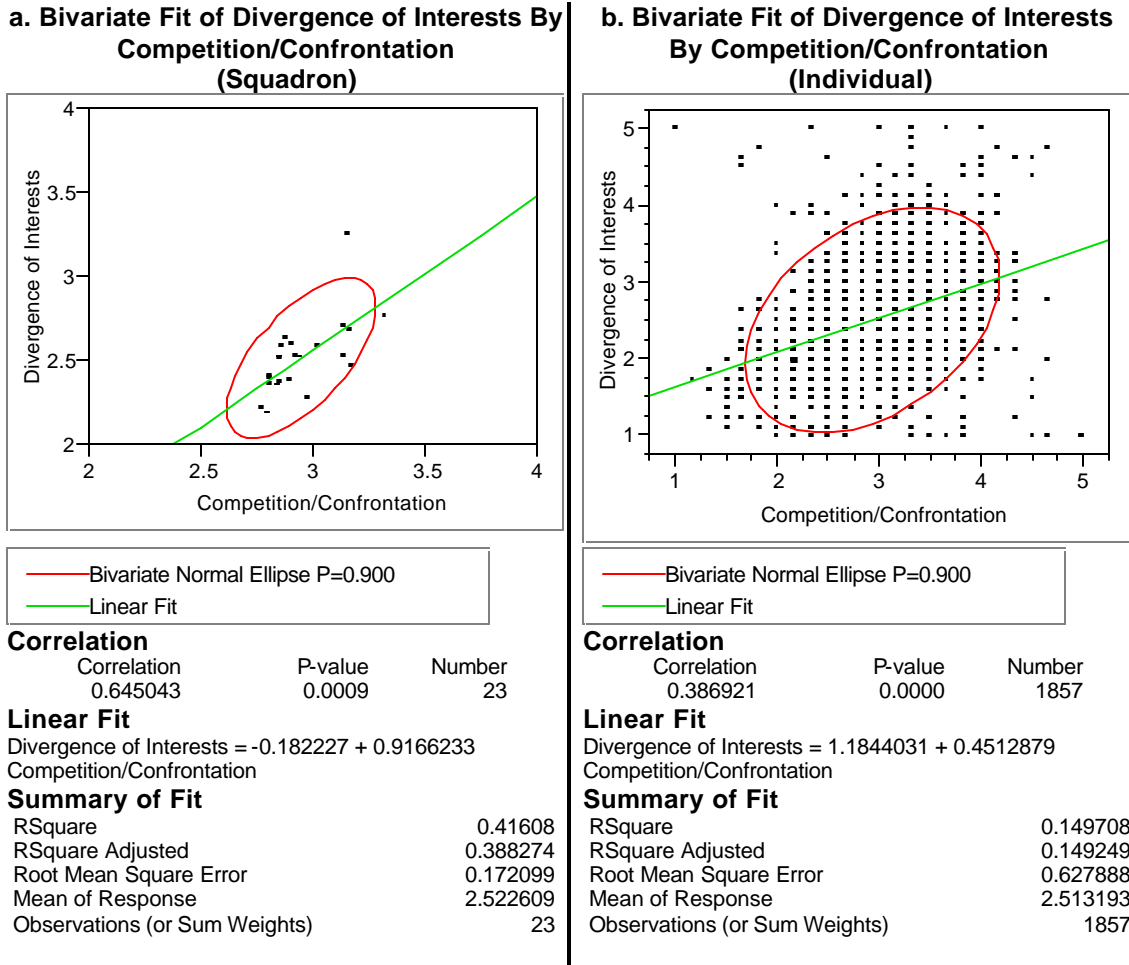


Table 19a shows a positive, significant correlation at the squadron level of analysis between competition/confrontation and divergence of interests. This result tends to support hypothesis 4d.

Table 19b also shows a weak, significant, positive correlation at the individual perception level of analysis between competition/confrontation and divergence of

interests. This result, while not as strong as the result for the squadron unit of analysis, shows that unit members appear to be aware that a relationship exists between the two constructs. It also highlights the fact that, although organizational cultures may be strong, individual perceptions still vary from person to person. . The weak correlation at the individual perception level of analysis may be because the competition/confrontation questions did not achieve the desired level of reliability, and therefore did not accurately measure the construct in question. Recall that the reliability of the competition/confrontation questions was .6422, meaning that only 13 of every 20 responses recorded for this construct agreed.

Demographics

Summary information for the demographics collected is listed in Table 20.

Table 20: Respondent Demographic Information

Demographic	Total Number of	% of Total
<i>Gender</i>		
Male	1475	79.4%
Female	382	20.6%
TOTAL:	1857	100%
<i>Age</i>		
> 21	105	5.7%
21-25	385	20.7%
26-30	385	20.7%
31-35	373	20.1%
36-40	418	22.5%
41-45	166	8.9%
46-50	20	1.1%
50 <	5	0.3%
TOTAL:	1857	100%
<i>Rank</i>		
AB	2	0.1%
Amn	10	0.5%
A1C	202	10.9%
SrA	215	11.6%
SSgt	449	24.2%
TSgt	350	18.8%
MSgt	260	14.0%
SMSgt	44	2.4%
CMSgt	16	0.9%
2d Lt	28	1.5%
1st Lt	61	3.3%
Capt	132	7.1%
Maj	45	2.4%
Lt Col	31	1.7%
Col	3	0.2%
Gen	1	0.1%
Other	6	0.3%
GS 0-10	1	0.1%
GS 11-14	1	0.1%
TOTAL:	1857	100%
<i>Education Level</i>		
High School	792	42.6%
Associates	295	15.9%
CCAF	312	16.8%
Bachelors	261	14.1%
Post-Graduate	58	3.1%
Masters	125	6.7%
Doctoral or Post-Doctoral	14	0.8%
TOTAL:	1857	100%

To determine whether there were any confounding effects of demographics, an analysis of means and variances was conducted for each of the four demographics. An example of a test is enclosed in Appendix H, for gender; however, each of the tests conducted is not included because of their length, and overall lack of significance found. Instead, a summary of the tests and general trends noticed are given in Table 21.

Table 21: Results of Demographic-Based Means/Variiances Analysis

Demographic	Results
<i>Gender</i>	Females consistently scored slightly lower than Males on every construct; except for the questions measuring divergence of interests (which were negatively scored). Results did not exceed .05 of one Likert-type point, and were therefore not significant.
<i>Age</i>	Younger respondents consistently showed a lower opinion of squadron cultures than other age groups (e.g. younger respondents saw their squadrons as more bureaucratic, and with a higher divergence of interests). This general trend was excepted on the organizational culture construct of task-oriented organizational growth, for which there was no difference in mean scores between age groups. This general trend was reversed on the knowledge transfer construct of partner similarity—with younger respondents tending to see themselves as more similar to knowledge transfer partners than older respondents. Interestingly, younger respondents tended to see their squadron as having less organizational self-knowledge than older respondents did. One might argue this is because younger respondents would tend to have less organizational self-knowledge than older respondents do. There were not enough results for the age groups < 21, 46-50, and 50 < to analyze their results. In each case, mean scores did not differ markedly (by more than .5 of one Likert-type point).
<i>Rank</i>	Individuals with less rank appeared to show a lower opinion of squadron cultures and factors indicating knowledge transfer than individuals with more rank; however, the results were inconsistent from factor to factor and they varied considerably, with responses ranging widely across the Likert-type scale.
<i>Educational Level</i>	Individuals with lower education levels consistently showed a lower opinion of squadron cultures and factors indicating knowledge transfer than individuals with higher education levels (e.g. lower education levels saw their squadrons as more bureaucratic, and with a higher divergence of interests). Quite markedly, High School, Associates, and Community College of the Air Force results clumped together, with Bachelors, Post-Graduate, and Masters also clumping together. There were not enough results for Doctoral and Post-doctoral individuals to analyze their results. In each case, mean scores did not differ markedly (by more than .5 of one Likert-type point).

Conclusion

Table 22 summarizes the conclusions reached after analysis of the research. Ten of the sixteen hypotheses were supported, while six were not supported.

Table 22: Description of the 16 “Fit Y by X” Tests and Actual Correlations

	Relational Channels	Partner Similarity	Organizational Self-Knowledge	Divergence of Interests
Openness to Change/Innovation	+	0	+	-
Task-Oriented Organizational Growth	+	+	+	-
Bureaucratic	0	0	0	0
Competition/Confrontation	-	0	-	+

The low reliability of the survey instrument may explain the lack of correlation in the Bureaucratic construct. The low reliability of the survey instrument in Bureaucratic and Competition/Confrontation may also explain the lack of significant results in two of the four instances of Partner Similarity, though this result may also be because squadrons in the Air Force are a mixture of primarily similar and primarily dissimilar units. Clearly more research on the construct of Partner Similarity is required before drawing any firm conclusions about this construct.

V. Conclusion and Recommendations

Research Question

Upon completing the research, the answer to the research question, “is there a correlation between types of organizational culture and factors influencing knowledge transfer,” appears to be a qualified yes, there is a correlation between some types of organizational culture and some factors influencing knowledge transfer.

Research Question Discussion

According to Kachigan (1986), when it exists between two constructs, correlation provides the following three pieces of information. First, correlation serves a descriptive function, showing how things appear to be in reality. Second, correlation serves a predictive function, possibly allowing the measurement of a surrogate construct to predict an unknown second, but correlated, construct. Third, it provides the capability to examine how much of the variance of one variable accounts for variance in a second, correlated variable. One item he further notes, in caution, is that correlation, “does not imply causality.” (Kachigan, 1986:213)

Having established a correlational relationship between types of organizational culture and factors influencing knowledge transfer, this research lays the ground work for academics interested in the interaction between organizational culture and other variables. Perhaps most importantly, the ability to link together a theory of how individuals behave in a group setting to a theory of how individuals behave as separate entities will spur further research into how the two units of measurement interact.

Further, this research provides a view of the link between group and individual

dynamics—that of the rather obscure theory of organizational economics. Perhaps this theory will continue to receive attention commensurate with its importance in future academic research.

Having established a correlational relationship between types of organizational culture and factors influencing knowledge transfer, this research lays the groundwork for practitioners interested in possible ways to increase knowledge transfer in their organizations. First, because the constructs of organizational culture and knowledge transfer appear to be correlated, the practitioner can attempt to measure one of the two constructs, then make educated inferences about the state of the other construct in his or her organization. This can reduce the time and cost burden of measuring constructs of interest when considering implementing knowledge management projects. Second, once an organization is measured, the practitioner can best decide how to proceed. As outlined in Chapter 1, this decision is a critical one considering the failure of many recent knowledge management efforts—and the costs associated with them.

This research appears to lend support to some practitioners' caution that, "Organizational learning is a long-term activity that will build competitive advantage over time and requires sustained management attention, commitment, and effort." (Goh, 1998:15) Put another way, if a relationship exists between organizational culture and knowledge transfer, there may not be any "quick fixes" to an organization that does not have a culture fertile to knowledge transfer. The solution is probably not to try to capture as much as one can about an employee's mind before the employee walks out the door; at this point it is probably too late. Instead, building an organizational culture fertile to knowledge transfer begins with senior leadership—and a commitment towards changing

culture the only way it has been shown to change: slowly. Even if there is no direct causal relationship between knowledge transfer and organizational culture, one might argue a management change effort directed at changing an organization's culture is a good place to start—with potential trickle-down benefits in the area of knowledge transfer. Until such a causal relationship is proven, one might argue this is still the best place to start.

However, one basic truth about organizational culture is it sometimes proves unwieldy to manage, and is therefore “frequently overlooked or misunderstood.” (Vesta, Fralix, and Spreier, 1997) Considering the long-term consequences of failing to properly manage an organizational culture, it is probably advisable to try; however, any attempt to manage organizational culture must begin with full management commitment to take the time and put forth the effort to understand it. One researcher advises, “The issue for senior management, then, is not choosing the ‘correct’ basic assumptions, but identifying those that will promote the most successful organizational performance.” (Young, 2000:20). Another warns that organizations may fail to create a unique, desired culture if there is a discrepancy between “what we say” and “what we do.” (Kyung-Koo, 2000)

Limitations

As mentioned above, one limitation of correlational research is that it cannot prove causation. In this case, though there appears to be a correlation between organizational culture types and indicators of knowledge transfer, one can only guess if one of the constructs actually causes the other. At the same time, it is also possible that a third construct or group of constructs causes both of the constructs to act the way they do.

Another limitation of the research performed is that even though a correlation is shown between organizational culture types and indicators of knowledge transfer, there is no empirical evidence to show that the indicators of knowledge transfer actually predict any significant level of transfer of knowledge. Only further confirmatory research can hope to show this essential link between theory and reality.

Another limitation to the research performed, as mentioned in Chapter 2, is the inherent problem with attempting to measure the constructs of organizational culture and knowledge transfer through a cross-sectional, self-report survey instrument. Previous culture research has shown anecdotal information suggesting a high correlation between culture scores and employee disenfranchisement (Key, 1999). In other words, the entire construct of culture is continually confounded in measurement by employee satisfaction. Again, only further confirmatory research separating culture from satisfaction can hope to show this essential link between theory and reality.

Finally, a limitation that only partially affected the research was the fact that two organizational culture constructs, Bureaucratic (.6172) and Competition/Confrontation (.7179), did not exhibit a strong inter-question reliability. In the case of Bureaucratic, the results were inconclusive, while in the case of Competition/Confrontation, the results may be either understated or overstated. Future efforts must pay close attention to the validation of instruments used to measure constructs of interest.

Future Research

This research is preliminary in nature, and has the limitations expressed above. For these reasons, this research exposes several additional areas for further research. First, a subsequent study might study the behavior of the two constructs of organizational

culture and knowledge transfer in a longitudinal study, to establish a precedent for how to interpret the correlation shown in this research with respect to an actual organization. Second, a subsequent study might explore the two constructs of organizational culture and knowledge transfer in a qualitative study, to confirm the link hypothesized in this research between the constructs measured and the actual constructs of interest. Such a study might also revisit the constructs of Bureaucratic and Competition/Confrontation to establish a stronger sense of their correlations to knowledge transfer, as well as searching for a proper relationship between organizational culture and the construct of Partner Similarity. Third, a subsequent study might wish to revisit the assumptions made in this paper as to how different organizational cultures account for the two organizational economic costs: agency costs and transaction costs. Fourth, a subsequent study might attempt to manipulate one of the two constructs of organizational culture and knowledge transfer in an attempt to show any causal relationship that may exist between the constructs. Fifth, a subsequent study might attempt to measure different types of squadrons, such as squadrons identifying themselves as primarily similar and those identifying themselves as primarily dissimilar, to see whether there are differences between them in organizational culture and knowledge transfer. Sixth, a subsequent study might attempt to investigate whether the Air Force as an organization exhibits an overall type of organizational culture and general trend as to knowledge transfer indicators. Finally, once the above studies are accomplished, a final step in this vein of research might attempt to give the practitioner important advice about how to treat the constructs of organizational culture and knowledge transfer with respect to each other in order to ensure the success of future knowledge management efforts.

Conclusion

This research indicates a correlation exists between some types of organizational culture and some factors influencing knowledge transfer. In doing so, it bridges the gap between the somewhat ethereal and group-centered theory of organizational culture and the equally ethereal, but individually centered theory of knowledge transfer—clearing up an apparent contradiction between the two theories.

In one sense, this research appears to confirm what both academics and practitioners alike have stated about the importance of considering organizational culture when implementing knowledge management projects. In another sense, the research asks new questions, such as, “if organizational culture and knowledge transfer are correlated, what can a manager do to make sure organizational culture is taken into account when proposing a knowledge management project?” Indeed, the answer to this question might prove as important to the academic as to the practitioner.

Appendix A: Survey Instrument

The Squadron Culture Questionnaire (SCQ)

Explanation:

Welcome to the SCQ. This survey is being conducted for two reasons: (1) to measure unit culture in the Air Force and determine how culture may affect a unit's capability to transfer knowledge internally, in concert with research sponsored by the Air Force Chief Information Officer's Information & Knowledge Management Division and (2) to fulfill a research requirement for completion of a student thesis through the Air Force Institute of Technology, Department of Engineering and Management. Your responses will be combined with the responses of other members of your organization and aggregated with other similar organizations to determine how organizations in your mission area compare to organizations in other mission areas.

This research is approved by the Air Force Survey Branch with survey control number USAF SCN 02-013 which expires 31 May 2002.

Several steps have been taken to protect your anonymity. First, you will not be asked to provide your name at any time. Second, your questionnaire responses will be entered directly into a database programmed such that there is no way of determining from whom the information is being sent. Finally, your organization's name is used only to fit each response with an organization type, and will not be used in any reports generated.

Instructions:

- The SCQ should take 10-15 minutes to complete, and consists of three areas:
- Area 1: Choose your squadron from the drop-down box.
- Area 2: Indicate your level of agreement with the 63 short statements, (from Completely Disagree to Completely Agree). Answer on behalf of your squadron (or equivalent unit). You may use the mouse to select the circle representing your answer to each item, or tab between items and use the "up" arrow to select the first circle, and "down" to select/move through the remaining 4 circles.
- Area 3: Demographic information. Your answers to these four questions are used only to assess the validity of the overall results.
- Finally, you are given the option to provide feedback (in about 50 words or less) to the authors of this survey. We welcome your comments and any suggestions for improvement.
- Each item only allows one answer, and each of the 63 items must be answered.
- The term "section" refers to your individual work unit *below* the squadron level (e.g., flight, element, or section, as applicable).
- Press The link to Survey page 1 below to begin:

[Survey Page 1](#)

The SCQ

Squadron You Are Currently Assigned to:					
Please indicate your level of agreement with the statements below. Answer on behalf of your squadron (or equivalent unit):	Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
1. My squadron . . . is comprised of people with similar trade skills					
2. In my squadron . . . people have a "meeting of the minds" to ask questions and give explanations					
3. In my squadron . . . Every single section is essential to mission accomplishment					
4. In my squadron . . . change is blocked					
5. In my squadron . . . individuals share similar career fields					
6. In my squadron . . . rewards are dependent on performance					
7. In my squadron . . . people who wish to advance are supported by their superiors					
8. In my squadron . . . objectives are clear					
9. In my squadron . . . people rely on other people to answer questions					
10. My squadron is . . . task-oriented					
11. In my squadron . . . coworkers regularly ask each other for assistance					
12. In my squadron . . . decision-making is centralized					
13. In my squadron . . . the chain of command is the most important					
14. In my squadron . . . in wartime, the entire unit deploys					
15. In my squadron . . . managers express concern about employees' personal problems					
16. In my squadron . . . management practices allow freedom in work					
17. In my squadron . . . management specifies the targets to be attained					
18. In my squadron . . . cautious, incremental improvement is stressed					
19. My squadron . . . encourages participation from all members					
20. In my squadron . . . people learn how to perform tasks by asking other people					
21. My squadron . . . changes its priorities to "keep the peace"					
22. In my squadron . . . people rely on documents to answer questions					
23. In my squadron . . . members oppose each other					
24. In my squadron . . . new ideas about work organization are encouraged					
25. In my squadron . . . there are hard criteria against which job performance is measured					
26. In my squadron . . . every section is located in close physical proximity to every other section					

27.	In my squadron . . . every section serves the same customer					
28.	In my squadron . . . the typical member takes initiative					
29.	In my squadron . . . constructive criticism is accepted					
30.	In my squadron . . . employees seem aware of their role in the organization					
31.	In my squadron . . . trade-based affiliations are important					
32.	My squadron is . . . comfortable in unfamiliar situations					
33.	In my squadron . . . every section shares a singular focus					
34.	In my squadron . . . problems are noticed and dealt with immediately					
35.	In my squadron . . . people with personal problems are helped					
36.	My squadron . . . passes the blame for failure					
37.	My squadron . . . does a good job of assessing its shortcomings					
38.	In my squadron . . . people have an informal style of dealing with each other					
39.	In my squadron . . . there are winners and losers					
40.	My squadron . . . searches for new opportunities in the external environment					
41.	In my squadron . . . people seem to know how their role fits into the overall mission					
42.	In my squadron . . . excellence is demanded					
43.	In my squadron . . . everyone is similar					
44.	My squadron . . . makes the best use of the employee skills to develop better products/services					
45.	In my squadron . . . individual innovation is rewarded					
46.	In my squadron . . . competitiveness between sections is measured					
47.	In my squadron . . . people seem to know each other's roles					
48.	In my squadron . . . people are willing to learn new things					
49.	My squadron . . . is very knowledgeable about skills required for our job, compared to the best of our peers					
50.	In my squadron . . . criticism is not well-taken					
51.	My squadron . . . rewards desired behavior					
52.	In my squadron . . . members play "devil's advocate" to each other					
53.	In my squadron . . . individuals share similar interests					
54.	In my squadron . . . cooperation is the most important					
55.	In my squadron . . . mistakes are tolerated					
56.	In my squadron . . . individual appraisal is directly related to the attainment of goals					
57.	In my squadron . . . people know where to go to resolve task-specific questions outside their area of expertise					
58.	In my squadron . . . people are willing to share what they know					

59.	In my squadron . . . the typical member is forceful with opinions					
60.	In my squadron . . . conflict is avoided at all costs					
61.	In my squadron . . . members argue about the best solution					
62.	My squadron . . . never settles for less than the absolute best solution					
63.	In my squadron . . . performance measurement is common					
64.	In my squadron . . . goals are often unachievable					
65.	In my squadron . . . people tend to pull in many different directions					
66.	In my squadron . . . communication is two-way					
67.	In my squadron . . . members know where to go for help					
68.	In my squadron . . . personal contacts are important					
69.	In my squadron . . . people from functionally diverse sections know each other					
70.	In my squadron . . . personal responsibility is stressed					
71.	In my squadron . . . individuals know enough about their own abilities to ask for assistance when they require it					
72.	My squadron is . . . extremely conservative					
73.	In my squadron . . . managers seem aware of the skill level of their employees					
74.	In my squadron . . . over time, individuals share similar experiences					
75.	My squadron . . . expends resources to encourage employees to share what they know					
76.	In my squadron . . . junior members learn from senior members					
77.	In my squadron . . . the typical member is direct					
78.	My squadron is . . . "win-lose" oriented					
79.	In my squadron . . . mentorship is important					
80.	In my squadron . . . it is clear how performance will be evaluated					
81.	My squadron . . . respects the opinions of senior members					
82.	In my squadron . . . the typical member pleases others					
83.	In my squadron . . . person-to-person discussions are common					
84.	In my squadron . . . the tried and true methods are questioned					
85.	In my squadron . . . people are open to criticism					
86.	In my squadron . . . failure is accepted					
87.	In my squadron . . . overall, the sections perform a singular functional mission					
88.	In my squadron . . . people work within the constraints of their job description					
89.	In my squadron . . . section goals are in-line with the organization's mission and goals					
90.	In my squadron . . . competition is encouraged or rewarded					

Demographic Information:	
Rank/Grade:	
Highest Level of Schooling Attained:	
Age:	
Gender:	
(Optional) Please Add Any Comments:	

Complete!

**Your results are now recorded.
THANK YOU FOR YOUR PARTICIPATON!**

Explanation of Appendix A

1. Radio buttons provided for selection are not shown; one radio button was provided per question for each choice (strongly disagree, disagree, indifferent, agree, strongly agree).
2. The construct measured for each question is listed in Appendix B, as is the reliability analysis for each construct. Questions were removed as noted in appendix B to increase inter-question reliability.
3. The factor analysis for each question/construct is listed in Appendix C.

Appendix B: Pilot Test Reliability Data

Reliability Analysis for Openness to Change/Innovation (I) Questions

Note: **Indicates Question Removed**

Reliability Coefficients:

First Run:	N of Cases = 66.0	N of Items = 13	Alpha = .8853
Last Run:	N of Cases = 66.0	N of Items = 10	Alpha = .8987

Item-Total Statistics:

Question Number	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
First Run:				
Q07	38.2576	58.5019	.5803	.8766
Q15	38.5000	56.1308	.6293	.8738
Q16	38.4545	57.1748	.6234	.8742
Q24	38.5758	59.3557	.5250	.8792
Q28	38.8485	54.8690	.7136	.8690
Q29	38.7576	56.0942	.6744	.8714
Q32	38.8333	59.4026	.4652	.8822
Q35	38.3939	57.7193	.5738	.8768
Q40	38.6970	59.2298	.5675	.8774
Q44	38.6818	54.7741	.7682	.8663
Q55	39.0152	60.7228	.3183	.8909
Q85	38.9545	55.3671	.7415	.8679
Q86	39.6667	62.1333	.2875	.8903
Last Run:				
Q07	29.8636	41.1965	.6068	.8912
Q15	30.1061	39.0501	.6640	.8876
Q16	30.0606	40.3963	.6196	.8904
Q24	30.1818	42.1818	.5260	.8959
Q28	30.4545	38.4979	.7073	.8845
Q29	30.3636	39.3427	.6839	.8861
Q35	30.0000	40.4923	.6010	.8917
Q40	30.3030	42.1221	.5651	.8937
Q44	30.2879	38.2082	.7821	.8793
Q85	30.5606	39.2655	.7044	.8848

Reliability Analysis for Task-Oriented Organizational Growth (T) Questions

Note: **Indicates Question Removed**

Reliability Coefficients:

First Run:	N of Cases = 66.0	N of Items = 10	Alpha = .8866
Last Run:	N of Cases = 66.0	N of Items = 9	Alpha = .8964

Item-Total Statistics:

Question Number	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
First Run:				
Q06	30.6061	32.8886	.7420	.8660
Q08	30.2879	35.2235	.5888	.8782
Q10	30.0000	35.5077	.6851	.8713
Q17	30.1061	36.5578	.5564	.8799
Q18	30.4242	36.3096	.6832	.8724
Q25	30.5000	35.4538	.6553	.8731
Q46	30.6212	38.9774	.3123	.8964
Q56	30.4394	35.1117	.7084	.8695
Q63	30.3636	36.5427	.6113	.8764
Q80	30.4697	33.7914	.7015	.8693
Last Run:				
Q06	27.4697	29.0529	.7359	.8787
Q08	27.1515	30.8690	.6188	.8885
Q10	26.8636	31.4734	.6834	.8832
Q17	26.9697	32.6145	.5380	.8938
Q18	27.2879	32.2082	.6843	.8840
Q25	27.3636	31.4042	.6553	.8851
Q56	27.3030	31.1683	.6992	.8819
Q63	27.2273	32.4245	.6121	.8884
Q80	27.3333	29.5487	.7302	.8790

Reliability Analysis for Bureaucratic (B) Questions

Note: **Indicates Question Removed**

Reliability Coefficients:

First Run:	N of Cases = 66.0	N of Items = 13	Alpha = .2546
Last Run:	N of Cases = 66.0	N of Items = 5	Alpha = .6172

Item-Total Statistics:

Question Number	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
First Run:				
Q04	35.8636	13.7503	.2691	.1539
Q12	35.2576	13.9172	.1852	.1864
Q13	34.7576	16.3711	-.0707	.2989
Q21	35.5303	13.1452	.3062	.1261
Q36	35.9091	14.6993	.1283	.2175
Q38	35.6667	16.3179	-.0490	.2864
Q60	35.6818	12.8357	.3663	.0978
Q70	36.3182	17.8510	-.2501	.3630
Q72	35.2424	15.1096	.1102	.2272
Q77	35.7576	17.6019	-.2206	.3466
Q82	35.3182	15.6972	.0291	.2588
Q84	35.5152	17.0536	-.1487	.3206
Q88	35.3636	12.6657	.3349	.1021
Last Run:				
Q04	12.2273	8.8245	.3120	.5912
Q12	11.6212	8.6389	.2667	.6171
Q21	11.8939	7.6655	.4692	.5111
Q60	12.0455	8.3517	.3588	.5693
Q88	11.7273	7.4629	.4576	.5149

Reliability Analysis for Competition/Confrontation (C) Questions

Note: **Indicates Question Removed**

Reliability Coefficients:

First Run:	N of Cases = 66.0	N of Items = 11	Alpha = .5908
Last Run:	N of Cases = 66.0	N of Items = 6	Alpha = .7179

Item-Total Statistics:

Question Number	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
First Run:				
Q23	31.0303	15.4452	.3857	.5332
Q42	30.0909	18.7916	.0597	.6044
Q50	31.0152	16.4459	.3489	.5467
Q52	30.8485	17.0228	.2920	.5603
Q54	31.3788	18.7312	.0214	.6195
Q59	31.0152	15.2152	.5113	.5055
Q61	30.7879	15.4005	.4499	.5188
Q62	30.6515	18.9075	-.0209	.6348
Q64	31.3939	16.1809	.4102	.5338
Q78	30.8788	16.8159	.2902	.5600
Q90	30.4545	18.0979	.1399	.5914
Last Run:				
Q23	14.6818	8.6818	.5306	.6529
Q50	14.6667	10.2564	.3589	.7055
Q59	14.6667	9.8564	.4109	.6912
Q61	14.4394	9.0193	.5395	.6508
Q64	15.0455	9.8902	.4560	.6785
Q78	14.5303	9.9760	.4079	.6918

Reliability Analysis for Relational Channels (R) Questions

Note: **Indicates Question Removed**

Reliability Coefficients:

First Run:	N of Cases = 66.0	N of Items = 10	Alpha = .7139
Last Run:	N of Cases = 66.0	N of Items = 6	Alpha = .8225

Item-Total Statistics:

Question Number	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
First Run:				
Q02	29.9091	18.5147	.4877	.6703
Q09	29.7879	24.3235	-.1356	.7623
Q20	29.7273	20.3245	.3429	.6966
Q22	30.7424	24.5634	-.1639	.7662
Q31	30.0303	20.5221	.3370	.6974
Q66	30.0758	17.3942	.5491	.6561
Q68	29.4697	19.3298	.5427	.6666
Q76	29.6364	18.2657	.5719	.6559
Q79	29.7273	17.5245	.6470	.6400
Q83	29.5303	19.0221	.6139	.6569
Last Run:				
Q02	17.4697	12.5606	.5623	.8006
Q66	17.6364	12.3580	.5095	.8169
Q68	17.0303	13.9375	.5115	.8098
Q76	17.1970	12.1298	.6963	.7708
Q79	17.2879	12.0235	.6838	.7730
Q83	17.0909	13.4993	.6174	.7918

Reliability Analysis for Partner Similarity (S) Questions

Note: **Indicates Question Removed**

Reliability Coefficients:

First Run:	N of Cases = 66.0	N of Items = 10	Alpha = .8358
Last Run:	N of Cases = 66.0	N of Items = 9	Alpha = .8367

Item-Total Statistics:

Question Number	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
First Run:				
Q01	26.2273	35.7476	.6245	.8111
Q03	25.4697	40.5914	.3311	.8367
Q05	26.4697	37.3914	.4841	.8250
Q14	27.7879	39.2466	.4045	.8315
Q26	27.2424	35.6019	.5696	.8165
Q27	27.4091	34.3685	.4997	.8289
Q43	27.0303	36.1837	.5919	.8144
Q53	26.7121	37.6235	.5958	.8160
Q74	26.3485	36.5075	.6666	.8091
Q87	26.3030	36.8298	.5675	.8170
Last Run:				
Q01	22.0303	32.2145	.5963	.8143
Q05	22.2727	33.8322	.4510	.8301
Q14	23.5909	34.8916	.4358	.8308
Q26	23.0455	31.4594	.5954	.8142
Q27	23.2121	30.3235	.5172	.8288
Q43	22.8333	32.3872	.5856	.8155
Q53	22.5152	33.8536	.5785	.8181
Q74	22.1515	32.6536	.6647	.8091
Q87	22.1061	32.9270	.5678	.8177

Reliability Analysis for Organizational Self-Knowledge (K) Questions

Note: **Indicates Question Removed**

Reliability Coefficients:

First Run:	N of Cases = 66.0	N of Items = 12	Alpha = .9149
Last Run:	N of Cases = 66.0	N of Items = 9	Alpha = .9116

Item-Total Statistics:

Question Number	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Last Run:				
Q11	37.5000	56.5615	.4810	.9148
Q30	37.6818	52.4357	.7598	.9033
Q34	37.9545	51.3671	.6974	.9060
Q37	37.8485	52.3767	.7029	.9057
Q41	37.7121	52.7005	.7382	.9043
Q47	37.9545	52.8441	.6747	.9070
Q49	37.8939	51.3886	.6955	.9061
Q57	37.6515	52.7228	.7032	.9057
Q67	37.5152	54.8690	.6486	.9085
Q69	37.9848	53.9228	.5296	.9142
Q71	37.6061	55.2578	.6011	.9103
Q73	37.5303	52.8068	.6623	.9075
Last Run:				
Q30	27.2727	32.9399	.7643	.8970
Q34	27.5455	31.8825	.7177	.9002
Q37	27.4394	33.0193	.6919	.9018
Q41	27.3030	33.3221	.7234	.8998
Q47	27.5455	33.3594	.6665	.9036
Q49	27.4848	32.0998	.6966	.9019
Q57	27.2424	33.0788	.7151	.9002
Q67	27.1061	34.9578	.6432	.9054
Q73	27.1212	33.3389	.6527	.9046

Reliability Analysis for Divergence of Interests (D) Questions

Note: **Indicates Question Removed**

Reliability Coefficients:

First Run:	N of Cases = 66.0	N of Items = 11	Alpha = .6373
Last Run:	N of Cases = 66.0	N of Items = 8	Alpha = .8420

Item-Total Statistics:

Question Number	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
First Run:				
Q19	34.2727	20.1399	.3665	.6000
Q33	35.0758	19.8249	.3827	.5960
Q39	34.7727	27.0091	-.3708	.7322
Q45	34.6818	18.1587	.5481	.5564
Q48	34.7273	18.8476	.5202	.5671
Q51	34.6970	18.8914	.5367	.5651
Q58	34.3939	18.6424	.6026	.5538
Q65	34.7424	29.0557	-.5381	.7616
Q75	34.9848	18.4767	.6004	.5520
Q81	34.4242	18.0634	.5175	.5613
Q89	34.2879	20.7620	.5275	.5879
Last Run:				
Q19	24.5455	22.6517	.4133	.8431
Q45	24.9545	19.7671	.6875	.8077
Q48	25.0000	21.1692	.5808	.8225
Q51	24.9697	20.7991	.6531	.8133
Q58	24.6667	21.0256	.6569	.8133
Q75	25.2576	21.1788	.6101	.8188
Q81	24.6970	20.7068	.5311	.8311
Q89	24.5606	23.7886	.5091	.8334

Appendix C: Pilot Test Factor Analysis—Rotated Component Matrix

Q#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
B (4)		-.361	-.352	.496																		
B (12)											.854											
B (13)		.643																				
B (21)														-.458								
B (36)			-.704																			
B (38)						-.549		-.356														
B (60)									.843													
B (70)	-.525																				.872	
B (72)																						
B (77)						-.402									-.655							
B (82)																						
B (84)						-.772				.512												
B (88)																.419						
C (23)	-.388																					
C (42)	.376	.576									.402											
C (50)														-.802								
C (52)															-.825							
C (54)	-.451																					
C (59)						.809																
C (61)						.694																
C (62)		.387															-.353	.422				
C (64)			-.357			.353	-.381											-.445				
C (78)									.475	.368												
C (90)	.439	.476																				
D (19)	-.800																					
D (33)	-.355														-.467							
D (39)																						.613
D (45)			-.433	-.403																		
D (48)	-.700																					
D (51)				-.396																	-.498	
D (58)							-.475															
D (65)				.381																		
D (75)												-.424										
D (81)	-.694																					
D (89)	-.765																					
I (7)			.534																			
I (15)	.450		.520																			
I (16)	.397		.357																			
I (24)							.385															
I (28)	.552							.391														
I (29)		.470							.374													
I (32)								.778														
I (35)			.709																			
I (40)		.392	.356											.427								
I (44)	.457		.526																			
I (55)									.812													
I (85)									.468													
I (86)									.628													
K (11)			.381				.439															
K (30)	.656	.370																				

Explanation of Appendix C:

1. The constructs abbreviations are defined as follows:
 - I: Openness to Change/Innovation
 - T: Task-Oriented Organizational Growth
 - B: Bureaucratic
 - C: Competition/Confrontation
 - R: Relational Channels
 - S: Partner Similarity
 - K: Organizational Self-Knowledge
 - D: Divergence of Interests
2. In parenthesis next to each construct abbreviation is the number of the question.
3. Loadings are shown with boxes. In some cases, a group of questions loaded on more than one factor.
4. Extraction Method: Principal Component Analysis.
5. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 49 iterations.
6. Cutoff for factor loadings: .35. (Note, this partially or completely eliminated the loadings for some factors and questions.)

Appendix D: Return Rates for Units Surveyed

SQUADRON ?	Personnel Listed	E-mails Sent	E-mails Rejected	Effective Size	Surveys Completed	Statistical Power
Air Base Sq 1	91	91	6	85	35	89.27%
Air Base Sq A2	238	211	203	35	0	
Air Mobility Sq 1	123	123	122	1	1	
Air Mobility Sq 2	315	223	13	302	56	90.06%
Air Refueling Sq 2	84	84	5	79	17	
Airlift Sq 1	403	232	41	362	30	85.60%
Airlift Sq 2	94	94	8	86	15	
Airlift Sq A4	232	210	52	180	33	87.02%
Airlift Sq A5	202	202	17	185	26	85.01%
Civil Engineering Sq 1	256	215	66	190	33	86.95%
Civil Engineering Sq 3	313	223	80	233	20	82.38%
Civil Engineering Sq A5	333	225	66	267	53	89.87%
Communications Sq 1	355	228	28	327	48	89.02%
Communications Sq 2	250	214	18	232	63	91.14%
Communications Sq A3	126	126	12	114	43	90.06%
Communications Sq A4	376	230	14	362	78	91.74%
Communications Sq A5	108	108	16	92	24	85.49%
Communications Sq A6	228	209	36	192	56	90.73%
Equipment Maintenance Sq 1	564	242	31	533	43	87.96%
Fighter Sq 1	303	222	27	276	48	89.19%
Fighter Sq 2	271	217	125	146	9	
Fighter Sq 3	228	209	123	105	57	92.60%
Fighter Sq A4	298	221	68	230	40	88.15%
Fighter Sq A5	244	213	29	215	64	91.36%
Fighter Sq A6	317	224	43	274	32	86.31%
Fighter Sq A7	238	211	140	98	32	88.01%
Fighter Sq A8	289	220	70	219	25	84.48%
Fighter Sq A9	328	225	24	304	57	90.16%
Intelligence Sq 1	339	226	226	113	15	
Intelligence Sq A3	315	223	28	287	69	91.36%
Logistics Support Sq 1	105	105	5	100	30	87.37%
Logistics Support Sq A3	93	93	6	87	26	86.41%
<i>Maintenance Sq 1</i>	529	240	78	451	66	90.64%
Maintenance Sq 2	491	238	31	460	48	88.75%
Medical Operations Sq A4	128	128	16	112	40	89.53%
Medical Operations Sq A5	202	202	13	189	34	87.19%
Medical Support Sq A7	172	172	44	128	25	85.19%
Mission Support Sq 1	86	86	10	76	17	
Operations Support Sq 1	184	184	28	156	36	87.94%
Operations Support Sq 3	107	107	16	91	39	89.99%
Operations Support Sq 4	142	142	8	134	65	92.65%
Operations Support Sq 5	167	167	11	156	44	89.46%
Security Forces Sq 1	149	149	68	81	24	85.83%
Security Forces Sq A3	214	206	170	44	25	
Security Forces Sq A5	85	85	18	67	11	
Space Operations Sq A3	171	171	15	156	37	88.15%
Special Operations Sq 1	163	163	26	137	29	86.39%
Supply Sq 1	127	127	17	110	47	90.88%
Supply Sq A2	156	156	27	129	41	89.35%
Transportation Sq 1	149	149	29	120	24	84.92%
Transportation Sq 2	151	151	41	110	27	86.19%
TOTAL (Not including pilot)	11632	9122	2414	9218	1857	--

Explanation of Appendix D:

1. The number of surveys sent was based on the smaller of either the number of personnel listed in each squadron times four or the number of personnel listed in each squadron.
2. The effective size of a squadron was based on the number of personnel listed in each squadron minus the number of rejected e-mails. In any case where this difference left an effective size of fewer than 40, the squadron's results were eliminated from further analysis (indicated by a dash "--").
3. Statistical power was calculated using Equation 2, and based on the effective squadron size. This mitigated the effects of the rejected e-mails, which might have been caused by personnel turnover or an outdated Air Force personnel system listing.
4. Squadrons listed in **boldface** met the statistical power required (88%) and were included in the squadron analysis.
5. The squadron listed in *italics* was used for the pilot study, and was therefore not included in either the squadron analysis or the individual perception analysis.
6. Statistical power for Squadrons with fewer than 10 responses and an effective size of less than 40 was not calculated, and those squadrons were eliminated from further consideration in the squadron analysis.
7. Individual responses from all squadrons except the squadron listed in *italics* were used for the individual perception analysis.

Appendix E: Squadron Average Responses for Each Construct

SQUADRON ?	VARIABLE ?	I	T	B	C	R	S	K	D
Air Base Sq 1		2.697	2.632	2.914	3.157	2.810	2.502	2.660	3.257
Air Base Sq A2		--	--	--	--	--	--	--	--
Air Mobility Sq 1		3.200	2.667	2.600	3.500	2.667	2.333	2.667	3.750
Air Mobility Sq 2		3.202	3.361	2.732	2.854	3.378	2.990	3.494	2.522
Air Refueling Sq 2		3.412	3.379	2.882	2.882	3.529	3.458	3.654	2.412
Airlift Sq 1		3.627	3.589	2.820	2.872	3.811	3.544	3.767	2.196
Airlift Sq 2		3.100	3.363	2.787	3.067	3.111	2.948	3.237	2.767
Airlift Sq A4		3.667	3.697	2.776	2.662	3.909	3.350	3.835	2.095
Airlift Sq A5		3.250	3.355	2.869	2.891	3.494	3.239	3.350	2.481
Civil Engineering Sq 1		3.124	3.279	3.030	3.010	3.288	3.098	3.333	2.712
Civil Engineering Sq 3		3.185	3.267	3.150	2.967	3.617	2.972	3.367	2.606
Civil Engineering Sq A5		3.219	3.344	2.864	3.019	3.478	2.851	3.296	2.594
Communications Sq 1		3.306	3.211	2.813	2.861	3.444	2.553	3.255	2.589
Communications Sq 2		3.430	3.444	2.921	2.802	3.566	2.734	3.409	2.421
Communications Sq A3		3.319	3.183	3.056	2.934	3.415	2.840	3.253	2.532
Communications Sq A4		3.504	3.433	2.744	2.808	3.575	2.731	3.446	2.370
Communications Sq A5		3.667	3.713	2.917	2.708	3.882	2.769	3.759	2.161
Communications Sq A6		3.182	3.143	2.850	2.878	3.414	2.817	3.111	2.634
Equipment Maintenance Sq 1		3.047	3.217	2.902	3.112	3.229	2.711	3.214	2.584
Fighter Sq 1		3.113	3.329	2.896	3.163	3.424	3.280	3.301	2.688
Fighter Sq 2		3.233	3.432	2.711	3.259	3.278	3.309	3.296	2.681
Fighter Sq 3		3.218	3.470	3.154	3.175	3.430	3.458	3.616	2.476
Fighter Sq A4		3.568	3.594	2.780	2.979	3.633	3.494	3.717	2.281
Fighter Sq A5		2.944	3.179	2.844	3.318	3.242	3.377	3.354	2.771
Fighter Sq A6		2.938	3.215	2.875	2.984	3.344	3.243	3.323	2.742
Fighter Sq A7		3.553	3.639	2.750	2.771	3.729	3.441	3.747	2.223
Fighter Sq A8		3.468	3.671	2.888	2.880	3.733	3.298	3.760	2.205
Fighter Sq A9		3.154	3.296	2.723	3.135	3.404	3.390	3.329	2.544
Intelligence Sq 1		3.480	3.474	2.893	2.789	3.589	3.141	3.281	2.467
Intelligence Sq A3		3.703	3.581	2.733	2.795	3.877	2.908	3.684	2.192
Logistics Support Sq 1		3.337	3.189	2.960	2.733	3.472	2.485	3.359	2.617
Logistics Support Sq A3		3.304	3.248	2.977	2.878	3.276	2.714	3.103	2.707
<i>Maintenance Sq 1</i>		3.358	3.402	2.976	2.934	3.457	2.830	3.418	2.453
Maintenance Sq 2		3.319	3.442	2.900	2.858	3.524	3.074	3.435	2.380
Medical Operations Sq A4		3.255	3.122	2.840	2.904	3.396	2.892	3.203	2.609
Medical Operations Sq A5		3.150	3.173	2.976	3.034	3.382	2.824	3.222	2.570
Medical Support Sq A7		3.520	3.444	2.848	2.527	3.593	2.711	3.489	2.335
Mission Support Sq 1		3.035	3.346	3.118	3.108	3.353	3.268	3.209	2.640
Operations Support Sq 1		3.581	3.451	2.622	2.653	3.736	2.142	3.522	2.260
Operations Support Sq 3		3.397	3.387	3.082	2.803	3.521	3.006	3.578	2.407
Operations Support Sq 4		3.417	3.345	2.871	2.923	3.492	2.340	3.412	2.538
Operations Support Sq 5		3.089	3.051	2.755	3.140	3.345	2.639	3.101	2.713
Security Forces Sq 1		2.929	3.181	2.775	3.264	3.382	2.995	3.120	2.734
Security Forces Sq A3		3.124	3.262	2.816	3.027	3.340	2.929	3.204	2.605
Security Forces Sq A5		2.445	2.626	2.327	3.167	2.727	2.646	2.556	3.375
Space Operations Sq A3		3.354	3.526	2.957	2.842	3.491	3.150	3.474	2.361
Special Operations Sq 1		3.521	3.563	2.779	2.960	3.661	3.249	3.705	2.384
Supply Sq 1		3.472	3.447	2.991	2.897	3.532	2.967	3.506	2.391
Supply Sq A2		3.354	3.366	2.966	2.854	3.520	2.780	3.379	2.527
Transportation Sq 1		3.067	3.120	2.808	3.056	3.313	2.866	3.051	2.880
Transportation Sq 2		3.200	3.407	3.037	3.062	3.327	2.564	3.284	2.616

Explanation of Appendix E:

1. The constructs abbreviations are defined as follows:
 - I: Openness to Change/Innovation
 - T: Task-Oriented Organizational Growth
 - B: Bureaucratic
 - C: Competition/Confrontation
 - R: Relational Channels
 - S: Partner Similarity
 - K: Organizational Self-Knowledge
 - D: Divergence of Interests
2. Squadron mean scores were calculated first for each individual for each construct, by adding the Likert-type responses for each question measuring a construct, then dividing by the total questions measuring that construct. (For example, to measure an individual's mean score for the construct "Openness to Change/Innovation," the Likert-type responses were added for questions 7, 15, 16, 24, 28, 29, 35, 40, 44, and 85, then divided by 10.) Next, each individual response for each construct was added with the other individual responses for the squadron, and divided by the total number of personnel in their squadron who completed the survey (there were no incomplete surveys).
3. Individual perception mean scores were calculated the same as above for each construct. Next, each individual's response for each construct was added with the other individual responses, and divided by the total number of personnel who completed the survey.
4. Squadrons listed in **boldface** met the statistical power required (88%) and were included in the squadron analysis.
5. The squadron listed in *italics* was used for the pilot study, and was therefore not included in either the squadron analysis or the individual perception analysis.
6. A dash "--" indicates no responses were received.
6. Statistical power for Squadrons with fewer than 10 responses and an effective size of less than 40 was not calculated, and those squadrons were eliminated from further consideration in the squadron analysis.
7. Individual responses from all squadrons except the squadron listed in *italics* were used for the individual perception analysis.

Appendix F: Final Reliability Analysis for Each Construct Measured

Openness to Change/Innovation (I)	N of Cases = 1857	N of Items = 10	Alpha = .9047
Task-Oriented Organizational Growth (T)	N of Cases = 1857	N of Items = 9	Alpha = .8589
Bureaucratic (B)	N of Cases = 1857	N of Items = 5	Alpha = .3575
Competition/Confrontation (C)	N of Cases = 1857	N of Items = 6	Alpha = .6422
Relational Channels (R)	N of Cases = 1857	N of Items = 6	Alpha = .8024
Partner Similarity (S)	N of Cases = 1857	N of Items = 9	Alpha = .7553
Organizational Self-Knowledge (K)	N of Cases = 1857	N of Items = 9	Alpha = .8954
Divergence of Interests (D)	N of Cases = 1857	N of Items = 8	Alpha = .8521

Appendix G: Final Factor Analysis—Rotated Component Matrix

Variable/#	1	2	3	4	5	6	7	8	9	10
B (12)							.624			.754
B (21)							.624			.754
B (4)	-.544								.392	
B (60)							.683			
B (88)			.362							
C (23)	-.475							.374		
C (50)	-.535									
C (59)								.620		
C (61)								.727		
C (64)										
C (78)									.597	
D (19)	-.597									
D (45)	-.791									
D (48)	-.468	-.552								
D (51)	-.717									
D (58)	-.429	-.462								
D (75)	-.574									
D (81)	-.558									
D (89)	-.482									
I (15)	.650									
I (16)	.653									
I (24)	.729									
I (28)	.455	.515								
I (29)	.684	.360								
I (35)	.655									
I (40)	.628									
I (44)	.701									
I (7)	.723									
I (85)	.635	.378								
K (30)	.489	.417	.436							
K (34)	.623									
K (37)	.684									
K (41)	.454	.386	.498							
K (47)	.375	.554								
K (49)	.479	.397								
K (57)		.462				.376				
K (67)	.519	.359				.371				
K (73)	.584									
R (2)	.631									
R (66)	.735									
R (68)										.607
R (76)	.563									.366
R (79)	.648									
R (83)	.538									.444
S (1)				.849						
S (14)					.608					
S (26)					.702					
S (27)					.764					
S (43)										.436
S (5)				.867						
S (53)		.396		.386						
S (74)				.377						
S (87)					.435					
T (10)	.463		.354							.420
T (17)	.504		.438							

T (18)	.489	.368
T (25)	.439	
T (56)	.653	
T (6)	.731	
T (63)	.604	
T (8)	.595	.438
T (80)	.683	

Explanation of Appendix G:

7. The constructs abbreviations are defined as follows:

I: Openness to Change/Innovation

T: Task-Oriented Organizational Growth

B: Bureaucratic

C: Competition/Confrontation

R: Relational Channels

S: Partner Similarity

K: Organizational Self-Knowledge

D: Divergence of Interests

8. In parenthesis next to each construct abbreviation is the number of the question.

9. Loadings are shown with boxes. In some cases, a group of questions loaded on more than one factor.

10. Extraction Method: Principal Component Analysis.

11. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 20 iterations.

12. Cutoff for factor loadings: .35. (Note, this partially or completely eliminated the loadings for some factors and questions.)

Appendix H: Example of Means Test for Male/Female Demographic

One-way Analysis of Average Openness to Change/Innovation by Gender

Means for One-way ANOVA

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
F	382	3.26099	0.03827	3.1859	3.3361
M	1475	3.30827	0.01948	3.2701	3.3465

Means Comparisons (Positive values show pairs of means that are significantly different)

Dif=Mean[i]- Mean[j]	M	F	Alpha=0.05
M	0.000000	0.047276	
F	-0.04728	0.000000	

One-way Analysis of Average Task-Oriented Organizational Growth by Gender

Means for One-way ANOVA

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
F	382	3.31618	0.03407	3.2494	3.3830
M	1475	3.35594	0.01734	3.3219	3.3899

Means Comparisons (Positive values show pairs of means that are significantly different)

Dif=Mean[i]- Mean[j]	M	F	Alpha=0.05
M	0.000000	0.039769	
F	-0.03977	0.000000	

One-way Analysis of Average Bureaucratic by Gender

Means for One-way ANOVA

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
F	382	2.83351	0.02809	2.7784	2.8886
M	1475	2.88651	0.01430	2.8585	2.9145

Means Comparisons (Positive values show pairs of means that are significantly different)

Dif=Mean[i]- Mean[j]	M	F	Alpha=0.05
M	0.000000	0.053001	
F	-0.053	0.000000	

One-way Analysis of Average Competition/Confrontation by Gender

Means for One-way ANOVA

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
F	382	2.91668	0.02986	2.8581	2.9752
M	1475	2.95163	0.01520	2.9218	2.9814

Means Comparisons (Positive values show pairs of means that are significantly different)

Dif=Mean[i]- Mean[j]	M	F	Alpha=0.05
M	0.000000	0.034956	
F	-0.03496	0.000000	

One-way Analysis of Average Relational Channels by Gender

Means for One-way ANOVA

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
F	382	3.40925	0.03640	3.3379	3.4806
M	1475	3.49412	0.01853	3.4578	3.5305

Means Comparisons (Positive values show pairs of means that are significantly different)

Dif=Mean[i]- Mean[j]	M	F	Alpha=0.05
M	0.000000	0.084871	
F	-0.08487	0.000000	

One-way Analysis of Average Partner Similarity by Gender

Means for One-way ANOVA

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
F	382	2.85951	0.03372	2.7934	2.9256
M	1475	2.97462	0.01716	2.9410	3.0083

Means Comparisons (Positive values show pairs of means that are significantly different)

Dif=Mean[i]- Mean[j]	M	F	Alpha=0.05
M	0.000000	0.115114	
F	-0.11511	0.000000	

One-way Analysis of Average Organizational Knowledge by Gender

Means for One-way ANOVA

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
F	382	3.30109	0.03741	3.2277	3.3745
M	1475	3.41516	0.01904	3.3778	3.4525

Means Comparisons (Positive values show pairs of means that are significantly different)

Dif=Mean[i]- Mean[j]	M	F	Alpha=0.05
M	0.000000	0.114066	
F	-0.11407	0.000000	

One-way Analysis of Average Divergence of Interests by Gender

Means for One-way ANOVA

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
F	382	2.56577	0.03481	2.4975	2.6340
M	1475	2.49958	0.01772	2.4648	2.5343

Means Comparisons (Positive values show pairs of means that are significantly different)

Dif=Mean[i]- Mean[j]	F	M	Alpha=0.05
F	0.000000	0.066196	
M	-0.0662	0.000000	

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14. ABSTRACT This research asked the following question: is there a correlation between types of organizational culture and factors influencing knowledge transfer? It hypothesized that organizations scoring high on the cultural factors of openness to change/innovation, and task-oriented organizational growth would be fertile to knowledge transfer. Second, it hypothesized that organizations scoring high on the factors of bureaucratic and competition/confrontation would be infertile to knowledge transfer. The research looked at Air Force squadrons, surveying a representative sample of the 1,495 active-duty squadrons included in the study with a 62-item, 5-point Likert-type instrument. Overall, 51 squadrons were surveyed, and 22 produced usable results. Both squadron and individual results were analyzed—and both were similar. Squadron results showed that organizations scoring high on the factors of openness to change/innovation and task-oriented organizational growth appeared to score consistently high on three of the four measures of fertility to knowledge transfer. Organizations scoring high on the factors of competition/confrontation appeared to score consistently low on three of the four measures of fertility to knowledge transfer. The factor bureaucratic produced no significant correlations. In every case, the measure of fertility to knowledge transfer known as partner similarity did not behave as expected. The research concluded that there appears to be a correlation between organizational culture and factors influencing the transfer of knowledge, but concludes that the factors influencing the transfer of knowledge should be further explored, and a longitudinal study performed, before inferring any causal relationship.					
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