

SHOULD THEY SHARE OR NOT? AN INVESTIGATION ON THE USE
OF COMMUNICATION AND KNOWLEDGE SHARING
TECHNOLOGY IN A POLICE ORGANIZATION

by

Roslin Viprakasit Hauck

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DEDICATION

To my Parents,

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My gratitude and my love to them are beyond words.

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ABSTRACT

Organizations are increasingly utilizing knowledge-sharing technologies to increase the amount of knowledge within their organization. While in most organizations, knowledge sharing is seen as a benefit, for law enforcement agencies it is viewed as a necessity. In order to protect against future terrorist attacks like September 11th, law enforcement agencies are trying to increase knowledge sharing across their current organizational boundaries. Given this massive undertaking, we have to wonder what are the potential unintended effects of this increase in knowledge sharing. This dissertation seeks to address this issue by understanding the relationships between individual and organizational factors, the use of knowledge sharing technology, and organizational outcomes.

After a general discussion on knowledge, knowledge management strategies and technologies, a two-part model of knowledge sharing is proposed that 1) predicts outcomes given the use of knowledge sharing technology and 2) investigates the individual and organizational factors that serve as antecedents to the use of the knowledge sharing technology.

The findings of this research suggest that given the characteristics of a police organization, an increase in the use of the knowledge sharing technology to communicate with external groups results in decreased productivity and job perceptions. Furthermore, this relationship may be moderated by factors within the police organization. Previous research on knowledge sharing has found that as knowledge sharing increases between individuals in different groups, productivity also increases. The results of this

dissertation indicate that this is not always the case. By pulling together different areas of research, such as knowledge management, information technology, communication, and organizational behavior, this dissertation addresses the gaps in the research and contributes to the existing understanding of knowledge sharing. This dissertation also provides an important notice to law enforcement and other organizations: although they may approach knowledge sharing with the best intentions, there can be unintentional effects to increasing the use of knowledge sharing technology.

CHAPTER 1. INTRODUCTION

On September 11, 2001, the United States experienced a tragic act of violence that changed our view of the world and made us question our security. In the months after the attacks of September 11th, we learned that these attacks were carefully planned. Not only did the hijackers meticulously plan and coordinate their efforts, they did so in our backyard. The 9/11 Commission investigated the series of events and oversights that lead to this tragic result. In their report, they cite numerous cases where information existed that could have signaled that such an event might occur (National Commission on Terrorist Attacks, 2004). One of the conclusions of the commission was that there needs to be a restructuring of intelligence agencies to better share information and knowledge with each other. Although the reason is clear for this recommendation, an issue that should also be addressed is the unintended consequences of this endeavor. For example, does this change in knowledge-sharing behaviors result in unintended consequences on current work outcomes? However, before I address knowledge sharing and its effects in the context of law enforcement and the police, I would like to take a step back and look at knowledge and knowledge sharing in a more general context.

Although knowledge has garnered increased attention in recent years, it has always been important to organizations. We know that organizations create and use knowledge (Demarest, 1997). But how can organizations best focus on building, sharing, and retaining knowledge in a way that promotes the functions of the organization? With

the development of large storage systems and data mining techniques, the potential to deal with vast amounts of information and convert it to something more useful (i.e., knowledge) has become the focus of academic as well as industry endeavors.

Yet, with the vast technological advances and the popularity of the knowledge management phenomenon, we have to wonder why organizations are not better able to utilize these technologies for the purposes of developing advanced knowledge capabilities (Ruggles, 1998). The problem is that many studies of knowledge management (see e.g., (Nemati, Steiger, Iyer, & Herschel, 2002) use the term “knowledge”, yet seem to be dealing more with something akin to information (Spriegler, 2000). The terms information and knowledge are also used interchangeably in industry (Alavi & Leidner, 1999). Therefore, although strides have been made in the development of “knowledge management” technologies, all that has been accomplished is information management. For example, the 9/11 panel found that a number of the hijackers did in fact exist on a terrorist watch list. However, the knowledge to use the watch list to try to locate those individuals prior to 9/11 did not occur (National Commission on Terrorist Attacks, 2004). There seems to be a need for both academics and industry practitioners to take a step back from the technologies to not only re-examine strategies behind the implementation of the technologies, but to reconsider the concept of knowledge itself. Only then can we better implement technologies for building knowledge capabilities within organizations.

Knowledge in an organization exists in individuals as personal experience and lessons learned. This knowledge is an extremely valuable asset for organizations.

However, because knowledge is tacit and difficult to capture, organizations often shortchange efforts to manage tacit knowledge, opting to instead focus their efforts on the development of computer systems and the underlying information that can exist in them. By focusing on this information rather than the knowledge that exists in people, organizations risk having very important knowledge literally walk out of their grasp.

To prevent the loss of this knowledge and to best ensure that the knowledge stays within the organization, organizations need to ensure that the knowledge that exists in individuals is shared with others in the organizations. I define “knowledge sharing” as a process that allows people to convey their knowledge to others or the spread of knowledge from person to person. As I will discuss in this dissertation, the process of knowledge sharing can occur in a number of different ways and can be more or less direct in manner.

An important facet of studying knowledge sharing is understanding the organizational context. Knowledge sharing does not occur in a vacuum; as a communicative activity, it is highly influenced by social and work-related aspects of the organizational context. Therefore, in studying knowledge sharing, it is crucial that we also address the organizational environment that surrounds knowledge sharing behavior.

The organizational context that I use in this dissertation is the quasi-military organization of law enforcement, specifically the police. The organizational environment of the police and other quasi-military organizations provide an extremely interesting arena for the study of knowledge sharing. On one hand, the nature of police work requires that officers be able to share their knowledge and experiences with others to

understand the different criminal activities that may be occurring throughout a city and to learn from other police officers' decisions and behaviors. On the other hand, the structure, workload, and reward system of the police organization often discourages police officers from sharing personal knowledge with others. For example, the chain-of-command structure of the police organization restricts knowledge sharing at certain levels of the organization. Because they are vehicle-based and their workload is often high, officers often do not have the opportunity or the time to connect with other officers. Officers are often rewarded and promoted based on individual performance and therefore, sharing knowledge with others can actually serve as a disadvantage.

In the case of law enforcement at the national level, this challenge of knowledge sharing between agencies is even more daunting. Different law enforcement agencies, such as the Central Intelligence Agency, Federal Bureau of Investigations, and the Department of Immigration, have different organizational structures, different protocols of communication, high workloads, and large stores of information, which discourage the sharing of knowledge outside of their organizational boundaries. While there is a crucial need for these agencies to overcome many fundamental organizational differences and environmental challenges to share knowledge with each other, we also need to understand the potential consequences of changing current knowledge sharing practices.

In addition to the organizational context, there are other individual factors that can influence knowledge sharing in the police. Demographic factors such as age, tenure, and education can affect levels of knowledge sharing. When looking at knowledge sharing

through the use of technology, individual differences in current level of technology use, experience, and attitude towards technology can influence knowledge sharing as well. Of course, knowledge sharing is not the end in itself but instead should serve specific organizational goals. For example, previous research has found that different aspects of knowledge sharing can lead to changes in productivity and job perceptions (Choi & Kim, 1999; Keller, 2001). The assumption behind knowledge sharing not only in law enforcement organizations, but in all organizations, is that an increase in productivity results. However, this dissertation seeks to investigate this underlying assumption. The research questions addressed in this dissertation are:

1). In a law enforcement organization, how do individual factors and organizational context affect the use of knowledge sharing technology.

2) How do different patterns of knowledge sharing in turn affect outcomes?

This dissertation begins with a discussion on the concept of knowledge and reviews the often-ambiguous definitions found in the literature. I then present my definitions for knowledge and knowledge representations, and how they relate to knowledge management strategies and technologies. I highlight knowledge sharing as a key element for organizations wanting to realize the value of knowledge management.

A model of knowledge sharing is proposed that links individual factors to aspects of knowledge sharing and predicts different outcome measures based on those aspects of knowledge sharing. The model also includes the effects of organizational factors.

Within this study, these factors are used to describe and understand the underlying influences of different organizational factors on knowledge sharing. Beyond this dissertation, these factors serve as a foundation that can be used to tie together the different studies on knowledge sharing. By being able to consider the impact of organizational factors, we can get a better understanding of how knowledge sharing works under different organizational influences.

As mentioned above, the organizational context that I use for this field study is the quasi-military organization of the police. In order to look at knowledge sharing behavior, I focus on knowledge sharing through the measures of communication frequency and communication distance by the use of a particular communication technology. I also examine the relationship between these aspects of knowledge sharing and outcome measures, such as productivity and job perceptions.

This dissertation addresses gaps and contributes to the different research areas of knowledge management, information technology, communication, and organizational behavior in a number of ways. First, this dissertation integrates different elements of knowledge sharing from all of these disciplines to create a more comprehensive study of knowledge sharing and its effects, given different individual and organizational factors. Second, a key issue in knowledge management is the ability to define the concept of knowledge and show how it can be managed in the best interest of an organization. This dissertation makes and defends a specific definition of knowledge rather than glossing over the highly debated question of what knowledge is. I use this definition in my discussion of knowledge management strategies, knowledge sharing, and technology use

to provide a cohesive way of looking at the current literature. Third, a limitation often found in the literature is the lack of actual measures in use for looking at communication and productivity. This dissertation overcomes this limitation by capturing data from organizational data repositories and communication system logs to use actual indicators of behaviors as well as self-reported measures.

CHAPTER 2. THEORETICAL BACKGROUND: CHARACTERIZING KNOWLEDGE, KNOWLEDGE MANAGEMENT, AND KNOWLEDGE SHARING

The research questions that this dissertation addresses involve the relationships between individual and organizational factors, knowledge sharing, and outcome measures given a specific context. The focus of this chapter is to review the knowledge, knowledge management, and knowledge sharing literatures to support the model of knowledge sharing presented and tested in later chapters.

2.1 Current Definitions of Knowledge

Before a discussion of knowledge management or knowledge sharing can take place, it is necessary to first discuss the concept of “knowledge” and what it means in the context of this dissertation. In existing literature the concept of knowledge has been viewed from many angles in an attempt to clearly delineate what it is and what it is not. Well-known methods of defining knowledge use a hierarchy of data, information, and knowledge to describe the characteristics of knowledge (Drucker, 1998; Maglitta, 1995; Vance, 1997) or make comparisons on some dimension of knowledge, such as tacit/explicit, expressible/inexpressible or declarative/procedural (Alavi & Leidner, 1999; Blair, 2002; Spriegler, 2000).

Although these attempts to define knowledge are undertaken with good intentions, many definitions cloud the literature, making it unclear what is truly knowledge and thus, how we can best manage knowledge. After presenting problems with the existing definitions of knowledge, I will present a way of thinking about knowledge that resolves the problems with existing definitions. In the final two sections of this chapter, I will extend my definition of knowledge by discussing the concepts of knowledge representations and knowledge management.

One popular method of defining knowledge is to distinguish it from data and information by incorporating additional elements or characteristics at each level of the hierarchy. There seems to be little problem when comparing data and information: data consists of objective facts or figures, while information is data with meaning and a specific context that has been organized for a particular purpose (Drucker, 1998). When moving from information to knowledge, the distinction becomes less clear (Alavi & Leidner, 1999; Blair, 2002). Some researchers define knowledge as information that is “enriched” with experience and context (Broadbent, 1998; Davenport, Long, & Beers, 1998).

The problem with this approach, which builds on each level of the data, information, and knowledge hierarchy is that it is unclear how this “enrichment” of information presents itself. By this definition, if a person takes in information and enriches it with her own experience and context, it is now knowledge. Now if she documents her newfound knowledge in a paper then perhaps for her, the paper is still knowledge. But for someone else who reads the paper, the addition of the personal

experience may just be additional information (i.e., it does not hold any personal experience or significance to the second person). Thus, by this definition, what is knowledge and what is information becomes dependent on the person viewing the content, i.e., the same content can be knowledge for one person, while information for another. Lacking the ability to distinguish between information and knowledge objectively greatly impedes our ability to devise strategies of managing knowledge versus information.

Perhaps the most popular method of defining knowledge is to categorize knowledge into different types based on our ability to express or codify it. First coined by Polanyi (1966) then made popular by Nonaka (Nonaka, 1991; Nonaka & Takeuchi, 1995), the terms explicit and tacit knowledge are ubiquitous in the knowledge management literature (see e.g., Choo, 2000; Osterloh & Frey, 2000). Explicit knowledge is defined as knowledge that is “formal and systematic” (Nonaka, 1994) and thus, easy to capture, codify and share.

The problem with this definition of explicit knowledge is that it becomes very similar to information (Alavi & Leidner, 1999; Alvesson, Karreman, & Swan, 2002; Tuomi, 2000). Once knowledge becomes formalized and explicit, for example in a written report, how does this report differ from information? To answer this question, it seems that one would have to be able to understand how the individual views the report. If the report is a result of someone codifying his/her newly created knowledge in a “formal, systematic language” (Nonaka, 1994, p.16), this report will be explicit knowledge, by this definition. However, it is also possible that the same written report

would be information for someone else who may have more experience in the subject area of the report. In addition, when information is added to knowledge and vice versa, the result is the possible creation of new information and knowledge (Grover & Davenport, 2001). The underlying problem with the definition of explicit knowledge is that to differentiate between this type of knowledge and information, we need to look at how people approach and use it. Because the same content can be viewed as information by some and explicit knowledge by others, the distinction between the two becomes ambiguous. We can see evidence of this in the literature where the lack of distinction between explicit knowledge and information results in the conclusion that strategies to codify knowledge (Hansen, Nohria, & Tierney, 1999) are actually strategies to manage information.

To illustrate this ambiguity between information and explicit knowledge, let's take the example of a crime scene investigation of a homicide. A rookie officer at his first homicide crime scene may gain much new knowledge, such as how to locate points of entry or how to piece together the order of events. A report based on his newfound knowledge that details what he learned could be considered explicit knowledge (according to Nonaka, 1994). However, if a seasoned homicide detective reviews the same report, it is likely that she would not view it as knowledge. Given her vast experience with thousands of homicide scenes, the report is merely a mass of information. This example shows that the ambiguity surrounding whether the report is explicit knowledge or information comes from whether we are viewing the report from the rookie officer's or the seasoned homicide detective's point of view.

In contrast to explicit knowledge, the literature also defines tacit knowledge, which is informal, implicit, and personal. Tacit knowledge includes cognitive mental models, beliefs and perceptions that prevent us from being able to easily communicate or formalize it (Nonaka, 1991). Tacit knowledge has been divided into two types: 1) knowledge that has not been, but could be, expressed, and 2) knowledge that is not expressible (also labeled intangible) (Blair, 2002; Dutta, 1997). For expressible tacit knowledge, documenting the knowledge (for example, recording directions on how to update drivers for a computer) converts it into explicit knowledge (i.e., information). An example that Blair (2002) gives for inexpressible tacit knowledge is the knowledge that a wine connoisseur possesses for selecting a good wine. The knowledge in this case cannot easily be distilled into a set of rules or steps that can be explicitly communicated (Blair, 2002). This knowledge is more likely to be expressed by some physical demonstration and learned through actual experience (Blair, 2002).

The division of tacit knowledge into expressible and non-expressible is problematic. As mentioned, a person can choose to express knowledge in two different ways: by documenting it and converting it into explicit knowledge (or information) or by some physical demonstration. If the expression of knowledge is performed poorly (e.g., the documentation of the knowledge is difficult to understand or the physical demonstration does not provide a realization as to the underlying understanding), the value of the knowledge is diminished. For example, a student may have a knowledgeable teacher, but if the teacher is not able to effectively express his/her knowledge, the student may not be able to benefit from that knowledge. It is not to say that the teacher is not

knowledgeable, but that knowledge may not be useful to others because of problems with expression. This definition of expressible versus inexpressible knowledge does not address this issue concerning the quality of the expression of knowledge.

The distinction between expressible and inexpressible tacit knowledge is problematic in that it is cluttered not only by the act of expression but also by the choice to express the knowledge. A person may be knowledgeable in some area, but choose not to express this knowledge. It is not to say that the knowledge is inexpressible, but at the same time, the knowledge has not been expressed. Relying on a person's act of expressing knowledge as part of the definition of knowledge does not provide a clear way of distinguishing what is and what is not knowledge.

The definitions of knowledge in the existing literature do not clearly distinguish between what is and what is not knowledge. Not only are there problems distinguishing between knowledge and information, the act and choice of expressing knowledge clouds what is and what is not knowledge. Because there are problems with defining knowledge, the literature, which agrees that knowledge is a valuable resource for individuals and organizations, often bypasses defining knowledge and jumps directly into a discussion of ways to manage it. For example, in their discussion of knowledge, Grover and Davenport (2001) argue that "people who are knowledgeable not only have information, but have the ability to integrate and frame the information within the context of their experience, expertise, and judgment. In doing so, they can create new information that expands the state of possibilities, and in turn allows for further interaction with experience, expertise, and judgment."

Without a formal definition of knowledge, it is highly questionable that the strategies that have been derived to manage knowledge actually manage knowledge effectively. Given these problems with current definitions, I will discuss a different way of defining knowledge that attempts to circumvent these issues and provide a clear framework of what knowledge is and thus, how it can be managed.

2.2 So, What is Knowledge?

Based on my review of the literature, I begin with the argument that knowledge exists only in the minds of people, incorporating context, personal beliefs and experiences that lead to personal understanding. Borrowing a term from Polanyi (1966), knowledge is inherently tacit and only exists within people, while everything else (e.g., explicit knowledge) is information. The rest of this section presents examples and discussions from various literatures that have led me to my definition of knowledge.

Given that we are trying to understand this concept of knowledge, an interesting method devised by Wittgenstein (1953) to understand concepts is to look at how the term is typically used in our language. As Blair (2002) aptly discusses in his paper, when the term “knowledge” is commonly used, it is not treated as an object like data and information (e.g., I lost the data, I lost the information, I lost the knowledge?). Knowledge is not considered tangible in the same way that we can possess, exchange, and lose data and information, but rather as an ability to perform some act. Therefore, when we refer to the loss of knowledge, we are typically referring to the loss of an ability to do or to understand something (Blair, 2002). Thus, knowledge is more akin to

personal experience and understanding rather than a tangible object. Blair (2002) presents the distinction of data, information, and knowledge in this manner: “A computer can have data (e.g., facts and figures stored in a data base). A report can have information; that is, a report can be informative. But only a person can be knowledgeable, that is, only a person can have and exercise knowledge.”

Knowledge also has a complexity that draws from underlying beliefs, perceptions, values, insights and experiences that make it rich in context and dynamic in nature (Blair, 2002; Davenport & Prusak, 1998; McInerney, 2002). Knowledge is also individualized and includes aspects of creativity and imagination. These characteristics of knowledge are extremely difficult to reflect in any external representation. Take for example, the knowledge of what it is to be a parent. How can a parent-to-be (who has never been a parent) gain the knowledge of being a parent? There are guidebooks on being parents, but these books do not capture the true nature of what it is to be a parent. The parent-to-be could communicate and learn from real parents about being a parent. However, talking to different parents with different experiences could lead to many different notions of what a parent is. Even talking to the same parent over time (e.g., when the child is a baby versus a teenager) could result in different discussions of what a parent is. A parent-to-be watching a parent with their child could get a sense of what parents do, but being able to perform an action does not necessarily mean that one understands the meanings of the action (therefore, not knowledge). Although all of these methods may be useful for gaining information of what it is possibly like to be parent, as any parent will report, they do not fully reflect the true understanding of what is a parent. The way that a

person can truly gain the knowledge of being a parent is to experience it firsthand. By experiencing it firsthand, a person pulls together the highly rich context of all his/her past personal experiences (e.g., experiences with his/her own parents), abilities (e.g., ability to empathize with others), and beliefs (e.g., what an “ideal” parent should be) with the current experience of being a parent.

Based on the 9/11 Commission Report (2004), there is much evidence in regards to the specific knowledge that the hijackers possessed that enabled them to carry out their mission. The report indicated that they gained experience by undergoing training and actual “dry runs” on other flights. They had creativity that allowed them to come up with the idea of using an airplane as a weapon. The terrorists had knowledge on how long it would take the U.S. government to react to their highly coordinated plan (The Washington Post, 2004). On the other hand, the events of 9/11 took the United States by surprise. One question that can be asked is why were we so surprised. In the 9/11 Commission’s report, a problem cited was lack of imagination. As a country, we just did not have the knowledge, which includes the insights, experience, or creativity that an event like 9/11 could occur to us. When I say knowledge, I do not mean the mechanics of the airplanes being hijacked and used as weapons¹. I mean knowledge as in the insight, realization, and belief that this event could happen to us. Since the events of 9/11, it has become clear that we have gained knowledge from this experience regarding the

¹ For example, in his best-selling book Debt of Honor, Tom Clancy (1994) includes the villain crashing a Boeing 747 into the Capitol Building.

knowledge of what it is like to be attacked and the knowledge of how other nations view the United States.

Knowledge can be seen as being composed of three types of components. A cognitive component (Davenport & Prusak, 1998) consists of mental models (Johnson-Laird, 1983), and involve some sensemaking (Weick, 1979). For example, the knowledge that a police detective has often manifests itself in the form of inferences and suspicions. Detectives draw these inferences about suspects and their behaviors based on the knowledge gained from experience. McInerney (2002) argues that in addition to a cognitive aspect, there are also physical and emotional components of knowledge. In the previous example of police knowledge, the experience of gaining that knowledge often includes a physical component (e.g., handling an uncooperative suspect) as well as an emotional component (e.g., having your life threatened). It is the physical body that performs action based on knowledge (Pritchard, 2000). In the example of physically handling an uncooperative suspect, the more experience that a new officer has, the more knowledge he/she gains about performing the action of restraining a violent person. Jagger (1989) argues that emotion can also be instrumental in the construction of knowledge. Emotions, whether or not we consciously realize them, can influence our experience and therefore our knowledge. Continuing with our example, feeling the joy of rescuing a child from a kidnapping or the fear of having a loaded gun pointed directly at you are experiences that are part of the knowledge of what it is to be a police officer.

Physical and emotional aspects of knowledge often occur in combination, and can affect decision-making behavior. An example is a police officer who, when interrogated

on how he knew the suspect was armed, answered that the “hair stood on the back of his neck”. Although the officer may have picked up on subtle cues without being aware of them, the ability of the officer to understand these cues (even if subconsciously) that manifest themselves in some physical or emotional response is a result of knowledge gained through personal experience (e.g., understanding the meaning of the subtle cues).

Based on this discussion of the characteristics of knowledge, true knowledge is rich and personal in that it stems from internalized experiences with the world (May & Taylor, 2003) and it resides in people. Whether we are discussing the knowledge that we have gained from experiencing the events of 9/11 or knowledge of what it really means to be a parent, the knowledge must be internally processed. By internally processed, I mean that cognitively, emotionally, or physically, our mind has taken sensory input (e.g., the written words in a parenting book, the spoken advice from a friend who is a parent, the video of the first tower coming down, or the sight of a loaded gun pointed at your head) and given it context or understanding. It is this context that is key in my definition of knowledge, which only exist in the minds of people. Once we try to somehow represent the knowledge that is in our mind to share with others, it loses context. As I will discuss in the last two sections, the best that we can do is to represent the knowledge in a way that helps others gain their own context.

2.3 Reflections of Knowledge: Knowledge Representations

As I stated previously, knowledge only exists in the minds of people, and therefore, we cannot directly share knowledge. However, there are many ways that we

can represent knowledge (using information or what was termed “explicit knowledge”, routines, processes, practices, structures, and/or technologies) that can be highly useful for the creation of knowledge by individuals. Given that knowledge is intangible, the different methods that we can use to embody knowledge that exists within an individual serve as representations of that knowledge (Buckland, 1991). These knowledge representations are information that can be interpreted and used by an individual to create his or her own knowledge (Lueg, 2001) by processing it and adding context. Such knowledge representations can also be described as knowledge artifacts (Seiner, 2000) or knowledge units (Zack, 1999).

Knowledge representations are extremely useful. Because knowledge can only exist in the person, the value of knowledge representations is dependent on the ability of individuals to use or integrate it into their work. As discussed in the previous section, an important part of making knowledge useful is the way in which the knowledge is “expressed”. By this, I refer to the way in which the knowledge is represented. Given the quality of the representation (i.e., how closely it can represent the underlying knowledge), people are able to effectively use these artifacts to create their own knowledge. People transfer representations of their knowledge that can be used by the receiver to create their own knowledge. This new knowledge may not necessarily be the same as the original knowledge held by the sender but is instead enriched and made meaningful by the personal experiences of the receiver.

Although it may be difficult to directly tap into knowledge, there are different contextual levels of knowledge representations that can reflect knowledge in distinctive

ways and thus, affect how individuals create their own knowledge. The levels of knowledge representations range from low context to high context. The lower the context, the more removed the knowledge representation is from the underlying knowledge. While an example of a low contextual representation would be a general textbook, an example of a high contextual knowledge representation would be an on-going conversation between a pupil and his/her instructor. The more contextual representations are, the more it reflects the actual characteristics of the underlying knowledge.

In order to illustrate the different means by which knowledge can be created using levels of knowledge representation, I will use the example of students in the police academy. Early on in the police academy curriculum, students start by studying texts and other general readings. These could be considered low context knowledge representations that impart principles and ideas (e.g., laws and statutes) that are not rich in context or dynamic in nature. The use of these types of knowledge representations however, allows students to “get on the same page” and serve as a starting point for effective knowledge creation. Instructors at a police academy also use videos, which are more contextual knowledge representations than a textbook. Another method to help students develop their policing knowledge could be to invite experienced officers from the field to speak to the police class about his/her experience in policing. The guest officer’s sharing of his/her experience, perspectives, and stories (i.e., his/her knowledge representations) is a way for the class to learn about policing in a richer context than reading about it. In addition, the dynamic nature of the interaction allows students to

become more involved in the exchange of knowledge representations, which make the experience richer in context for the students. Although given the definition of knowledge, the speaker is not directly sharing his/her knowledge, from the interaction the students are able to develop their knowledge of policing by relating to the experiences of the guest speaker. Students in the police academy also engage in hands-on learning activities, in which students demonstrate proficiency in the subject matter and skills by participating in scenarios that give students the opportunity to gain knowledge through experiencing police work in a controlled environment. Using this method of knowledge creation, students tie what they have gained from the previous knowledge representations of the textbooks, readings, videos, and guest speakers with the rich context of their own experience by participating in policing scenarios. The scenarios provide a safe, shared context in which students are exposed to situations that allow them to exercise their own cognitive, physical, and emotional facilities in the creation of their individual knowledge. Students may start the scenario with mental models and ideas of how the situation will proceed (i.e., cognitive), perform actions such as restraining a “suspect”, (i.e., physical), or have to deal with disturbing issues such a child molestation (i.e., emotional). These different aspects of the knowledge creation process interact to produce a rich and highly contextual experience.

Given my definition of knowledge and knowledge representations, Table 1 classifies the existing literature by providing a way to clearly distinguish between the different terms, concepts, and descriptions that have been posed for describing knowledge and describing information.

<u>Information</u>	<u>Knowledge</u>
Explicit knowledge Codified knowledge Knowledge representation Knowledge artifact	Existing in the minds of people Inherently tacit Highly rich, contextual, and dynamic Based on experience Having cognitive, physical, and/or emotional components

Table 1. Terms/Descriptions Used in the Literature That Correspond to my Definitions of Information and Knowledge

The difference between knowledge representations and knowledge is not just semantic; there is an important reason for making this distinction. Whereas a knowledge representation can be separated from its original source (i.e., individuals) and stored in a computer-based technology, knowledge itself cannot be separated from people who are the creators and users of knowledge. Although managers may realize that knowledge is based in people, the majority of resources are focused on creating strategies and technologies that capture a knowledge representation rather than ensuring that people can effectively use the technologies to create their own knowledge (Ruggles, 1998). This could include developing technologies to enhance the richness of the knowledge representation.

As I will discuss in the next section, levels of knowledge representation lead to different approaches with which individuals can create knowledge using different strategies and technologies. For organizations, the key is to use strategies that enhance their employees' ability to not only develop their own individual knowledge by utilizing more contextual and rich representations but also the means to make as many aspects of that knowledge common to others in the organization.

2.4 Knowledge Management

Given that knowledge exists within people, how do organizations develop strategies and technologies to foster the development of knowledge within their employees? Knowledge management (KM) has been defined as how we create, form, manipulate, store, access, and use knowledge (Davenport et al., 1998). However, given my definition of knowledge, knowledge management does not deal directly with knowledge per se, but more with the management of knowledge representations for the purpose of fostering the development of individual's knowledge in a manner that enhances the organization. Therefore, although the KM literature refers to "knowledge," by my definition, they are actually referring to knowledge representations. This section will apply the concepts of knowledge and knowledge representation as presented earlier to knowledge management processes, strategies, and technologies.

Drawing from Grover and Davenport (2001), I break down knowledge management into four processes. The first process in knowledge management is *knowledge generation* or the creation or acquisition of knowledge. Given my definition of knowledge, the origin point of knowledge is in the mind of an individual. *Knowledge representation creation* refers to the conversion of knowledge into an explicit form. *Knowledge sharing* occurs when the knowledge is spread from person to person. This sharing occurs through the sharing of knowledge representations through direct person-to-person interaction. *Knowledge realization/outcome* refers to the way in which

knowledge creates value for its recipient and for the organization (Grover & Davenport, 2001). Although not necessary for knowledge management, technology has served as the catalyst for the recent interest in knowledge management (Dutta, 1997). Given my definition of knowledge and knowledge representations, the rest of this section will discuss the ways in which aspects of individual knowledge can be converted and managed at the organizational level by examining strategies for knowledge transfer, technologies choices for the different strategies, and knowledge realization/outcomes.

2.4.1 Technologies and Strategies for Making Knowledge or Knowledge Representation Useful

Figure 1 shows the relationship between the knowledge processes and the strategies for knowledge sharing. Knowledge is generated in the mind of a person. The person can then create some representation (e.g., a written report or spoken words) of that knowledge. The representation of the knowledge is then shared with others, which can lead back to the generation of other knowledge or some realization of that knowledge. As Figure 1 shows, knowledge that is generated does not have to be shared. An individual can simply choose to act or not to act on that knowledge (i.e., knowledge realization).

There are two strategies for knowledge sharing: codification and personalization (Hansen et al., 1999). The codification strategy deals with the capture and storage of knowledge representations in a way that makes it independent of the people who generated them. Examples of this strategy would be the creation of reports, videos, and

information to be stored in some repository. This strategy is also referred to as an information processing approach to KM (Iverson & McPhee, 2002). Although the codification strategy reduces the knowledge's original richness of social context (Brown & Duguid, 2002; Flanagan, 2002), knowledge representations can still help individuals gain knowledge. For example, a low context knowledge representation could be a text describing the laws and statutes that officers in training study in the police academy. Although the knowledge gained from this text are limited (e.g., little or no context of how the laws or statutes would play out in a specific incident), it provides a basic understanding that all officers will need in the field.

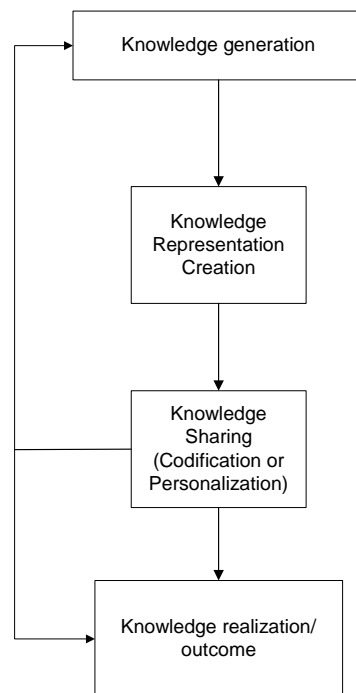


Figure 1. Knowledge Processes and Strategies for Knowledge Management

The second knowledge sharing strategy put forth by Hansen, Nohria and Tierney (1999) is personalization, in which knowledge representations are not disconnected from its source, but is shared and created through person-to-person interactions. This interaction can be face-to-face with a shared context, as when co-workers gather around the water cooler, or through technology mediation that enables people to interact, as with instant messaging (Garrett & Caldwell, 2002). As more organizations move towards distributed work and global teams, where teams face issues of temporal and geographic distance, the personalization strategy through technology mediation use becomes increasingly important. Communication technologies, such as email, weblogs (or blogs), videoconferencing, and text messaging are examples of technologies that support this strategy.

In the personalization strategy, the focus is not on capturing knowledge representations. Rather, the focus is on creating knowledge through the process of interacting with others by directly sharing knowledge representations. If used effectively, this strategy leads to sharing knowledge representations that retain more of its context and dynamic nature (McInerney, 2002). The fact that knowledge exists in people makes knowledge sharing through person-to-person interactions more important than merely focusing on creating knowledge representations that are disconnected from the individual. The distinction between codification and personalization is based on how the representations are utilized. While the personalization strategy is focused on sharing knowledge representations through person-to-person interactions, the codification strategy is focused on the capture of knowledge representations. The action of

exchanging emails (i.e., the knowledge representation) to share knowledge would be a personalization strategy. The storage of the same emails for individuals to review would be an example of the codification strategy of knowledge sharing.

Personalization allows for individual knowledge to be cultivated in communities within an organization (Baumard, 2001; Nonaka & Takeuchi, 1995) because knowledge that is not shared is of limited value to an organization (Alavi & Leidner, 1999). The sharing of individual knowledge can result in the creation of organizational knowledge, leading to the manifestation of the common knowledge in organizational processes and work practices (Bourdreau & Couillard, 1999).

Organizational knowledge creation is the movement of knowledge from an individual level to the level of the organization. As an initial idea is expressed and shared between individuals, it begins to assume a common form throughout the organization (i.e., many people in the organization have the same knowledge). If this created and shared knowledge is accepted by the organization, it can become embedded into the organization as part of a new process, structure, or procedure (Bourdreau & Couillard, 1999). An example of this would be the use of firm-specific routines, such as quality circles or task forces, for total quality and continuous improvements (Osterloh & Frey, 2000). Organizational knowledge is still dependent on individuals to act upon it and give it value to the organization.

Fostering the development and spread of people's knowledge can occur with both codification and personalization strategies. Codification strategies give people access to databases and repositories and allow them to create their own knowledge based on the

stored knowledge representations. Through the personalization strategy, people can develop knowledge based on interactions with others, learn behaviors to become integrated in a community of practice, or form networks (Swan, Newell, Scarbrough, & Hislop, 1999). Personalization is a dynamic and context-rich strategy that gives organizations and individuals the freedom to adapt to different situations and experiences, while building a sense of community.

These strategies of knowledge management play an important role for organizations considering the use of technologies. The use of different technologies can affect how these strategies are implemented in organizations. The following section ties together how different technologies relate to the different contextual levels of knowledge representations.

2.4.2 Technology Characteristics and Knowledge Representations

Although there are some technologies that are commonly associated with a knowledge management strategy (e.g., use of videoconferencing for personalization strategies), it is not always easy to separate technologies that support one strategy over another. For example, there are technologies that can support both strategies. Collaborative writing technologies enable people to communicate and collaborate (i.e., personalization strategy), while allowing access to stored documents and knowledge artifacts (i.e., codification). Another example is a company's yellow pages of people or a "people finder" database (Hansen et al., 1999), in which explicit knowledge on "who

knows what” is stored in a database (i.e., codification) for the purpose of connecting people with specific knowledge or expertise (i.e., personalization).

Technologies matched with different contextual levels of knowledge representations can also affect how people are able to create knowledge. As we know from previous literature, technologies or media can vary in their capability to process rich information (Daft & Lengel, 1986). Richness is determined by the capability of the technology to provide immediate feedback, number of cues and channels utilized, and level of personalization (Daft & Wiginton, 1979). The richest medium is face-to-face interaction, which provides multiple cues through body language and tone of voice, rapid feedback, and a shared physical environment. Media of low richness are more impersonal, provide fewer cues, and limit feedback (Daft & Lengel, 1986). Databases and formal reports are examples media of low richness. While rich media that allow for prompt feedback and multiple cues can help individuals converge on a common interpretation, lean media can help when dealing with standard data and easily understood messages (Daft & Lengel, 1986).

The richness of a technology coupled with the contextual level of the knowledge representations can influence how people are able to use these representations. As discussed previously, knowledge representations can vary from low context (e.g., a textbook) to high context (e.g., conversation between teacher and pupil). The use of a highly rich medium (e.g., videoconferencing) to transfer highly contextual knowledge representations (e.g., time- and experience-specific) allows people to engage in a more personal and unique experience as opposed to the use of a lean media (e.g., database or

repository) to transfer knowledge representations that are less rich (e.g., asynchronous and general). People can also choose to use leaner media (e.g., text messaging) to share contextual knowledge representations (e.g., synchronous and experience specific) and richer media (e.g., video recording) to share less contextual knowledge representations (e.g., general instructions). Figure 2 shows examples of different technologies and how they would be classified given the relationship between technology characteristics (in terms of media richness level) and level of knowledge representation (i.e., high versus low context) transferred using that type of technology.

The mix of different technology choices coupled with the various levels of knowledge representations provides organizations with numerous strategies to facilitate knowledge management and sharing. As in the previous example of the police academy, in general, a mixture of different strategies are often used to help different individuals create knowledge. Once this process of knowledge transfer occurs, the next challenge for organizations is the process of knowledge realization or outcomes.

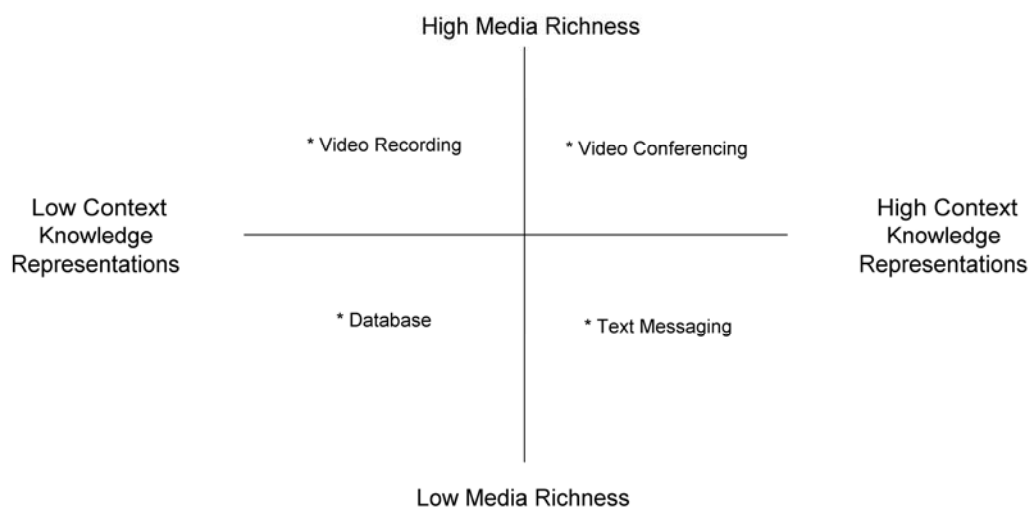


Figure 2. Technology Examples by Media Richness and Contextual Level of Knowledge Representation

2.4.3 Knowledge Realization/Outcome Process

For organizations engaging in knowledge management, a common belief is that fostering knowledge management capabilities and having the ability to successfully manage knowledge leads to some value for the organization. This assumes that there is some realization or outcome that occurs based on the knowledge.

Organizations are able to realize outcomes of knowledge management efforts through the behaviors of individuals in the organizations. These behaviors can manifest themselves in a number of different ways. For example, one study by Decarolis and Deeds (1999) investigated the tie between organizational knowledge and firm performance in biotechnology organizations. These organizations focused on representing knowledge through the creation of knowledge stocks, such as development of products, scientific citations, and patents. The researchers found that there was a

significant relationship between the number of products in the development pipeline, the number of scientific citations, and productivity in the firm (Decarolis & Deeds, 1999). In this situation, individuals work together to develop and share knowledge that results in measurable knowledge products or stocks, such as number of products in development or number of scientific citations that are related to firm performance.

The decision-making process in organizations necessitates that individuals engage in knowledge-sharing behaviors or actions to facilitate some end, whether it is group consensus or a plan of action. Communities of practice, for example, involve individuals engaged in knowledge-sharing behaviors in order to further the generation and value of knowledge to the community. The generation of new lines of business, the fostering of business strategies, the solving of problems, or assistance to companies to recruit and retain employees are all examples of such knowledge generation by communities of practice (Wenger & Snyder, 2000).

This discourse on performing some action as a realization of knowledge management efforts leads directly to the issue of underlying factors that can affect an individuals' decision to engage in knowledge activities, such as knowledge sharing, for the benefit of the organization. The 9/11 Report points to a number of instances where there was some knowledge of a terrorist plot against the United States. However, although the knowledge could have potentially changed the outcome of 9/11, because there was no action taken, there was no realization of that knowledge. To give you an example of how knowledge realization did work against the terrorists, on August 16, 2001, Zacarias Moussaoui, a suspected terrorist possibly slated to be a pilot in the 9/11

attacks, was arrested after his flight instructor notified authorities. The flight instructor noted two things that prompted him to contact the authorities: 1). Moussaoui paid for the flight training in cash, and 2). it was unusual for a student with little experience to want to learn to fly large jets without wanting to obtain a pilot's license (National Commission on Terrorist Attacks, 2004). Not only did the instructor have the knowledge to recognize that Moussaoui's conduct was out of the ordinary, knowledge realization occurred in that the instructor performed some action based on that knowledge (i.e., contacting authorities).

2.5 Chapter Summary

This chapter lays the foundation for the rest of the dissertation by first, discussing the problems that exist in the literature surrounding the definition of knowledge, then by resolving these issues by presenting a clear definition of knowledge that is used in this dissertation. To show how this concept of knowledge relates to knowledge management, I extend my discussion of knowledge to include knowledge representations, processes, strategies, and technologies related to knowledge sharing. Given my definition that knowledge exists in people, the focus should be less about extracting knowledge from people, and more about facilitating the development of organizational and relevant knowledge through person-to-person interactions, with or without technology. While it is not possible to describe all the factors that can affect an individual's decision to share knowledge in an organization, the next chapter will present a model of the knowledge

sharing process that encompasses some of the organizational and individual factors that can be influential.

CHAPTER 3. A MODEL OF KNOWLEDGE SHARING

Based on my discussion of knowledge and knowledge management, this chapter presents a model of knowledge sharing (Figure 3), which draws on the paradigm of human collaboration and communication exchange (Garrett & Caldwell, 2002) to describe the process by which knowledge is shared, given the influence of organizational and individual factors. Given my definition that knowledge resides in and is created by people, knowledge sharing occurs when people are able to learn by accessing knowledge representations both in repositories (i.e., codification) and by direct person-to-person interactions (i.e., personalization).

The model depicted in Figure 3 describes the process of knowledge sharing, through the codification and personalization strategies of Hansen, Nohria, and Tierney (1999), and knowledge realization/outcome, by including behavior as a result of knowledge. The social aspect of the model is depicted by the inclusion of two people engaging in the knowledge-sharing process. In reality, these people who send and receive knowledge representations in the communication process can be from one to many. This knowledge-sharing process is affected by and can affect organizational and individual factors over time. The rest of the chapter describes and discusses each facet of the model in more detail.

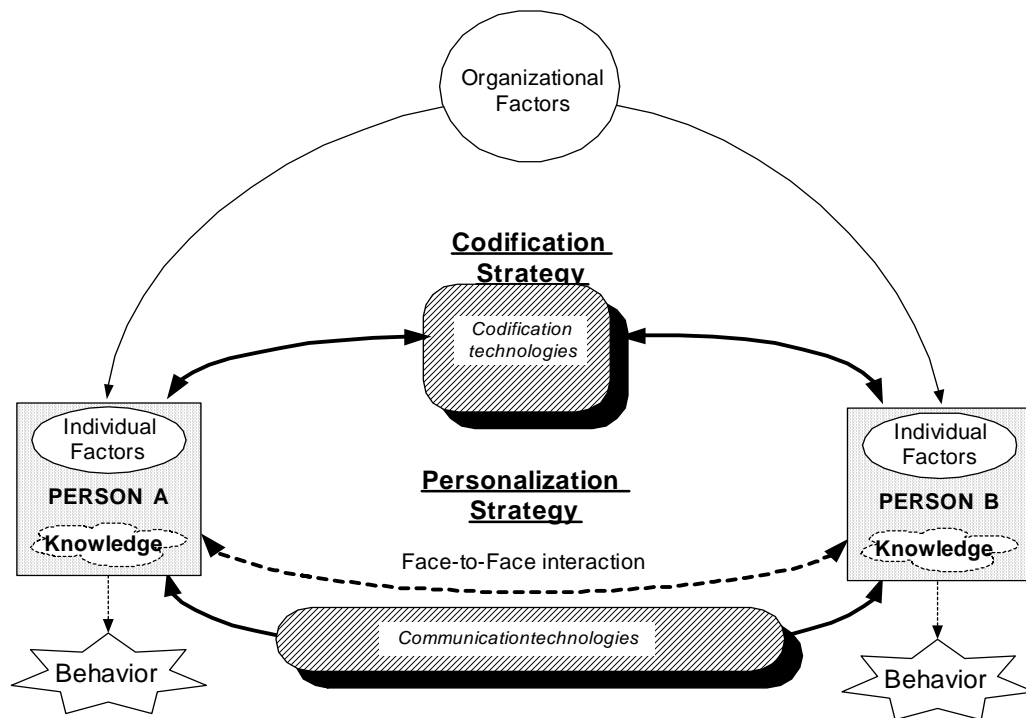


Figure 3. Conceptual Knowledge Sharing Model

3.1 Main Processes

Based on the previous discussion of knowledge management, the main processes included in the model are the personalization and codification strategies of knowledge sharing and performing actions that are a result of knowledge realization/outcome. From the previous chapter, it is apparent that knowledge enables people to perform behaviors useful to an organization (Argyris, 1993). Without looking at behaviors or actions, it would be difficult to know that knowledge sharing within the organization is occurring.

Thus, by observing behavior, we can examine the result of knowledge sharing through this knowledge realization/outcome process (Grover & Davenport, 2001). This behavior can be measured through changes in productivity, efficiency, or by looking at other changes in behavior. In the model, I have included behavior resulting from knowledge, allowing for the investigation of outcomes or realization of the individual and organizational knowledge processes.

Knowledge sharing between people can occur indirectly through codification and directly through personalization strategies. Codification technologies enable people to share knowledge representations so that others may access them and subsequently, develop their own knowledge. Personalization can occur (1) by direct, unmediated (i.e., face-to-face) interaction, or (2) by the use of technologies that serve as a channel through which people interact and learn directly from each other.

3.1.1 Codification Strategy

Knowledge sharing through codification is a result of employees codifying their knowledge in a knowledge representation and storing it in a repository accessible by other employees. This strategy typically requires that the organization provide some technology, such as a database, that people can access. The repository, which contains organizational knowledge representations, becomes the conduit through which knowledge sharing occurs. For example, at the conclusion of a project, the project manager may create a “lessons learned” document based on his/her experience at the conclusion of a project. As part of an organizational knowledge repository, other project

managers can access this document spreading the “lessons learned” across the organization.

3.1.2 Personalization Strategy

Sharing knowledge through direct person-to-person interaction (mediated or non-mediated) is related closely to the function of interpersonal communication.

Interpersonal communication is an interactional process that occurs within some context with social cognition and some meaning to the participants (Knapp, Miller, & Fudge, 1994). As depicted by Figure 3, person-to-person knowledge sharing through personalization can occur via face-to-face interactions or through technology-mediated communication. Non-mediated face-to-face interaction implies that the participants share the same time, place, and social context for the interactions. Given the growth of distributed work and global organizations, the use of communication technologies for knowledge sharing has become an important part of the study of knowledge management. Communication technologies allow temporally and geographically dispersed individuals to engage in knowledge sharing through interpersonal communication.

Regardless of whether this interpersonal communication is mediated or non-mediated, people not only share knowledge, but also share both organizational, contextual, and psychological factors as well (Constant, Kiesler, & Sproull, 1994). Given the social nature of this process, the personalization strategy of knowledge sharing involves not only the actual content of the message, but also feelings, values and self-

identities (Constant et al., 1994; Jarvenpaa & Staples, 2001) of those involved in the transfer.

Social exchange theory (Kelley & Thibaut, 1978) and other more recent theories built from social exchange theory (Constant et al., 1994) provide a way of looking at the personalization strategy of knowledge transfer in terms of factors that influence sharing behavior. The premise behind social exchange theory is that people engage in the exchange of information or knowledge based on some expectation that there is value in the exchange behavior. Unlike economic exchanges, where the value is clearly defined, in social exchanges, the precise nature of the value is not clear. Some researchers have argued that the value of social exchange of knowledge is in maintenance of image, power and relationships for future exchanges (Culnan & Armstrong, 1999; Kim & Mauborgne, 1998).

Teigland and Wasko (2000) found that participation in an electronic community had a direct impact on the acquisition of new knowledge. In their study, they found that individuals who participated more (i.e., more communication frequency) are more likely to acquire new knowledge than those who had lower levels of participation. Therefore, knowledge sharing can be measured by the frequency of which communication occurs as well as between whom the communication occurs. By looking at these measures of knowledge sharing, we can start to investigate its relationship with productivity and job perceptions.

3.2 Influencing Factors

A complicated issue in examining knowledge sharing behaviors is understanding some of the motivating factors that affect individuals' decisions to perform these behaviors. For example, from previous studies, we know that people do not always openly share their knowledge (Desouza, 2003) and just having technology for information sharing does not mean people will use it (Vandenbosch & Ginzberg, 1996/1997). There are environmental factors that influence how and whether people engage in the knowledge process in an organization, regardless of whether codification or personalization strategies are being used.

The factors included in the model and discussed in this chapter revolve around organizational and individual characteristics that not only influence the knowledge sharing process, but over time, may be in turn, influenced by the same process. In the following sections, I discuss the impact that organizational and individual factors have on the knowledge sharing process.

3.2.1 Organizational Factors

Although individuals create and use knowledge, this creation and use occurs within the organization and is affected by factors in the organization. Forces in the organizational environment not only provide the motivation for organizations to adopt knowledge management practices, but also affect the way these practices emerge.

Many of the studies on organizational knowledge sharing describe and examine the process within a single organization (e.g., Cummings, 2004). Each organization can be looked at in terms of different organizational factors, such as structure and culture that encompass the knowledge sharing process. By taking into account these different factors and the interplay between them, we can start to develop a broader picture of how different factors of organizations can affect individuals' knowledge sharing behaviors. For example, the organizational factors of a police organization that influence knowledge sharing will be different from the organizational factors found in a software development firm, even though both organizations may engage in similar knowledge sharing behaviors. Therefore, a strategy for successfully integrating knowledge-sharing behaviors in one organization may be quite different from an appropriate strategy in another organization.

These organizational factors exist in all organizations and they interact with each other. Yet, there is little research on how these different factors affect each other and can work together to influence knowledge sharing behaviors. There are several key factors that are useful for categorizing different types of organizations and for understanding the relationship of these factors to knowledge-sharing practices. These include organizational structure, culture, hierarchy-in-practice, characteristics of the work task, and geographic and temporal distance. Another reason to study these organizational factors is that some organizational dimensions are more difficult to change than others. For example, it may be harder for an organization to change its organizational structure

than to change other factors, such as its level of distributed work. Therefore, organizations need to be able to understand the key factors, how they work together, and be able to decide which factors are feasible to modify.

Organizational structure refers to the degree to which effort is integrated through the coordination and control of activities (Mintzberg, 1979; O'Neill, Beauvais, & Scholl, 2001). The organizational structure includes the relationships between work tasks, jobs, work groups, and people within an organization. Organizational structures can be centralized or decentralized. In centralized organizational structures, such as functional, divisional, and matrix designs, the delegation of tasks, work groups, and people are defined by a high level of explicit control and coordination mechanisms. In decentralized organizational structures, there is less explicit control and coordination of people and work aspects in the organization. Instead people have more flexibility in how and with whom they work. The structure of an organization often delineates the flow of communication and progression of authority. In highly structured organizations, control, authority and communication tend to occur vertically (O'Neill et al., 2001) affecting the knowledge-sharing process. These boundaries, often functional and divisional, have been found to hinder the use and distribution of knowledge (Markus, 1984). For example, in a study of social structure in a multiunit organization, Tsai (2002) found that high levels of centralization are negatively associated with levels of inter-organizational knowledge sharing.

Organizational culture is the shared meanings, beliefs, symbols, and myths that result in basic assumptions and norms within an organization. This culture is manifested in behavior patterns often unique to the organization (Lorsch, 1986; O'Neill et al., 2001; Weick, 1987; Wilkins & Ouchi, 1983). Culture guides and shapes behavior by conveying to employees a sense of identity and facilitating a commitment to the larger social system of the organization (Smircich, 1983). Organizational culture and its effect on information technology use have been widely studied (see e.g., Markus, 1984; Orlikowski, 1992; Robey & Boudreau, 1999). For example, organizational culture has been found to have a powerful influence on the adoption of technology and new processes (Barley, 1986). Another study found that in organizational cultures where norms for collaboration and sharing expertise did not exist, the use of groupware did not result in collaboration (Orlikowski, 1992).

In another study investigating the factors that could lead to perceptions of organizational ownership of information and expertise (or personal knowledge) by individuals, Jaavenpaa and Staples (2001) found that an organizational culture of pro-sharing attitudes was associated with a feeling of organizational ownership of knowledge. Furthermore, this feeling of organizational ownership of knowledge (as opposed to personal ownership of knowledge) was more likely to lead to engaging in knowledge-sharing behaviors.

An example of an organizational culture that promotes the personalization strategy of knowledge is communities-of-practice, in which people are “informally bound

together by shared experience and passion for joint enterprise” (Wenger & Snyder, 2000). An example of a community-of-practice is a task force comprised of a group of law enforcement officials across different agencies that meets periodically to discuss and share their knowledge regarding potential terrorist activities, strategies, and prevention tactics. The terrorist task force community-of-practice has created an organizational culture where individuals can relate to and interact with each other based on their common interests to expand their knowledge. The research on communities-of-practice concentrates on the socialization of people to promote and enhance learning and knowledge through practice and experience (Brown, 1998; Brown & Duguid, 1991, 2001; Wenger, 1998). The learning process behind COP, which comes from the work of Lave and Wenger (1991), necessitates that the learner becomes part of a community and the processes engrained in the culture leads to learning and creation of knowledge through participation.

Brown and Woodland (1999) found that knowledge within an organization resides in individuals, who often utilize personal knowledge as a power base, thus resulting in limited knowledge sharing. In their study, this use of limited knowledge sharing for personal gain was enforced by the organizational culture. Organizational culture can strongly affect knowledge sharing practices by providing accepted norms or patterns of behaviors dictating how and what knowledge is typically shared and with whom. Organizational cultures, although quite difficult to change (Trice & Beyer, 1993), can be influenced by other organizational factors, such as organizational structure, hierarchy-in-practice, or work task.

Level of *hierarchy-in-practice* can result from the interaction between structure and culture within an organization. Even though formal hierarchical structures may exist in an organization, the level in which the hierarchy is practiced can differ (e.g., Hagan & Kay, 1996). For example, an organization can be structural in nature, yet due to the accepted culture, the hierarchy exists more on paper than in practice. At the other extreme, in military organizations, the hierarchical nature of the organization is not only seen in structure but also in the culture, including behavior and in symbolic manifestations (e.g., uniforms and salutation behavior). Hierarchy-in-practice can strongly influence knowledge sharing practices, signaling what are acceptable and unacceptable behaviors.

Organizational *work task* refers to the characteristics of the actual work required of the employees in an organization and includes the level of coordination and uncertainty of completing those tasks. Task coordination refers to the level at which individuals coordinate their actions with others to perform their work. Task coordination includes aspects of the work that may dictate how and under what level of uncertainty (regarding predictability of occurrences and outcomes) that individuals perform the tasks. For example, some tasks necessitate a high level of coordination, resulting in the need for individuals to engage in rapid decision-making, act reactively and perform in highly uncertain environments. An example of this type of task would be the work of highly specialized military and paramilitary units, such as the Navy SEALs or police special weapons and tactics (SWAT) teams. Individuals may also engage in work that requires

high task coordination but has a low level of uncertainty. For example, individuals who work together to create technical specifications may require a high degree of coordination, but in an environment of low uncertainty. Individuals who perform tasks that require a high level of coordination will likely benefit more from knowledge sharing practices than employees in organizations who engage in complex tasks with low coordination. In situations where uncertainty and potential for critical errors surrounding the task increase, the need for the knowledge sharing process to be more efficient also increases. For example, in his analysis of the tragic Mann-Gulch disaster, during which 13 smokejumpers perished, Weick makes the point that communication is a critical source of coordination, especially in “complex systems that are susceptible to catastrophic disasters” (p. 664, Weick, 1993). The recent 9/11 Commission found considerable problems in coordination during a period when there was a high need for knowledge sharing (National Commission on Terrorist Attacks, 2004). These complex systems are environments where a high level of task coordination is needed to deal with a high level of uncertainty.

The level of *geographic and temporal distance* can influence the opportunities and types of knowledge sharing practices in which employees can engage. Also referred to as a proximity effect, previous research on geographic distance has found that if people work in nonadjacent locations, communication drops sharply (e.g., Monge & Kirste, 1980). In co-located work groups, employees are more likely to engage with each other on a regular basis due to convenience or serendipitous encounters leading to a higher

probability of knowledge sharing than distributed groups. In distributed work groups, the use of electronic communication is an important way for groups to communicate and mitigate the proximity effects to encourage communication between external groups (Hinds & Kiesler, 1995). The availability of communication technologies may serve as a facilitating factor for individuals to engage in more knowledge-sharing.

Similarly, the temporal distance, which is the time or work shift that employees work, can influence knowledge-sharing behavior. Much like the case of geographic dispersion, employees who do not work the same time shift are less likely to encounter or have an opportunity to interact with individuals who work different shifts. If mechanisms are not in place to support asynchronous communication, employees who work on different shifts or even in different time zones may be less likely to engage in knowledge sharing behaviors.

The key for organizations to facilitate knowledge sharing is to generate, sustain, and cultivate knowledge in an environment that is diverse with people, communities, technologies, information, and knowledge representations. This environment is greatly influenced by the different organizational factors that drive the general behavior and function of the organization. By looking at the different factors that make up an organization, we can investigate different technologies that fit with that organization's tasks and needs. We can also start to look at the forms, structures, and media types to promote the sharing and use of knowledge within individuals. Thus, organizations that wish to implement knowledge management strategies successfully need to understand

their existing organizational factors and their relationship to each other (Damodaran & Olphert, 2000). Although the extent to which some of these factors can be changed varies, it still provides some understanding of how knowledge sharing and management processes function in given organizational environments.

3.2.2 Individual Factors

Individual factors can also be an important influence on knowledge sharing behavior. Maslow (1977) describes a hierarchy of basic needs (i.e., physiological needs, safety, love, esteem, and self-actualization) that motivates human behavior. In the organizational setting, these needs often play out in terms of individual factors, such as personal goals. The motivation paradox is that an individual's knowledge is often viewed as part of his/her power base, thus making it challenging for organizations to find methods to motivate knowledge-sharing that is beneficial to the firm (Jarvenpaa & Staples, 2001; Trauth, 1999). Some researchers argue that organizations must depend on the voluntary actions of an individual to share their expertise or knowledge (Kim & Mauborgne, 1998). Therefore, the challenge for organizations is to encourage individuals to use their knowledge to produce organizational value. In some organizational settings, individual moderating factors will encourage knowledge accumulation rather than sharing. On the other hand, individuals who are motivated by the development of interpersonal relationships through collaboration and team work are more likely to engage in knowledge sharing behaviors.

Other individual differences (such as demographics, expertise, and tenure) often relate to past experiences, expertise, and skills that affect current and future knowledge transfer behaviors. For example, in their study of perceptions of knowledge ownership and influencing factors, Jarvenpaa and Staples (2001) found that women were more likely to view their knowledge as belonging to the organization than men. In the same study, they also found that younger knowledge workers were more likely than older workers to view their knowledge and expertise as belonging to the organization.

Given that a large part of knowledge sharing behavior in organizations is a result of the implementation of different technologies, another individual factor that can influence this behavior is an individual's experience with computer technologies and attitudes towards technologies. Previous research has found that an individual's expectation of computer use can affect usage of the computer systems (Compeau & Higgins, 1995). Given this, it is likely that an individual's general level of computer use, experience, and other communication tool use will affect the individual's level of knowledge sharing through the use of computer-based KM technologies.

Individual factors, such as motivations, career aspirations, demographics, expertise, tenure, and general computer use/experience play an important part in influencing knowledge sharing behaviors. Since knowledge is created and used by individuals, we can examine individual factors to understand some of the forces that influence knowledge sharing behavior and learn how to develop mechanisms (such as human resource interventions) to promote knowledge sharing.

From the literature, a general conceptual model of knowledge sharing is presented that forms the basis for the hypothesis testing discussed in the remaining chapters. This research model shows the relationships between the key components of the conceptual model discussed earlier in this chapter. As shown in Figure 4, the key links are between individual factors, the use of knowledge sharing technology, and outcome measures. The model also includes the role that organizational factors have in influencing outcome measures, and describes the moderating effect of organizational factors on the use of knowledge sharing technology and outcome measures.

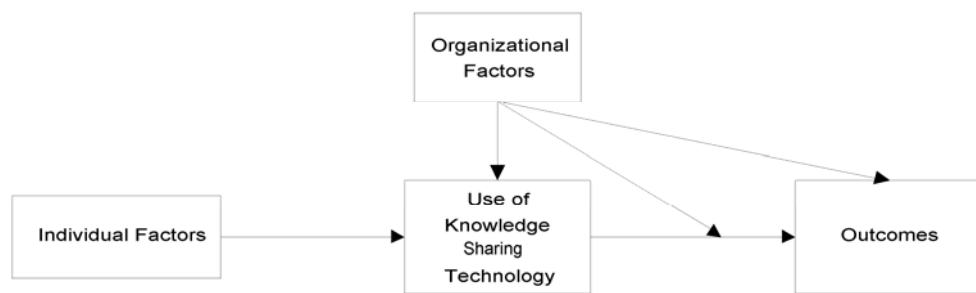


Figure 4. Proposed General Conceptual Model

3.3 Chapter Summary

In this chapter, I first present a model of knowledge sharing that depicts the process by which knowledge is shared between two individuals through the use of codification and personalization strategies. I also incorporate organizational and individual factors that can affect the knowledge sharing process. This model of knowledge sharing is robust in that it applies to different technologies and different types of organizations. Although I have described the model as a person-to-person interaction,

this model can be adapted to groups, communities, or organizations (e.g., in looking at strategic alliances and knowledge sharing between organizations). This model gives researchers and practitioners a means of looking at knowledge sharing and generation between entities, while incorporating the other organizational and individual factors surrounding this process.

I also propose a general conceptual model that depicts the relationship between individual factors, organizational factors, the use of knowledge sharing technology, and outcomes. From this conceptual model, two research models will be tested: 1) Model I will investigate the effects of using knowledge sharing technology and work shifts on outcomes. One characteristic of the police organization, shift that an officer works, will be tested as a moderating variable. 2) Model II will look at the antecedents to the use of knowledge sharing technology. Work shift will also be tested as a moderating variable.

CHAPTER 4. RESEARCH MODELS AND HYPOTHESES TESTING

Communication between people can lead to knowledge sharing through the sharing of personal experiences and ideas. The patterns and ways in which people communicate are in turn influenced by the organizational environment. As discussed previously, organizational factors, such as organizational structure, culture, hierarchy-in-practice, characteristics of the work task, level of geographic dispersion, and the existence of a temporal factor greatly influence the knowledge sharing process. To show this influence and how these organizational factors jointly affect knowledge sharing factors, hypotheses will be discussed in the context of the organizational environment of the police. The following section will describe in detail the organizational context of the police organization.

4.1 Organizational Context of the Police

4.1.1 Organizational Structure and Hierarchy-in-Practice

Given that police deal with much uncertainty in the field (Manning, 1977), it is not surprising that the organization is highly structured to help eliminate uncertainty and secure internal discipline (Bittner, 1990). The hierarchical structure of police agencies and other quasi-military organizations affects the work process as well as the general organizational culture. Police follow a strict hierarchy-in-practice through a chain of

command, where individuals are evaluated by, and answer to, immediate superiors. This structure not only provides a power structure for the organization, it helps to eliminate any confusion of misdirection. Each individual knows to whom he or she reports and questioning the authority of superiors is a serious infraction. The hierarchy-in-practice is also demonstrated through the use of uniforms differentiating rank and the ways in which higher-ranking officers are addressed. Given the often-chaotic task of policing, having a formal structure of command is important not only for the safety of the officer, but also for public safety. The highly structured chain of command reduces the possibility for confusion in a potentially chaotic situation and police officers are trained to act in a similar way in these critical situations. This also leads to the public perception of police unity. As protectors of the community, it is important for the public to view the police as a single force, working to ensure the safety of its citizens. Following a chain of command helps to assure the public of this unity.

Figure 5 shows a sample organizational structure for a police agency. At the highest level of command, the police chief is the head of the police agency. He or she is responsible for the department's actions and serves as the ultimate decision maker of the department. The police chief is also able to reallocate resources to different areas within the department as needed. The chief has a support staff made up of assistant chiefs, usually from a number of areas, such as investigative services, field or patrol services, administrative services, and support services. The next levels in the chain of command are captains and lieutenants. As part of the police command staff, captains, with the assistance of lieutenants, usually supervise a group of sergeants, detectives, and officers.

Sergeants usually deal with many management issues given the service division they are under, such as disciplinary, case assignment and evaluations for detectives and officers. Detectives typically work specific investigative tasks for a particular crime area or unit, such as homicide, aggravated assault, automobile theft, etc. They follow up on initial case reports by pulling together information and evidence in order to bring a case to a court of law.

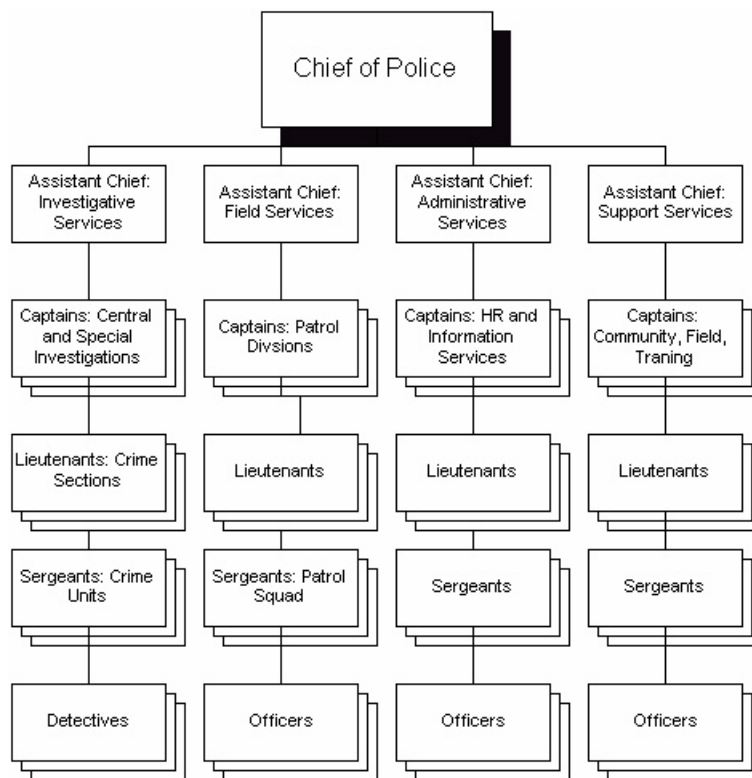


Figure 5. Sample Organization Chart of a Police Agency

Officers, the lowest ranking and largest group in a police agency, serve as the community protectors on the streets. They serve as the first line of defense, being the first responders to the public's call for assistance. They also provide primary investigative tasks, initiating the case report that may eventually get assigned to detectives, who work specific types of cases. Officers are primarily car-based and incident-driven (Maltz, Gordon, & Friedman, 2000). Officers must be mobile to be able to respond quickly to calls. Due to high workloads, officers are often not able to follow up on cases, and must instead quickly pass the case to the detective unit, thus limiting the knowledge and information that an officer may be able to pass along with the case report.

4.1.2 Organizational Culture

The organizational structure, strict chain of command, work task, geographic distance, temporal factors and being a public sector organization have led to a police culture that has certain effects on knowledge sharing. In this environment, knowledge and information is hard earned, and there is the constant challenge of acquiring valid and accurate information in a timely manner. Although it is in the organization's best interest to strategically share information and knowledge with other police personnel, it is rational for the individual to not share given the competitive nature and reward structure that currently exists in most police organizations (Maltz et al., 2000). This often results in an 'us' versus 'them' mentality, between officers in different geographic areas, as well as between officers and detectives. The hierarchical, centralized organizational structure also inhibits knowledge sharing between different units within a police department.

Finally, given their individual assignments and workload, police have little time to coordinate and work with others.

4.1.3 Characteristics of the Work Task

The work task of the police includes various levels of task coordination. Low coordination tasks are tasks that deal with routine work, such as traffic citations. However, given the potentially high uncertainty that comes with some police work, task coordination can also be quite high. Although new officers undergo training, most skills are developed while on the job. With a high level of task coordination and high workload, police officers often do not have the time to engage in knowledge sharing activities that are not pertinent to the task at hand.

4.1.4 Geographic Distance

Geographic distance and isolation are other aspects associated with police work. Although this varies from agency to agency, due to resource demands, police officers often work individually and are assigned to specific geographical regions (called beats or sectors). Not only are individuals typically distributed geographically, they also tend to be mobile, either patrolling different neighborhoods or responding to specific incidents or calls for service. While being incident-driven, car-bound and mobile limits the opportunity for officers to communicate with others, both in the police department as well as the community in general (Maltz et al., 2000), this distributed work pattern that is the characteristic of police organizations makes the availability and use of communication technologies extremely important.

4.1.5 Temporal Distance

In addition to working distributed geographic regions, police also work on different shifts, adding to difficulties in knowledge sharing, especially if the technologies available do not support this type of asynchronous communication. Although a certain geographical area is assigned to officers 24/7, these officers who work the same area, may never have a chance to communicate or engage in knowledge sharing behaviors, due to working different shifts or not being in the same work group. Given that these officers are often dealing with the same businesses, problems, victims, and probably perpetrators, the temporal factor's effect on knowledge sharing is problematic.

I have decided to focus on the police organization because I would expect that its organizational factors would have a large impact on knowledge sharing behaviors. The potentially high level of task coordination needs, uncertainty, and complexity would greatly benefit by knowledge sharing between individuals. The culture within the police organization also serves as a bond between individuals encouraging communication and knowledge sharing. However, we also know from previous research (e.g., Tsai, 2002) that a highly centralized structure and hierarchy-in-practice diminishes communication and knowledge sharing. Furthermore, challenges imposed by geographically and temporally distanced work groups can also make communication and knowledge sharing more difficult.

In the police and other law enforcement organizations, the relationship between these organizational factors presents an interesting setting for studying knowledge sharing. The police have an extreme need for sharing knowledge given the dynamic and

sometimes difficult environment. Yet, these organizations often have traditional ways of working, structures, norms, and other work challenges (such as physically dispersed members) that make the adoption of knowledge-sharing behaviors difficult. Furthermore, especially in police organizations dealing with homeland security, we have seen a push towards the implementation of different types of knowledge management technologies as a result of government initiatives. With the coupling of new technologies and need for knowledge sharing with traditional structures and ways of working, this research examines a timely and important issue relevant to not only the police but many other types of organizations as well.

4.2 Introduction to the Research Models

Drawing from the proposed model of knowledge sharing, the purpose of this dissertation is to examine the use of knowledge sharing technology in relation to job perceptions and job productivity. Communication is an underlying mechanism in this process of knowledge sharing. Therefore, direct person-to-person communication, whether face-to-face or mediated, serves as an important precursor to the knowledge sharing process. For example, in a study on the use of communication technology for knowledge sharing, Kock and Davison (2003) found that under the appropriate social processes, the use of simple collaborative technology (such as email) can lead to knowledge sharing in organizations.

Many of the previous studies that investigate knowledge sharing and its relationship to productivity measures rely on questionnaires and self-report of knowledge

sharing. Based on my earlier definition that knowledge that resides in the mind of individuals, the measurement of actual knowledge is quite difficult. However, I believe that this knowledge manifests itself through behaviors. For example, behaviors like communication can serve as proxy measures for knowledge sharing. This dissertation looks at actual behavioral measures that are indicative of knowledge sharing, such as general communication frequency, the pattern of communication between different organizational groups, and productivity.

In addition to using measures of actual communication behavior rather than relying on self-report measures, this dissertation differs from much of the existing literature on knowledge sharing by considering organizational factors (in this case, of the police organization) in the formulation of the hypotheses. Some of the hypotheses proposed in this chapter will differ from what the current literature will posit, given the effects of the organizational factors. My intent is to show the importance of organizational factors in determining the consequences of knowledge sharing practices.

In this study, my hypotheses focus on knowledge sharing between individuals, as measured by the frequency of direct, mediated communication and communication distance between communicators. Rather than look at all communication, this study looks at only communication mediated through the use of a single technology. The technology chosen for this study is a text-based, synchronous communication system. The organizational factors or dimensions discussed in Chapter 3, characterize the environment in which the knowledge sharing takes place, is used in two ways. First, the organizational factors can be characteristics within an organization that affects work and

knowledge sharing. For example, in this study, I use work shifts (i.e., day shift and night shift) as a factor that I believe affects knowledge sharing and outcomes differently within the organization. Second, the organizational factors discussed in the previous section can be used to describe different organizations to help understand the different conditions under which knowledge sharing behavior occurs. The individual factors that are expected to influence knowledge sharing through the use of this technology are age/tenure, level of computer experience/use and communication tool use. The knowledge sharing aspects, which I use as proxy measures for personal knowledge, include the frequency of communication through communication technology use and communication distance between the communicators (i.e., whether communication is internal to the same work group, internal to a different work group within the same department, or external to the department (Hinds & Kiesler, 1995). Outcome variables that are a result of knowledge sharing and personal knowledge creation include level of productivity, job perceptions (i.e., level of cohesion, job satisfaction, and distributive justice), and stress level.

Based on the general knowledge-sharing model discussed in Chapter 3 and depicted in Figure 4, I have chosen to divide the general model into two research models for hypothesis testing. Model I investigates the consequences of knowledge sharing and Model II looks at the antecedents of knowledge sharing.

4.1 Consequences of Knowledge Sharing – Model I

Research Questions: *In a law enforcement organization, how do different types of knowledge sharing behaviors affect outcomes? Can organizational factors not only influence outcomes, but also moderate the relationship between knowledge sharing behaviors and outcomes?*

As discussed previously in the literature review, an important way for organizations to realize the outcome of knowledge management (and sharing) efforts is through the behaviors of individuals based on that knowledge. For organizations striving to capitalize on knowledge management capabilities, this transformation of knowledge into action often translates into increased productivity, some discernible advantage, or a gain in performance. Although I am using a single organization in this study, I focus on two types of organizational factors of knowledge sharing in my hypothesis rationale and testing. I look at both work group and temporal distance to show variance within a single organization. As depicted in Figure 6, Model I links the use of knowledge sharing technology to outcome measures.

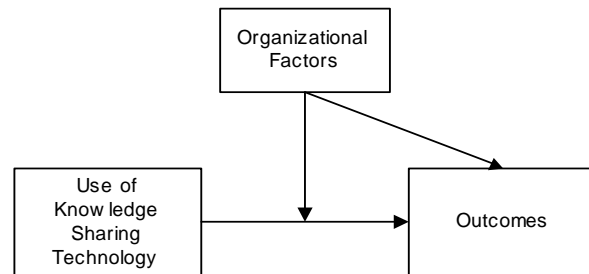


Figure 6. Model I Part of General Conceptual Model

The detailed research model shown in Figure 7 shows the specific variables used in this study. I examine the use of knowledge sharing technology through two methods: frequency of communication and the distance between communicators. The following section discusses the relationship between these two methods that characterize the use of knowledge sharing technology with the outcome variables of productivity, job perceptions, and stress level. Productivity refers to the measures that the police organization views as being indicative to the amount of work that officers are completing. Job perceptions include attitudes that officers have towards their job and the police organization. Stress level refers to the extent that the officer's work results in stress. Because only one organization was studied in this research and I am unable to compare effects of different organizational factors, I instead look at one factor that exists in the police organization, work shift, and its relationship to outcomes. I also consider the moderating effect that work shift can have on the relationship between the two patterns of technology use and outcomes.

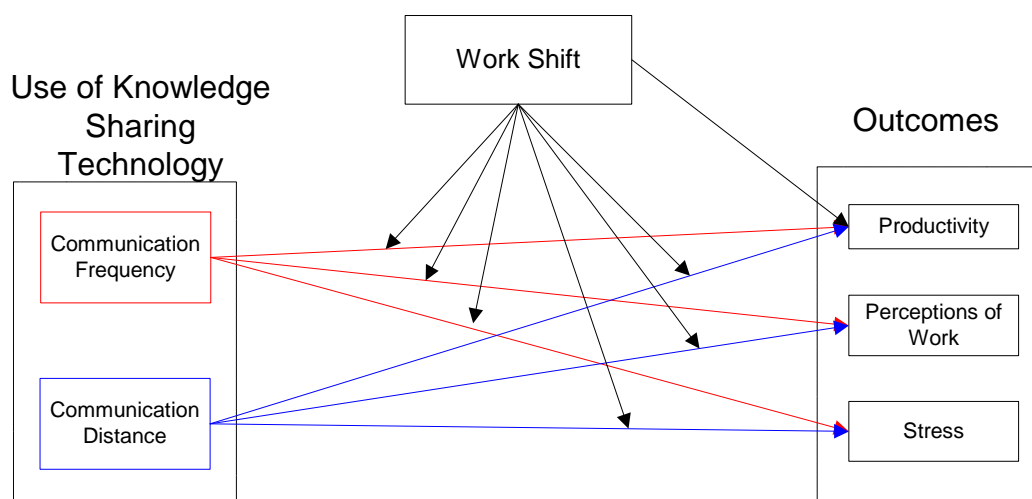


Figure 7. Research Model I

4.1.1 Use of Knowledge Sharing Technology: Communication Frequency and Communication Distance

The transformation of knowledge into action often begins with the communication process. The communication process leads to knowledge sharing through knowledge dissemination and interpretation, which in turn leads to actions based on sensemaking processes (Lehr & Rice, 2002; Weick, 1995). Communication can result in the sharing of knowledge based on experience, which in turn leads to increased performance. For example, in their longitudinal study of the profitability of kibbutz² agriculture, Ingram and Simons (2002) found that within work groups, the transfer of experience through communication led to improved performance. There is also a group of studies that have found that familiarity, which often results from communication, can

² A *kibbutz* is a collective farming community.

also lead to higher performance (Dubnicki & Limburg, 1991; Goodman & Leyden, 1991; Watson, Michaelsen, & Sharp, 1991). An example is a study done on the productivity of coal-mining crews, which found that lower levels of familiarity resulted in lower levels of productivity (Goodman & Leyden, 1991). Due to the nature of distributed work, much of this communication takes place through the use of communication technologies. Thus, it stands to reason that a positive relationship between communication technology use and productivity exists. In a study of productivity and computer-mediated communication usage patterns, Abdul-Gader (1996) found users of the communication system reported high levels of productivity impacts.

While this relationship between communication (both mediated and non-mediated) and productivity exists, the evidence is mixed. A number of research studies have also found that too much communication may lead to decreased productivity. In the case of communication leading to increased familiarity, too much familiarity has been found to result in detriments in group performance (e.g., Katz, 1982). In another study of communication mode and group productivity, researchers found that use of communication technology could lead to perceived information overload.

I believe that a key factor to unraveling the mixed findings in the literature is to look at organizational factors and their influence on the relationship between communication frequency and different outcomes. In law enforcement and other quasi-military organizations, the different organizational factors work against each other in terms of knowledge sharing, communication, and performance. As mentioned, highly centralized structures, hierarchical natures, geographic and temporal distances do not

facilitate knowledge sharing or communication. On the other hand, there is a need to engage in knowledge sharing given the high level of task coordination, uncertainty and unique culture. From the literature, we know that the frequency of communication can work to increase or decrease productivity depending not only on the overall level of communication, but the conditions under which the communication takes place. I believe that this is the case in law enforcement organizations. Although increased frequency of communication can facilitate knowledge sharing, in a given organizational environment like that of law enforcement, the effort to communicate can overpower the need to communicate.

In the case of law enforcement, because of the high level of task complexity and uncertainty that often exists in their work, a moderate level of communication can lead to increased productivity. However, extremely low or extremely high levels of communication can lead to decreased productivity. Individuals who engage in low levels of communication would lack the interaction that personnel need to deal with task complexity and uncertainty. Individuals who engage in high levels of communications may find it costly in terms of the resources or time available needed to engage in the knowledge-sharing and communication process. Thus, the following hypotheses relating communication frequency, productivity, and job perceptions can be put forth:

Hypothesis 1.1: There will be a curvilinear effect of communication frequency on performance, such that very high and very low levels of communication frequency will be related to low levels of productivity and moderate levels of communication will be related to high levels of productivity.

In addition, knowledge sharing as a social process can also result in building interpersonal relationships, familiarity, and trust. Familiarity resulting from communication can also influence perceptions of job satisfaction, cohesiveness, and stress levels (see e.g., Guzzo & Dickman, 1996). For example in the case of communities of practice, knowledge sharing forms the backbone through which a cooperative spirit is developed among the community. Because communities of practice are internally motivated through common interests and a need to learn from each other (Brown & Duguid, 1991), this internal motivation often leads to increased job satisfaction (Osterloh & Frey, 2000).

In the case of an organizational environment where there is a distinct organizational culture and times of high uncertainty, communication can enhance job satisfaction and cohesiveness in the organization. The high degree of organizational culture will support communication and the use of communication technology. The use of communication technology will in turn influence individuals' attitudes towards the organization. For example, in a study of communication patterns in a virtual organization, Wiesenfeld and colleagues (Wiesenfeld, Raghuram, & Garud, 1999) found that the use of communication technologies helped to create and maintain organizational identity. Organizational identification, which refers to an individual's level of cognitive attachment to the organization, has been found to influence aspects of job satisfaction (Dutton, Dukerich, & Harquail, 1994).

Stress as a result of organizational work can also be influenced by level of communication. In a study of organizational stress in elite sport performers, researchers

found that lack of communication between athletes was one of the leading team issues resulting in increased organizational stress (Fletcher & Hanton, 2003). In a study of police officers, Toch (2002) found that lack of consistent communication was one of the issues rated to be most stressful by officers

This discussion indicates that especially in the quasi-military organizational environment of times of high demand and uncertainty, communication can provide individuals a sense of familiarity and stability (Guzzo & Dickman, 1996) promoting well-being in the form of job satisfaction, cohesiveness, and reduced stress. Hence, the following hypotheses are posited:

Hypothesis 1.2: Increased frequency of communication positively affects perceptions of work.

Hypothesis 1.3: Increased communication frequency lowers stress level.

Inkpen (1996) investigated the effects of collaboration on knowledge creation. He found that organizational learning occurs when the outcome of collaborative efforts is shared throughout the organization. Not only is it important to look at how this process of collaboration occurs, but with whom it occurs. Communication distance (i.e., extent to which communication occurs between individuals inside of and outside of organizational group boundaries) is an important facet of knowledge sharing. In-group communication or internal knowledge sharing involves individuals who typically work together on a daily basis and are most often supervised by the same person. Out-group communication or external knowledge sharing involves individuals with little or no daily collaboration,

often working at a distance, with different supervisors (Zenger & Lawrence, 1989).

While in-group communication is more frequent, out-group or external communication has been found to result in higher performance ratings by top management (Ancona & Caldwell, 1992b). In other studies of external communication and performance, Keller (2001) and Choi and Kim (1999) found that external communication resulted in performance improvements.

The boundaries of communication distance can refer not only to organizationally defined work groups (e.g., project team or business unit), but can include other types of groups. Co-located versus geographically distributed groups, temporal groups separated by shift, and groups from different functional departments within an organization (e.g., MIS department and accounting department) are other examples of boundaries that exist within organizations.

Research extending group communication to internal and external knowledge sharing has found similar results correlating higher performance with external communication. Cummings (2004) found that knowledge sharing in general was positively related to performance and external knowledge sharing was related to even higher performance when the work groups were distributed and cross-functional. As groups become less immediate and more distributed (i.e., higher communication distance), it is more likely that these groups have developed different work processes and perhaps know of or use different resources. The communication and knowledge sharing across these boundaries would lead to other groups' realizations of other resources and methods of working. Therefore, although knowledge sharing in general should lead to

factors of law enforcement and other quasi-military organizations affect the relationship between communication distance and productivity. The “distance” in communication distance refers to the method in which organizational boundaries are defined. In this study, communication distance is separated into two variables: work group and temporal distance. Work group distance is the level of communication distance as defined by organizational group boundaries (i.e., low distance is within work group, medium distance is outside of work group but within same division, and high distance is outside of division). Temporal distance refers to the time of day or shift worked (i.e., daytime and nighttime). Since the two distinct communication variables are similar conceptually, the following hypotheses will only refer to the conceptual variable, communication distance.

In the case of either type of communication distance, given the nature of work (i.e., high task coordination and uncertainty) in law enforcement organizations, as well as the necessity of officers to be aware of their immediate surroundings, the effort to move outside of their immediate group to engage in communication with more distant groups could lead to high costs in terms of productivity. Therefore, I hypothesize that the relationship between communication distance for the police will differ from the other organizations discussed previously.

Hypothesis 1.4: Increased communication distance between communicators negatively affects productivity.

It is also hypothesized that communication distance will affect job perceptions (such as cohesiveness, job satisfaction, and distributive justice) and stress level. In his study of new product development, Keller (2001) found a number of interesting relationships between internal and external communication and cohesiveness. He concluded that while internal communication had a positive effect on cohesiveness, there was a negative effect between external communication and cohesiveness. In general, as communication distance between individuals decreases, the opportunities to communicate (not only for work related matters, but also social purposes) increases, leading to higher job satisfaction, cohesion, and lower stress level. On the other hand, as communication distance increases, fewer contextual cues are shared and the purpose for the communication is more likely to be work-oriented in nature.

In previous research, distributive justice has also been related to organizational and personal outcomes, including an employee's perceptions and intent to stay at an organization (Alexander & Ruderman, 1987; McFarlin & Sweeny, 1992). In their theory paper on the establishment of technology alliances between organizations, Daellenbach and Davenport (Daellenbach & Davenport, 2004) argue that distributive justice is associated to perceptions of trustworthiness. As mentioned earlier in this section, trust can occur as a result of familiarity and interactions over time. Therefore, given the relationships between distributive justice, outcomes, and trust, it can be hypothesized that communicating at different distances can affect an individual's perception of distributive justice.

In the law enforcement organization, a high organizational structure, geographic and time distances, close communication distances will encourage social interaction and therefore, increase feelings of cohesion, job satisfaction, and distributive justice. On the other hand, the need to engage in communication at farther distances will be a result of work-driven reasons, such as task coordination, complexity, or uncertainty, and will lead to lower cohesion, job satisfaction, and distributive justice. Similarly, as officers communicate with others who are more immediate (i.e., close/low communication distance), it is expected that stress levels will also lower as a result of higher levels of familiarity and a shared environment. Because they are communicating more with those they are more likely to be working with, there seems to be more of an opportunity to become familiar with how these “close” co-workers operate and think. In a law enforcement organization and given the oftentimes-unpredictable environment, this familiarity would lead to lower stress levels. As illustrated by the hypothesized mean differences in the second and third columns of Table 2, the following hypotheses on the relationship between communication distance and job perceptions and stress level within a law enforcement organization are put forth:

Hypothesis 1.5: Increased communication distance negatively affects perception of work.

Hypothesis 1.6: Increased communication distance increases stress level (i.e., positive relationship).

4.1.2 Work Shift

Within a particular organization, there are certain characteristics inherent to that organization that plays a role in dictating work behaviors. These characteristics or factors vary across the organization and affect the work process and outcomes in different ways. By not looking at these factors, we not only fail in understanding the real nature of the organization's work, we could also miss the chance to realize how these factors affect certain groups within the organization differently.

One organization factor found in law enforcement and other quasi-military organizations is work shift. Given that the law enforcement organization must be operational 24 hours a day, officers are divided into different work shifts, typically days and nights. Work duties and job can differ vastly from the day to the night shift. Because many criminals operate under the cover of darkness, officers who work during the night shift are likely to encounter increased criminal activity than officers who work the day shift. The increase in general criminal activity during the night shift would lead to an increased workload for the officers who work the later shift.

Hypothesis 1.7: Working a later shift positively affects productivity.

Differences in work shift can also moderate the relationship between knowledge sharing behavior and productivity. Given the increased workload and

increased potential for danger, officers who work the night shift have less leeway with their time and resources. An officer who works the day shift may have the time to track down another officer in a different precinct to obtain additional information. However, given the time pressures that exist during the night shift, the additional information and the time spent acquiring the information may not be worth the effort for night shift officers. Earlier, I posited that in general officers who have a high level of communication frequency would also have lower productivity. This relationship would be exacerbated for officers who worked the night shift due to the fact that they have even less time to communicate.

Hypothesis 1.8: For officers working a night shift, the strength of the relationship between communication frequency and productivity is increased, such that officers working the night shift will have lower productivity than officers working the day shift.

Although increased communication can lead to increased job perceptions, such as cohesiveness and job satisfaction, and less stress, the characteristics of the work environment can differ for individuals, so that the effort to communicate becomes more costly to an officer's work. This is the case for officers who work the night shift; instead of generating positive feelings towards their work environment and reducing the stress level, the added communication takes away from their duties and adds a burden to their job.

Hypothesis 1.9: For officers working a night shift, the strength of the positive relationship between communication frequency and job perception is decreased, such that officers working the night shift have more negative job perceptions than officers working the day shift.

Hypothesis 1.10: For officers working a night shift, the strength of the relationship between communication frequency and stress is decreased, such that officers working the night shift have more stress than officers working the day shift.

As discussed previously, not only can we look at communication frequency of knowledge sharing technology, we can also look at behavior patterns of use, such as with whom people are communicating. It is expected that relationships between the distance between communicators and outcomes will be affected by organizational factors as well. It is posited earlier that as communication distance increases, the level of productivity decreases. For officers who work the night shift, this relationship between communication distance and productivity is strengthened: the increase in effort to communicate with those outside of the officer's work group is even more costly for officers working at night.

Hypothesis 1.11: For officers working a night shift, the strength of the relationship between communication distance and productivity is increased, such that officers working the night shift are less productive than officers working the day shift.

In looking at the relationship between communication distance and job perceptions, work shift can actually serve to lessen the negative effect. For officers who

work the night shift, communicating at increased communication distance may not reflect upon job perceptions. It becomes more about the need to communicate at increased distances and thus, officers will not see the communication as being detrimental to their job.

Hypothesis 1.12: For officers working a night shift, the strength of the relationship between communication distance and job perceptions is decreased, such that officers working the night shift have more positive perceptions than officers working the day shift.

Hypothesis 1.13: For officers working a night shift, the strength of the relationship between communication distance and stress is increased, such that officers working the night shift have more stress than officers working the day shift.

4.2 Antecedents of Knowledge Sharing – Model II

Research Questions: *In a law enforcement organization, what officer characteristics influence knowledge-sharing behavior? In addition to these individual factors, can organizational factors influence knowledge sharing behaviors as well?*

Given that this research looks at knowledge sharing through communication behavior, it is important to look at some of the possible antecedents to the different types of knowledge sharing technology use. Whereas Model I examines the consequences of knowledge sharing through the use of technology, Model II examines some of the possible antecedents to knowledge sharing. Individual factors, such as tenure and age, have been shown to influence reported knowledge sharing behaviors in previous research (e.g., Jarvenpaa & Staples, 2001). As discussed previously, organizational factors can

also affect knowledge sharing behavior. Figure 8 depicts the relationship between individual factors, organizational factors, and the use of knowledge sharing technology.

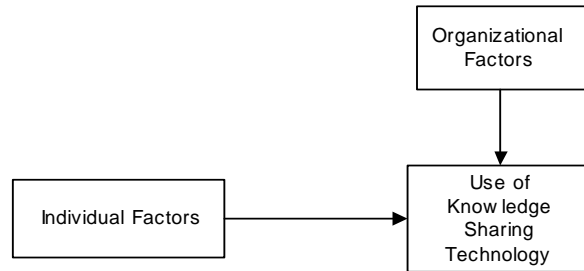


Figure 8. Model II Part of General Conceptual Model

The detailed research model shown in Figure 9 shows the specific variables used in this part of the dissertation. Again, I look at use of knowledge sharing technology in two ways: frequency of communication and the distance between communicators. The following section discusses the individual factors that are predicted to influence these two uses of knowledge sharing technology. I also look at the effect that work shift can have on the use of knowledge sharing technology.

increased productivity, knowledge sharing with external or less immediate groups should lead to even higher productivity (see Table 2).

	Productivity	Job perceptions	Stress Level*
Close Communication Distance	Hi	Hi	Lo
Med Communication Distance	Med	Med	Med
Far Communication Distance	Lo	Lo	Hi

Table 2. Hypothesized Mean Differences: Productivity/Job Perceptions and Communication Distance³

In many organizations, there exist different groups that have different communication distances, often due to the hierarchical nature, work units, and geographic and temporal distances. The adoption of communication technology allows for the distribution of work across geographic areas and thus, the feasibility of out-group communication and external knowledge sharing. Those individuals who engage in communication with individuals from more distant groups are more likely to be exposed to different methods and ideas, leading to higher levels of productivity. Also in organizational environments where there is a high level of uncertainty and task coordination, external communication (to justify actions and gain feedback from external actors) becomes more critical to effectiveness (Choi, 2002).

However, unlike the organizations studied in much of the literature on communication distance and in-group/out-group communication, the organizational

³ High stress levels refer to more stress, while low stress levels refer to less stress.

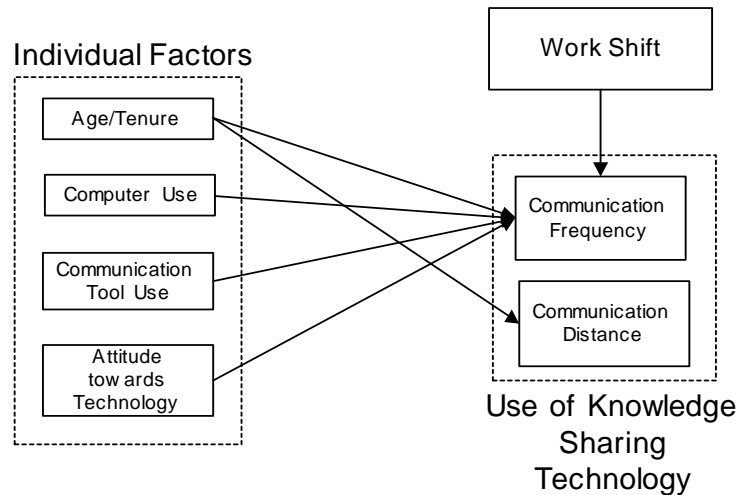


Figure 9. Research Model II

4.2.1 Individual Factors: Age/Tenure, General Computer Use, Communication Tool Use, and Attitudes towards Technology

In dynamic organizations with high task coordination, complexity, and uncertainty, where acquiring expertise is difficult, an individual's perception of the value of knowledge increases as age and tenure increases. In a study by Constant et. al. (1994) work experience (or tenure) was highly related to attitudes of information sharing. In another study on the effects of expert status on knowledge exchange, experts, who were also likely to be those with more tenure, engaged in increased communication (Thomas-Hunt, Ogden, & Neale, 2003).

Experience and knowledge typically increases with age and tenure. The problem in a law enforcement organization is that the work is physically demanding.

Characteristics that are of value to the organization are physical fitness and vigor (i.e., attributes more likely to be found in younger and less tenured personnel). As individuals in law enforcement organizations increase in age, tenure and experience, the pressure that is inherent in their work, there is oftentimes a burn-out period where more tenured and older personnel are less active in their jobs than younger personnel. For example, in doing previous research with a police organization, I noticed that older and more tenure officers tended to be less active while the younger officers were more active in taking calls and working the more involved cases. As this happens and the higher tenured/older personnel become more removed from their work, it would stand to reason that their interactions with other officers using communication technology would also decrease.

Hypothesis 2.1: Increase in age/tenure negatively affects communication frequency.

In law enforcement organizations, especially that of the police, personnel movement throughout the organization is quite common. In fact, in the case of many police agencies, officers have the opportunity to request a change in work group, shift, or unit once a year. For officers who have been with the organization for longer periods of time (i.e. older and more tenured), it is likely that their peers no longer work in the same group as they do, but are scattered throughout the organization. This would differ from younger, less tenured officers, who are likely building relationships with other new

officers who work closely with them. Therefore, there is likely to be a pattern of communication over different distances based on age/tenure.

Hypothesis 2.2: Increase in age/tenure negatively affects amount of close communication.

Hypothesis 2.3: Increase in age positively affects amount of far communication.

Another antecedent to the use of communication technology and thus, communication frequency is general computer use. The reason for this is two-fold. First, it is likely that individuals who generally use computers and have a comfortable level of computer experience will also be more likely to use technology for communicating with others. For example, in a study on the adoption and use of a particular communication technology, Tung and colleagues (2000) found that the adoption of new communication technology was strongly associated with existing levels of technology use in the organization (Tung et al., 2000). Second, individuals who utilize computer systems to access information are more likely to want to share what they have learned with others, often through the use of communication technology as a way of demonstrating their computer skills and to promote their personal knowledge of technical skills.

Given the highly centralized structure and the chain of command that exists in the hierarchy-in-practice, informal power for personnel in a law enforcement organization most likely manifests itself in the form of personal knowledge. Unlike many organizations in industry or business, the use of computers in law enforcement organizations is not a core necessity of their typical work. A majority of their work is

expected to be hands-on and in the field rather than on a computer. It could be the case that too much computer use would be seen as inhibiting “real work” that takes place in the field rather than behind a computer. The limited time spent on the computer would mean that increased computer use/experience would not lead to increased communication in a law enforcement organization. Therefore:

Hypothesis 2.4: Increase in computer use negatively affects communication frequency, as measured by the use of knowledge sharing technologies.

Another antecedent of communication frequency through the use of a particular knowledge sharing technology is the use of other non-computer-based communication technologies. In general, there are some individuals who engage in more communication than others. Similarly, those who use traditional communication tools are more likely to also use computer-based communication tools. Therefore:

Hypothesis 2.5: Increase in communication tool use positively affects communication frequency through the use of knowledge sharing technology.

Previous research has shown that attitudes regarding technology (such as usefulness) are related to technology use (Davis, 1989). Given that we are interested in the use of a particular technology, it is expected that general attitudes towards technology will influence that technology’s use. Individuals who have a

favorable attitude towards technology will be more likely to use the technology.

Therefore:

Hypothesis 2.6: Increase in attitude towards technology positively affects communication frequency.

4.2.2 Work Shift

In addition to individual factors, other factors can also affect the use of knowledge sharing technology. In the previous section, I discussed work shift and its effect on outcomes. Work shift can also directly influence the level of knowledge sharing and the use of technology. With the added burden of working the night shift, law enforcement officers have less time to spend on using communication technology. Therefore:

Hypothesis 2.7: Working a night shift negatively affects communication frequency.

4.3 Chapter Summary

In this chapter, I first discuss Model I, which focuses on the relationship between the use of knowledge sharing technology, work shift, and outcome measures. I look at the pattern of knowledge sharing technology use in two ways: communication frequency and the distance between communicators. In a law enforcement organization, while increased communication leads to more favorable job perceptions and less stress, too

much communication can adversely affect productivity. Furthermore, communicating with other officers in distant work groups can lead to lower productivity, lower job perceptions, and increased stress. I look at the direct and moderating effect of work shift, which I believe is an important aspect of a law enforcement organization. Officers who work the later night shift are more likely to have higher productivity.

Model II, shown in Figure 9, focuses on the use of knowledge sharing technology and its antecedents. The antecedents include the individual factors of age/tenure, general computer use, communication tool use, and attitude towards technology. Work shift is also used as an antecedent to frequency of communication using knowledge sharing technology.

CHAPTER 5. RESEARCH METHODS AND DATA COLLECTION

To address the models developed in the previous chapter, a field study was conducted. The goal of this chapter is to present the organizational research context, describe the data collection process, and operationalize the constructs from the model so that the hypotheses posed earlier can be tested. Questionnaires, interviews, communication logs from the central computer aided dispatch system, and information from an organizational database were collected. Given the rich context of the study, ethnographic participant observation (see e.g., (VanMaanen, 1982) will also be used to enhance the findings of the research.

5.1 Description of methods

5.2.1 Site and Sample

The site for this field study was a local police agency utilizing a computer aided dispatch (CAD) messaging system in their patrol cars. The police agency was in the process of expanding their implementation of technologies in the patrol cars and this study served as the first phase investigating the use of the current communication technology that was already deployed in the patrol vehicles. The CAD system that is the focus technology for this study has been in use by the police department since the early 1990s. Although I had not worked directly with the patrol units, I developed a relationship with the organization during the past four years on other projects. Based on

this relationship, I was allowed access to internal organizational databases, including their central CAD system for this project.

The police agency serves as the primary law enforcement organization for a metropolitan area of a population of approximately 500,000. The police organization can be characterized by the knowledge factors put forth in the previous section and follows closely the organizational structure in Figure 5. The focus of this study was the patrol units, or car-based officers who work 4/10 work weeks (i.e., 10 hour shifts for 4 consecutive days). The patrol units are separated into four divisions, or geographic quadrants, with each division having approximately 120 officers. The geographic area in each division is further divided into smaller areas called sectors. Patrol officers in each division not only work in a particular squad and shift, they are also responsible for a particular sector.

The sample used for this study consisted of patrol units from two of the four divisions. These two divisions were chosen based on proximity and similarity of their geographical coverage area, neighborhood characteristics and typical crime types. Each division consisted of 11 squads and eight sectors, with each squad led by a sergeant. At the beginning and end of each shift, the squad meets for approximately 15-30 minutes as a group (i.e., briefing and debriefing meeting). The remainder of the shift is usually spent in the patrol cars taking calls from dispatch (i.e., 9-1-1 operators). Due to the general shortage of officers, officers typically ride alone, with the exception being double (or “Baker”) units pairing a field-training officer (FTO) with a trainee officer.

5.2.2 Procedure

The entire data collection took place during a six-month period from June 1, 2002 to December 31, 2002. I spent a three-week period in early June of 2002 collecting the survey and interview data. After attending division meetings with sergeants and senior officers to introduce myself and the study, I attended each squad's briefing and distributed surveys. A vast majority of the officers completed the survey and returned them to me by the end of the meeting. The survey took approximately 20 minutes to complete and consisted of two parts. The first part asked participants to provide demographic information as well as level of use and expertise of different computer systems. The second part of the survey consisted of data related to perceptions of their work (see Appendix A for a copy of the survey). Identities of the participants in the survey are kept confidential by stripping any personnel information and assigning random ID numbers.

Immediately following each briefing, I was assigned an officer from the squad who would participate in a structured interview (see Appendix B for a copy of the interview questions). The length of the interviews ranged from 35 to over 60 minutes. I was also able to ride along with an officer in each of the 24 squads for 3-4 hours of their shift for observation.

In addition to survey, interviews, and observation, data was collected from a number of computer systems within the organization. Data from the central computer aided dispatch system consisted of communication sent from unit to unit and was collected 24 hours-a-day from June 2002 to December 2002. The data logs include a day

and time stamp, sender, receiver, and message text for each message. Division rosters, designating the locations and shift that officers work, were also collected during this time period.

5.3 Variables

5.3.1 Frequency of Communication

The frequency of communication comes from the CAD communication logs and consisted of the total number of messages for each participant in the study.

5.3.2 Communication Distance

5.3.2.1 Work group communication distance: Within Squad, outside squad, and outside division

Given that the designated divisions and squads of the subjects were known, I was able to calculate the number of sent and received messages within and between different boundaries of groups. The work groups defined by the police organization are squads and divisions. Using these work groups, I defined three levels of communication distance. Low or close communication distance was assigned to cases in which communication was between members within the same squad (i.e. internal to squad). The medium communication distance category consisted of cases in which communication is between individuals not in the same squad but within the same division

(i.e., internal to division). High or far communication distance consisted of communication that occurs between individuals in different divisions (i.e. external to division). Although all subjects were part of the same police agency, the different groupings afford a number of differences that affect day-to-day work practices and expectations. Each squad was under the authority of a different sergeant and can cover one of three work shifts (e.g., day, midnight, and swing shifts). Each division covered a different geographical area and is headed by a different command staff (i.e., captain and lieutenants).

5.3.2.2 Temporal group communication distance: Within and outside of shift

In addition to work groups, two levels of communication distance based on temporal or shift work were also used in this study. The close or low communication distance category in temporal work group consisted of cases in which communication was between officers who worked shifts that overlapped in at least nine of the ten work hours. Far or high communication distance consisted of cases of communication between officers who worked no more than one hour in common.

5.3.3 Job Perceptions

Work perceptions were based on the survey data collected and included the measures of cohesion with members of different groups and job satisfaction.

5.3.3.1 Cohesion

Cohesion was measured for four different groups adapted from a four-item measure used by Jehn (1995). This construct uses a five-point scale anchored on “strongly disagree” and “strongly agree.” The four cohesion groups referred to the level of perceived cohesiveness of the respondent with 1) other officers within the squad (COHSQD), other officers who work the same geographic sector or beat (COHBEAT), other officers who work outside of the squad but within the same division (COHDIV) and officers who work outside of the respondent’s division but within the agency (COHAGN). The construct definition and four items are shown in Table 3.

Construct Name	Definition and Items
<i>Cohesiveness (COH)</i> <i>Alpha = .88</i> <i>(Jehn, 1995)</i>	The degree to which a person feels connected to his/her colleagues from various groups within the organization. <ol style="list-style-type: none"> 1. The other officers within my [group name] are my friends. 2. There is little cohesiveness within my [group name]. 3. My fellow [group name] members are satisfied with being a member of the [group name]. 4. There is a lot of group spirit in my [group name].

Table 3. Construct Measuring Cohesiveness

5.3.3.2 Job Satisfaction

Job satisfaction consisted of a five-item self-report measure by (Tsui, Egan, & O'Reilly, 1992). This construct uses a five-point scale anchored on “extremely dissatisfied” and “extremely satisfied.” The construct definition and five items are shown in Table 4.

Construct Name	Definition and Items
<i>Job Satisfaction (JobSat)</i> <i>Alpha = .74</i> <i>(Tsui, Egan, & O'Reilly, 1992)</i>	The degree to which a person feels satisfied with aspects of his/her job. <ol style="list-style-type: none"> 1. How satisfied are you with the nature of the work you perform? 2. How satisfied are you with your relations with others in the organization? 3. How satisfied are you with the pay you receive for your job? 4. How satisfied are you with the opportunities that exist in this organization for advancement [promotion]? 5. Considering everything, how satisfied are you with your current job situation?

Table 4. Construct Measuring Job Satisfaction

5.3.3.3 Distributive Justice

A six-item self-report measure by Price and Mueller's Distributive Justice Index (1986) was used to create this measure. This construct uses a five-point scale anchored on "extremely dissatisfied" and "extremely satisfied." The construct definition and five items are shown in Table 5.

Construct Name	Definition and Items
<i>Distributive Justice (DisJus)</i> <i>Alpha = .74</i> <i>(Sorenson, 1985; cited in Price & Mueller, 1986)</i>	The degree to which rewards and punishments are related to performance inputs. <p>To what extent are you fairly rewarded...</p> <ol style="list-style-type: none"> 1. considering the <i>responsibilities</i> that you have? 2. in view of the amount of <i>education and training</i> that you have had? 3. in view of the amount of <i>experience</i> that you have? 4. for the <i>amount of effort</i> that you have put forth? 5. for <i>work that you have done well</i>? 6. for the <i>stresses and strains</i> of your job?

Table 5. Construct Measuring Distributive Justice

5.3.4 Stress

The stress measure used in this study consists of a four-item scale adapted from Brett, Stroh and Reilly (1990) and Thatcher (2000). This construct uses a five-point scale anchored on “strongly disagree” and “strongly agree.” The construct definition and four items are shown in Table 6.

Construct Name	Definition and Items
<i>Stress</i> <i>Alpha = .76</i> <i>(Brett, Stroh, & Reilly, 1990)</i> <i>(Thatcher, 2000)</i>	The degree to which a person feels stress as a result of his/her job. <ol style="list-style-type: none"> 1. My job is extremely stressful. 2. Very few stressful things happen to me while at work. (reverse coded) 3. I feel a great deal of stress because of my work. 4. I almost never feel stressed at work. (reverse coded)

Table 6. Construct Measuring Stress

5.3.5 Productivity

Productivity measures used in this dissertation were gathered from the police agency’s central case management system during the same six-month period as the CAD communication files (June 2002-December 2002). After a number of interviews with law enforcement personnel, number of arrests and number of primary officer cases were determined to be suitable quantitative measures of productivity in a police organization.

5.3.5.1 Number of Arrests

The number of arrests refers to the number of criminal arrests made by each study participant. Arrests are made based on evidence that a criminal violation has occurs, and

furthermore, there is sufficient evidence for prosecution. Arrests can be made based on a call in progress as well as a result of an issued warrant. Number of arrests is an important statistic used by the police agency for determining organizational productivity. Therefore, number of arrest by officer was used in this study as a measure of individual productivity.

5.3.5.2 Number of Primary Officer Cases

The total number of primary officer cases during the six-month period was collected for each subject. The primary officer refers to the officer who is indicated as the lead or initiating officer on a case. Officers can become a primary officer by asking for the assignment or assignment from the police dispatcher (i.e., from 9-1-1 calls). Officers can also become primary officers on cases based on proactive policing. Proactive policing refers to activities performed to prevent or solve crimes that involve officers taking an initiative and acting on their knowledge⁴. Primary officers take lead responsibility for decisions made on call, with other officer officers often deferring to the primary for guidance. In situations where it is unclear who the primary officer is, officers engage in their own negotiation to determine who should be listed as the primary. Thus, the number of primary officer cases is based on the workload that an officer shoulders in the field.

⁴ For example, I encountered an officer who was well known as a GTA (Grand Theft Auto) Hound. This officer had an extraordinarily high number of primary officer cases in which he located occupied stolen vehicles.

5.3.6 Individual Factors: Age/Tenure, Computer Experience/Use, and General Communication Tool Use Self-Report

5.3.6.1 Age/Tenure

Total tenure and age were all based on self-report data collected in the survey. Total tenure in the police agency referred to the total length of time (reported in months) a subject has been an employee of this particular police agency.

5.3.6.2 Computer Use

To assess level of use, subjects were first asked to report their level of use on five items: computers in general, the Internet, a word processing application (e.g., MS Word), a spreadsheet application (e.g., MS Excel), and a browser (e.g., Internet Explorer). Subjects were asked to rate each of the five items using a five-point scale anchored from “never” to “many times every day.”

5.3.6.3 Communication Tool Use

Subjects were asked to report the frequency that they accessed another person for information through the use of three communication tools: regular telephone, mobile telephone, and pager. Again, a 5-point scale anchored from “never” to “many times every day” was used for the three items and the sum was used for the composite score. The range of scores for communication tool use was 0 to 12.

5.3.6.4 Attitude Towards Technology

Subjects were asked to report the extent to which they believe that having more technology gives them an edge in various aspects of their jobs. This construct uses a five-point scale anchored on “not at all” and “completely.” The construct definition and the six items that make up the construct are shown in Table 7.

Construct Name	Definition and Items
<i>Attitude Towards Technology (TechEdge)</i> <i>Alpha = .85</i>	The degree to which a person feels that technology gives them an edge in their job. To what extent does having more technology give you an edge in dealing with... <ol style="list-style-type: none"> 1. other patrol officers 2. receiving rewards 3. detectives units 4. the public/community 5. the courts/lawyers 6. your supervisors (e.g., sergeants, lieutenants)

Table 7. Construct Measuring Attitude Towards Technology

5.3.7 Work Shift

To look at work shift, the dataset was divided into two groups, daytime shifts and nighttime shifts. The daytime dataset was comprised of officers who worked shifts that are made primarily of daylight hours: DAYS (6-8 am to 4-6 pm) and SWING1 (2 pm to midnight). The nighttime dataset was comprised of officers who worked primarily at night: SWING2 (5-6pm to 3-4 am) and MIDS (9 pm to 7 am).

5.4 Chapter Summary

This chapter described in detail the methodology, including the organizational research context and data collection site and procedures used in this dissertation.

Detailed descriptions of the constructs used are also given.

CHAPTER 6. RESULTS

6.1 Descriptive Statistics

This section provides a description of the subjects who participated in this study as well as a description of the constructs used. The sample size for this study, which consisted only of patrol officers (as opposed to other ranking or civilian officers), was 166. Table 8a shows the demographic characteristics collected but not utilized in the hypothesis testing. Subjects were asked to report their highest education level. Most of the officers had either an associate's degree/1-2 years of college (43.5%) or a bachelor's degree (44.8%). The gender breakdown for the sample was 88% male and 12% female. The majority of the officers were Caucasian (72%).

Demographic Variable	Percentage (n=166)
Education Level	
High School	8%
Associate Degree	43%
Bachelors Degree	44%
Graduate Degree	3%
Gender	
Male	88%
Female	12%
Ethnicity	
Caucasian	72%
African American	4%
Hispanic	17%
Asian American	2%
Native American	1%
Other	4%

Table 8a. Demographic Descriptive Statistics

Table 8b shows the descriptive statistics for the specific constructs used in testing both research models. The average age of the officer who participated in the study was thirty-three (S.D. = 7.5) and the average tenure was sixty-four months or 5.3 years. Table 8b also shows the variability for all of the constructs used in the analyses.

Construct	Minimum	Maximum	Mean	(S.D.)
Comm Frequency	28	7128	2308	(1661)
Comm Distance – Work Group – Close	36	4443	1111	(894)
Comm Distance – Work Group – Med	34	2338	502	(426)
Comm Distance – Work Group – Far	34	4333	716	(692)
Comm Distance – Temporal Group – Close	46	7384	1821	(1399)
Comm Distance – Temporal Group – Far	0	431	42	(66)
Comm Distance – Reported – Close	1.6	4.9	3.47	(.68)
Comm Distance – Reported – Far	1.0	3.5	1.4	(4.2)
Arrests	0	113	27	(18)
Primary Officer Cases	10	428	208	(85)
Age	21	59	33	(7.5)
Tenure (months)	1	322	64	(65)
Computer Use	0	20	8.5	(4.2)
Communication Tool Use	0	12	7.7	(2.8)
Attitude towards Technology	1	5	2.9	(0.8)
Cohesiveness	2.3	4.4	3.4	(.44)
Job Satisfaction	2.2	5.0	3.8	(.48)
Stress Level	1.5	5.0	3.3	(.66)
Distributive Justice	1	5	3.2	(.81)

Table 8b. Construct Descriptive Statistics

6.2 Correlations

Table 9 provides the correlations between the variables used in the models. Note that age and tenure were highly correlated ($r = .602, p \leq .01$). Given that there were little differences between using age or tenure in the results, age alone will be used in the

analysis. The correlation analyses indicate that age is negatively correlated with many of the variables: Attitudes towards technology ($r = -.193, p \leq .05$), shift ($r = -.292, p \leq .01$), number of primary officer cases ($r = -.231, p \leq .01$), and cohesiveness ($r = -.268, p \leq .01$). Computer use was significantly correlated with number of arrest ($r = .171, p \leq .05$). As expected, both measures of productivity, number of arrests and number of primary officer cases were highly correlated ($r = .220, p \leq .01$).

As suspected from the hypotheses, work shift is highly correlated with number of arrests ($r = .295, p \leq .01$); the later the shift, the more number of arrests. Work shift is also significantly positively correlated with computer use ($r = .198, p \leq .05$). Officers who worked the later shift reported higher computer use than their day shift counterparts.

Notice that for work group communication, close distance and far communication distance are both highly correlated with number of primary officer cases ($r = .283, p \leq .01$ and $r = .178, p \leq .05$, respectively), but is not correlated with communication outside squad (medium distance). A similar pattern can be seen for temporal group communication distance and number of primary officer cases: Close communication distance ($r = .263, p \leq .01$) and far communication distance ($r = -.176, p \leq .05$).

For the outcome measures of job perceptions and stress, the measures are very highly correlated with each other. There is a significant negative correlation between stress level and job satisfaction ($r = -.236, p \leq .01$) and stress with distributive justice ($r = -.166, p \leq .05$). The job perceptions measures (cohesiveness, job satisfaction, and distributive justice) are also highly correlated with each other.

		1. Age	2. Ten	3. Comp Use	4. Com Tool Use	5. Tech Att	6. Work shift	7. CF	8. Close WG	9. Med WG	10. Far WG	11. Close TG	12. Far TG	13. Close Rep	14. Far Rep	15. Arr	16. PO	17. Coh	18. Job Sat	19. Dis Jus
Individual Factors	1. Age	1.00																		
	2. Tenure	.602**	1.00																	
	3. Computer use	-.107	-.010	1.00																
	4. Comm tool use	.142	.081	.187*	1.00															
	5. TechAtt	-.193*	-.270**	-.017	.063	1.00														
Org Factor: Shift	6. Work shift	-.262**	-.292**	.198*	-.015	-.017	1.00													
Comm Freq	7. CF	-.122	-.098	.014	.098	.201*	-.075	1.00												
Work Group Comm Distance	8. Close - Within Squad Comm	-.172*	-.136	.098	.078	.035	-.058	.163*	1.00											
	9. Med - Outside Squad Comm	-.189*	-.126	.031	.042	.157	.127	.058	.385**	1.00										
	10. Far - Outside Team Comm	-.104	-.058	.040	.009	.061	.089	.279**	.491**	.300**	1.00									
Temporal Comm Distance	11. Close - Within Shift Comm	-.162*	-.101	.082	.064	.124	-.091	.205*	.908**	.567**	.631**	1.00								
	12. Far - Outside Shift Comm	-.011	.089	-.002	.096	.012	-.009	.066	.118	.323**	.232**	.103	1.00							
Reported - Comm Distance	13. Close - Reported	-.218**	-.152	.181*	.170*	.265**	.180*	.073	.181*	.247**	.061	.198*	.108	1.00						
	14. Far - Reported	.309**	.272**	.012	.210**	.142	-.067	-.087	-.114	.016	.040	-.026	.070	.267**	1.00					
Productivity	15. Arrest	-.053	-.144	.171*	.053	-.022	.259**	-.004	-.069	.005	.034	-.087	-.030	.035	-.135	1.00				
	16. Primary Officer Cases	-.231	-.362**	.029	-.057	.085	.029	.098	.283**	.130	.178*	.263**	-.176*	.123	-.149	.220**	1.00			
Perc of Work	17. Cohesiveness	-.268	-.311**	.096	-.023	.319**	.067	.064	.081	.192*	-.086	.097	-.022	.443**	.002	-.054	.116	1.00		
	18. Job Satisfaction	.017**	-.098	.038	.022	.134	-.001	.082	.072	.073	-.019	.075	-.008	.181*	.013	-.005	.025	.421**	1.00	
	19. Distributed Justice	.057**	-.196*	-.088	-.037	.270**	-.105	.110	.147	-.019	-.050	.079	-.020	.172*	-.070	-.090	.117	.409**	.430**	1.00
Stress	20. Stress	.046	-.013	.045	-.025	-.144	.035	.130	-.091	.104	-.099	-.076	-.010	-.039	-.068	-.011	-.040	-.110	-.236**	-.166*

** $p \leq .01$ * $p \leq .05$

Table 9. Correlations

6.3 Model I – Consequences of the Use of Knowledge Sharing Technology

This section will present the results of hypothesis testing for Model I, which investigates the consequences of the use of the communication technology by the police officers. The independent variables used for this model were: Communication Frequency (CF), Communication Distance (CD), and Work Shift (SHIFT). The two types of communication distance used in this study were work group distance and temporal group distance. For these hierarchical regression analyses, the main effects were entered in the first step. Since work shift was also included as a moderating variable, moderating effects were tested in step two. In order to prevent problems with multicollinearity leading to inflated standard error terms, the independent variables were centered prior to the creation of the interaction terms (Cronbach, 1987; Jaccard, Turrisi, & Wan, 1990).

6.3.1 Model I – Main Analysis

Hypothesis 1.1 predicted that there would be a curvilinear effect of communication frequency on performance, such that extreme levels of communication would result in low productivity while an intermediate level of communication would result in high productivity. Support for this hypothesis for either productivity as measured by number of arrest or primary officer cases was not found (Appendix C- Tables A and B). Hypotheses 1.2 and 1.3 predicted that communication frequency would positively affect job perceptions and negatively affect stress level. Support for these hypotheses were not found (see Appendix C - Tables C and D).

Hypotheses 1.4, 1.5, and 1.6 look at the effect of CD on productivity, work perceptions, and stress level. Hypothesis 1.4 predicted that as the distance between communicators increased, productivity would decrease. This prediction was not supported for communication distance either by work group or temporal group on arrest (Appendix C - Tables E and G). However, support for this hypothesis was found for productivity as measured by primary officer case. For the work group communication distance, the hypothesis was partially supported: Close at a communication distance was associated with number of primary officer cases ($\beta = .28, p < .001$; Appendix C-Table F). Looking at the communication distance by temporal group, Hypothesis 1.4 was fully supported: As shown in Appendix C – Table L, as communication distance by temporal group increases, productivity decreases. Officers who communicate with other officers who work the same times as they do, have a higher number of primary officer cases ($\beta = .30, p < .01$). As officers communicate more with other officers who work a different shift, their number of primary officer cases decreases ($\beta = -.22, p < .01$).

Hypothesis 1.5 states that an increase in communication distance will negatively affect job perceptions. Results for work group communication distance were significant as predicted by the model for the job perceptions of cohesiveness and distributive justice. As Appendix C - Table G shows, communicating at a medium work group distance increases cohesiveness ($\beta = .20, p < .05$). However, communicating at a far work group distance significantly decreases cohesiveness ($\beta = -.25, p < .05$). The job perception variable of distributive justice is also affected by work group communication distance. Communication at a close work distance positively influences perceptions of distributive

justice ($\beta = .26, p < .05$) and communication at a far work distance negatively influences perceptions of distributive justice ($\beta = -.17, p < .10$; Appendix C - Table I).

Hypothesis 1.6 suggests that communication at a close distance will be associated with lower levels of stress and communication at a farther distance will be associated with higher levels of stress. Support for this hypothesis was found for communication distance by work group. Communication at a close work distance was associated with low stress levels ($\beta = -.15, p < .10$) and communication at medium work distance was associated with increased stress ($\beta = .16, p < .10$).

In addition to investigating the effects of the use of knowledge sharing technology on outcomes, this model also looks at the effect of work shift on outcomes. Hypothesis 1.7 states that working a late or night shift (as opposed to a day shift) will positively affect productivity. Support for this hypothesis was found for both the productivity measures for number of arrests and number of primary officer cases. As Appendix C – Table B shows, working the later shift resulted in an increase in arrests ($\beta = .33, p < .01$) as well as an increase in primary officer cases ($\beta = .15, p < .10$).

Hypotheses 1.8 to 1.13 address the moderating effect of work shift on the use of knowledge sharing technology and outcomes. Hypothesis 1.8, 1.9 and 1.10 state that work shift will moderate the relationships between communication frequency and productivity, work perceptions, and stress. Support was not found for the moderating effect of shift on the relationship between communication frequency and productivity or stress level (i.e., Hypotheses 1.8 and 1.10). Regardless of whether an officer works the day or the night shift, the effect of communication frequency on productivity or stress

remains the same. Support was found for Hypothesis 1.9, which looks at the moderating effect of work shift on the relationship between communication frequency and job perceptions. Hypothesis 1.9 states that working the night shift will decrease the strength of the relationship between communication frequency and perception of work. As shown in Appendix C –Table C, for distributive justice, the interaction term for CF x SHIFT is significant and negative ($\beta = -.20, p < .05$). Thus, for officers who work the later shift, the relationship between communication frequency and perceptions of distributive justice is weakened.

Hypothesis 1.11, 1.12, and 1.13 state that work shift will moderate the relationships between communication distance and productivity, work perceptions, and stress. Although support was not found for the moderating effect of work shift on communication distance and productivity (i.e., Hypothesis 1.11), or on communication distance and stress (i.e., Hypothesis 1.13), partial support was found for the moderating effect of work shift on communication distance and job perceptions. Hypothesis 1.12 states that the strength of the relationship between communication distance and job perceptions will be decreased for officers who work the later shift. It is believed that due to the increased workload in the later shift, an increase in communication distance is not seen as affecting job perceptions. If communication across an increased distance occurs, it is more likely to be viewed as a necessary part of the job, not to be reflected in perceptions of the work. In looking at communication distance and perceptions of cohesiveness, work shift was found to moderate the relationship for both work group and

temporal group at the far level of communication distance. The beta coefficients are $-.17$ ($p < .10$; Appendix C – Table G) for communication distance measured by work group and $-.23$ ($p < .01$; Appendix C – Table M) for communication distance measured by temporal group.

6.3.2 Model I – Supplementary Analysis: Reported Communication Distance

Although the focus of this study is to look at knowledge sharing through the use of technology, a follow up analysis was conducted to see if the findings would be different if general communication at different distance levels was established by self-reported measures. As stated earlier in this dissertation, the use of knowledge sharing technology serves as a proxy measure of knowledge sharing and communication. By looking at self-report measures in addition to measures of technology use, I should be able to better report on whether technology use reflects the individual's perception of their general communication with different groups. Looking at self-reported measure of communication also can serve to reinforce the notion that the use of this knowledge sharing technology is associated with communication in general.

As part of the survey, subjects were asked to report how often they communicate with people in different work groups. This construct of reported communication distance used a five-point scale anchored on “never” to “all the time, many times every day.” The items used to create the close and the far reported communication distances (presented in Tables 10 and 11) were based on a combination of work group and rank distances.

For many of the hypotheses involving communication distance, using reported communication distance rather than communication distance based on communication logs resulted in similar findings. For Hypothesis 1.4, I previously found support that communication at close distances was associated with increased productivity and increased communication at far distances was associated with decreased productivity (as measured by primary officer cases). As Appendix C – Table R shows, using reported rather than actual communication results in the same finding. The beta coefficients for close and far communication distance are .18 ($p < .05$) and $-.20$ ($p < .05$), respectively.

I also found support for Hypothesis 1.5, which states that an increase in communication distance is associated to a decrease in job perceptions. As hypothesized, communication at a close reported distance is associated with high levels of cohesiveness ($\beta = .49, p < .001$; Appendix C – Table S) and high ratings of distributive justice ($\beta = .25, p < .01$; Appendix C – Table U). As seen in the same two tables, communication at a far reported distance is associated with lower levels of cohesiveness ($\beta = -.13, p < .10$) and lower ratings of distributive justice ($\beta = -.15, p < .10$). The hypothesis was partially supported for job satisfaction. While I did not find significance for the far distance, reported communication at a close distance was positively associated with job satisfaction ($\beta = .21, p < .05$; Appendix C – Table T).

For Hypothesis 1.11, 1.12, and 1.13, which looks at the moderating effect of work shift, I found partial support only for Hypothesis 1.12. This hypothesis states that working a later shift will decrease the strength of the relationship between

communication distance and job perceptions. As indicated in Appendix C – Table T, the interaction term of CLOSE x SHIFT was significant ($\beta = -.17, p < .05$) for job satisfaction.

6.4 Model II – Antecedents to the Use of Knowledge Sharing Technology

Model II looks at the antecedents to the use of knowledge sharing technology. The independent variables used for this model were: age, computer use, general communication tool use, attitudes towards technology, and work shift. Similar to Model I, hierarchical regression analyses were used to test the model

6.4.1 Model II - Main Analysis

Appendix C – Tables W, X and Y show the results for Hypothesis 2.1, 2.4, 2.5, 2.6, and 2.7. Of all the independent variables, only attitude towards technology is a significant predictor of communication frequency ($\beta = .17, p < .05$). Hypothesis 2.2 and 2.3 states that an increase in age will negatively affect the amount of close communication and positively affect the amount of far communication. These hypotheses were partially supported. A significant finding was found for age and close communication (both for work group and temporal group). An increase in age was found to be negatively associated with close communication by work group ($\beta = -.21, p < .05$; Appendix C – Table X) and by temporal group ($\beta = -.19, p < .05$; Appendix C – Table Y).

6.4.2 Model II - Supplementary Analysis: Reported Communication Distance

In running the analysis using communication distance based on self-report measures, I found that communication tool use and attitude towards technology were both positively associated with close communication (communication tool use: $\beta = .16, p < .05$; attitude towards technology: $\beta = .23, p < .01$; Appendix C – Table Z) and far communication (communication tool use: $\beta = .15, p < .10$; attitude towards technology: $\beta = .20, p < .01$). As the table also shows, age was negatively associated with reported communication at a close distance ($\beta = -.15, p < .10$) and positively associated with reported communication at a far distance ($\beta = .33, p < .001$), providing support for Hypothesis 2.2 and 2.3.

6.5 Chapter Summary

This chapter presents the detailed statistical analyses used to test both models. Table 12 summarizes the hypotheses and findings for both research models. The results for Model I suggest that which whom an officer communicates, strongly affects outcome measures of productivity, job perceptions, and stress. As an officer communicates at greater communication distances, productivity and job perceptions decreases and stress level increases. I also found that work shift significantly affected productivity, such that officers who worked the later shift had both a higher number of arrests and primary officer cases. I also found partial support for the effect that work shift can have on the

Construct Name	Definition and Items
<i>Close Communication Distance - Reported</i> <i>(Close CD - Rep)</i> <i>Alpha = .88</i>	The degree to which a person communicates with others. How often do you typically talk about work-related/socially related issues with... <ol style="list-style-type: none"> 1. other officers within your squad 2. other officers within your sector/beat 3. other officers in another squad, same division 4. other officers in another beat, same division 5. Detectives 6. Your immediate sergeant 7. Other sergeants in your division

Table 10. Construct Measuring Close Communication Distance (Reported)

Construct Name	Definition and Items
<i>Far Communication Distance - Reported</i> <i>(Far CD - Rep)</i> <i>Alpha = .91</i>	The degree to which a person communicates with others. How often do you typically talk about work-related/socially related issues with... <ol style="list-style-type: none"> 1. Other sergeants in other divisions 2. Sergeants of the detective 3. Your squad's lieutenant 4. Other lieutenants in your division 5. Other lieutenants in other divisions 6. Your division's captain 7. Other captain(s) 8. Other commanders (Asst. chiefs, and chief)

Table 11. Construct Measuring Far Communication Distance (Reported)

Descriptive statistics and correlations for the reported communication distance measures are included in Tables 8b and 9, which were presented earlier. The correlation table indicates that the close measures (reported, work group, and temporal group) of communication distance are significantly correlated. Reported close communication distance is also highly correlated to the three work perception measures.

relationships between knowledge sharing and outcomes. The findings indicate that work shift can reduce the effect of communication frequency and distance on job perceptions.

H#	Hypothesis	Findings
1.1	Curvilinear relationship between communication frequency and productivity: Very high and very low levels of communication related to low productivity, moderate level of communication related to high productivity.	Not supported
1.2	As communication frequency increases, job perceptions increase.	Not supported
1.3	As communication frequency increases, level of stress decreases.	Not supported
1.4	As communication distance increases, productivity decreases.	<ul style="list-style-type: none"> • Partially supported for Close Work group and PO Cases • Supported for Temporal groups and PO Cases • Supported for Self-reported groups and PO Cases
1.5	As communication distance increases, job perceptions decreases.	<ul style="list-style-type: none"> • Supported for Work groups and Cohesiveness/Distributive Justice • Supported for Self-reported groups and Cohesiveness/Distributive Justice
1.6	As communication distance increases, level of stress increases	Supported for Work Groups
1.7	Working a later shift increases productivity.	Supported for both Arrest and PO
1.8	Working the later shift increases the negative relationship between communication frequency and productivity.	Not supported
1.9	Working the later shift decreases the positive relationship between communication frequency and job perception.	Supported for Distributed Justice
1.10	Working the later shift decreases the negative relationship between communication frequency and stress.	Not supported
1.11	Working the later shift increases the negative relationship between communication distance and productivity.	Not supported
1.12	Working the later shift decreases the negative relationship between communication distance and job perceptions.	Partially supported for Shift x Far CD (Work and Temporal Groups) and Cohesiveness
1.13	Working the later shift increases the positive relationship between communication distance and stress.	Not supported.
2.1	As age increases, communication frequency decreases.	Not supported
2.2	As age increases, communication at close distances decreases.	Supported for Self-reported groups
2.3	As age increases, communication at far distances increases.	Supported for Self-reported groups

2.4	Increase in computer use negatively affects communication frequency.	Not supported
2.5	Increase in communication tool use positively affects communication frequency.	Not supported
2.6	Increase in attitude towards technology positively affects communication frequency.	Supported
2.7	Working a later shift negatively affects communication frequency.	Not supported.

Table 12. Summary of Hypotheses and Findings

The results found for Model II indicate that the only individual factor that predicts frequency of communication via the knowledge sharing technology is attitudes towards technology. The more an officer feel that technology gives him/her an advantage in dealing with others, the more likely the officer is to use the communication technology. I also found support for the effect that age can have on communication at different distances. As officers increase in age, not only do they report lower levels of communication with others in groups close to them, they also report higher levels of communication with others in farther communication groups.

In the next chapter, I will discuss and interpret these findings in the given context of law enforcement as well as other organizational contexts. Implications for this dissertation for both research and practice will be presented. Finally, limitations of this study and future research directions will be discussed.

CHAPTER 7. DISCUSSION, IMPLICATIONS, AND CONCLUSION

The mid-1990s saw an increased interest in knowledge sharing and knowledge management technologies. Organizations were eager to find ways to capitalize on the knowledge that they knew they possessed, but oftentimes did not know how to manage and share. Although law enforcement agencies were also interested in finding ways to share knowledge, the events of 9/11 changed how these agencies approach knowledge sharing. Based on the findings of the 9/11 Commission, the ability to share knowledge between government law enforcement and security agencies is no longer a luxury; it is a necessity. In retrospect, the Commission found numerous missed opportunities that could have resulted in the apprehension of the 9/11 terrorists. Many of these missed opportunities stemmed from the absence of knowledge sharing between government agencies.

The shift to bridging the boundaries between different organizations and groups has not proven to be easy. Organizations must deal with different organizational structures, cultures, and a need for increased coordination to successfully share knowledge. While there is no doubt that knowledge sharing may have given the United States a better chance to prevent the horrible events that took place on 9/11, there are inevitable tradeoffs that result from an increase in knowledge sharing. This dissertation indicates some of the tradeoffs that can result from an increase in knowledge sharing.

Before I address the tradeoffs of knowledge sharing, I first summarize the issue of what is knowledge and how knowledge sharing works. The most popular definitions of knowledge include the attempts to distinguish it from data and information (i.e., Drucker, 1998), or the classification of knowledge into different types: tacit versus explicit (e.g., Nonaka, 1991), expressible versus inexpressible (e.g., Blair, 2002), and declarative versus procedural (Zack, 1999). These definitions result in the embodiment of knowledge into some entity of form that can exist separate from people. What we see from the literature utilizing these definitions is confusion and ambiguity on what exactly is knowledge.

I argue that knowledge only exists in the minds of people, who must process it and give it context. Therefore, the only way that we can share this knowledge is by using knowledge representations (e.g., representing the knowledge in our heads by spoken words or a written text). The two strategies that address knowledge sharing are personalization and codification. While personalization focuses on direct person-to-person interactions, codification focuses on capturing knowledge representations and making them independent of individuals. Based on these strategies, I propose a model of knowledge sharing that illustrates how knowledge sharing can occur, through both communication and codification technologies. Ultimately, the result of the knowledge sharing is for individuals to be able to perform some action that leads to increased productivity, efficiency, or positive attitudes towards the organization.

A crucial issue in understanding knowledge sharing is the realization that the knowledge sharing process does not occur in a vacuum, but is influenced by

organizational factors. These organizational factors or dimensions not only influence the knowledge sharing process, but also serves as a mean to building a more thorough understanding of how knowledge sharing works in different types of organizations. Organizational factors can also serve as areas of potential change for organizations looking to increase knowledge sharing behaviors. The organizational factors that are highlighted in this study are organizational structure, culture, hierarchy-in-practice, task coordination, and geographic and temporal distances.

To show the impact that organizational factors can have on knowledge sharing, I used a police agency for this research study. Like other types of organizations commonly seen in the knowledge sharing literature, the police organization has a real need for knowledge and the ability to utilize and share knowledge within the organization. However, the different organizational dimensions that surround police work can illustrate the effect that organizational factors can have on knowledge sharing. The focus of this research is two-fold: the first is to understand how the use of knowledge sharing technology and organizational factors affect outcomes and the second is to understand how both individual and organizational factors influence this knowledge sharing. In examining the use of knowledge sharing technology, I used measures of communication frequency as well as the communication distance between officers. Outcome measures included productivity, work perceptions, and stress level. For productivity, I used the objective measures of number of arrests and the number of primary officer cases. Job perceptions included were cohesiveness, job satisfaction and distributive justice.

7.1 Discussion of the Findings

This dissertation contributes to the existing literature on knowledge sharing, organizational behavior, communication technology, and law enforcement by presenting and testing a model of knowledge sharing that incorporates actual communication behavior, technology use, and productivity measures while taking in account the influence of the organizational environment.

The results of this study suggest that the use of knowledge sharing technology can affect productivity and job perceptions in a police organization. Particularly, the findings show that the ways in which knowledge sharing affects these outcome measures 1) can be detrimental given the distance between communicators and 2) can be affected by the organizational factors that differ within a single organization due to the types of work environment that exists. Even though knowledge sharing can be very important, given the characteristics of the police work environment, there are conditions when knowledge sharing can lead to decreased productivity and perceptions towards work. The findings are discussed in greater detail in the following sections.

7.1.1 Communication Distance and Knowledge Sharing

In this study, in order to measure knowledge sharing, I examined the use of a particular knowledge sharing technology. In addition to investigating the frequency of communication, I also included measures that indicate the pattern of use within and between different groups within the organization.

Communication distance refers to the extent to which communication occurs between individuals within and outside of group boundaries. In terms of knowledge sharing, individuals who communicate with others at farther distances also access knowledge that may be different from the collective knowledge within his or her group. Increasing the amount of knowledge that a person has would presumably lead to an increase in performance. In this dissertation, I have expanded this concept of communication distance to include the effect of temporal distance as well as work group distance on performance. Like work group distance, temporal distance requires that efforts be made to go outside boundaries. For temporal distance, it is usually the case that individuals have to go outside of their shift or time zone to communicate at far temporal distances. Communication across work group and temporal distances often requires the use of communication technology that allows work across these boundaries to be feasible.

Work and communication within law enforcement also has these characteristics of communication distance. Officers who work in the field are organized into work groups called squads. These squads are organized into divisions, with multiple divisions in an agency. Therefore, communications between officers can be measured in terms of distance, whether it is within a squad, within a division, or outside of a division. As communication distance increases, the difference in shared work environment also increases. In addition, law enforcement officers work different shifts. This temporal factor can also serve as a boundary that officers must cross to communicate with other

officers. Similar to work group, an increase distance in the time worked can also lead to differences in work environment.

Previous research has found that communication over increased distances leads to better performance (Ancona & Caldwell, 1992a; Choi & Kim, 1999; Cummings, 2004) and more favorable attitudes towards work and fellow employees (Keller, 2001).

Although I am investigating the same relationship, the twist of using a law enforcement organization results in different findings, supporting the importance of analyzing organizational factors when researching knowledge sharing behaviors.

In general, the results support that a negative association between communication distance and productivity exist. I found that communication at low distances (for work group, temporal group, and based on self-report) resulted in higher productivity. Police work in the field is highly oriented to the task at hand, making it less likely that communication at farther distances will occur in most everyday tasks. Therefore, it makes sense that communication between officers who are closer in work group or in temporal group will result in higher productivity. On the other hand, while officers in more distant groups may have different knowledge, the effort to communicate with these outside groups reduces the amount of time and effort that can be spent on the current task. As communication increases with officers who work in more distant groups, productivity decreases. For the police organization, the organizational factors of structure, culture, work task, and having to deal with geographic and temporal distances, all play a part in making communication at higher distances more difficult. Thus, there is

a sacrifice made in terms of the time and effort needed to communicate outside of organizational boundaries versus using that time and effort to deal with the work at hand.

Another finding of this study was the negative effect that distance between communicators has on job perceptions. This finding is similar to previous research by Keller (2001), which found that internal communication often serves to build relationships among group members. Therefore, individuals engaging in external or communication with more distant groups are not able to develop the relationships that result in higher perceptions of cohesiveness or distributive justice. These findings may be related to two other areas of research: The social creation of local knowledge and the formation of networks.

These findings that support the idea that having a close communication distance is not only more productive, but also results in more favorable job perceptions, may be tied to the role that local knowledge plays in police work. Local knowledge can be thought of as knowledge that is created and used by a limited group of people who work together (Fagrel, Ljungberg, Bergquist, & S., 1999; Geertz, 1983). Previous research in the area of computer-supported collaborative work (CSCW) has looked at local knowledge and the role that it can play in facilitating the work process. For example, local knowledge described as “who knows what, who’s busy, who’s worth asking about X” is believed to be closely related to coordination and collaboration in managing collaborative virtual environments (Bowers, O'Brien, & Pycock, 1996). Local knowledge can be thought of as the knowledge about the knowledge that exists within a certain group of people. The way

that this group collectively creates this local knowledge is through repeated interactions, coordination, and collaboration.

In a police organization, local knowledge can play an important role in explaining the relationship between communication distance and outcomes. Because police officers work in the field and work particular geographical regions or shifts, it is likely that over time officers tend to interact more with other officers who work close to them (either in close work groups or the same time). The local knowledge that is created and shared is more likely to exist between officers who have a close communication distance. The more officers communicate with those who are close to him/her, the more that this local knowledge grows. Therefore, not only is it easy to share knowledge within this local group of officers (e.g., “I know who knows what” or “who may be available”), the familiarity resulting from this interaction leads to a favorable support system and job perceptions. In a sense, local knowledge develops from relationships built from interactions, which lead back to the development of local knowledge. On the other hand, officers who communicate outside of the local group (i.e., farther communication distances) may not share or understand the local knowledge that exists. In this case, it may be more difficult for officers to interact with the other officers in other groups.

Another area of research that may be relevant to these findings on communication distance is the creation of social networks. McDermott and O’Dell (2001) argue that the networks that are used for sharing knowledge are built upon existing networks. In the case of the police, these existing networks are built on familiarity and trust, which in turn leads to an inclination to share knowledge. Therefore, in communicating with others at

higher distances, the relationships or underlying networks that can facilitate knowledge sharing may not exist. This may make distant communication not only less likely, but when it occurs, more difficult.

Ultimately, I have found that this finding may be reliant on the type of organization. While other studies looked at business organizations, this dissertation looked at a quasi-military organization. The characteristics of a quasi-military organization can influence the effect of communication and knowledge sharing on productivity.

7.1.2 Work Shift

I also investigated the effect that work shift can directly have on knowledge sharing behaviors and outcome measures as well as the moderating effect it can have between the two. The significant relationship between work shift and productivity suggests that factors within the organizational work environment are an important influence in studying organizational outcomes. Within all organizations, there are some factors that can affect how work is done and other behaviors. We need to identify and understand these factors in order to fully understand the effect that different interventions (such as implementing new technology or encouraging knowledge sharing) can have on strategic goals and outcomes.

The role of work shift as a moderating variable was also studied in this dissertation. I found some support for the concept that work shift (i.e., working the later shift) may reduce the effect that communication distance has on productivity and job

perceptions. In law enforcement, work with others at high communication distances often occurs due to high-pressure work situations, such as a homicide or hostage situation. The increased pressure that the night shift officers are often forced to face can impact how knowledge sharing and communication affects their relationship with other officers and their job perceptions. This communication is not seen as relating to personal perceptions (e.g., “Why is this person from this other group communicating with me?”), but rather as a necessity to the task at hand.

7.1.3 Individual Factors

Model II of this dissertation investigated the individual factors that served as antecedents to the use of knowledge sharing technology. I found that attitudes towards the technology predicted the use of the knowledge sharing technology. This finding coincides with the research on technology acceptance, perceived usefulness, and technology use (see e.g., Davis, 1989).

The other interesting finding deals with age and communication at close and far distances. Based on my analysis, I concluded that age is negatively associated with communication at close distances and positively associated to far communication distances. This finding was based on reported communication distance, where close distance referred to others at the same rank or same work group and far distance referred to others at a higher rank or different work group. In an organization, individuals who are older and likely more tenure are presumably the individuals who have the most familiarity and knowledge in the organization. However, this research supports the

concept that these individuals are not communicating with those around them, but with those far from them. Therefore, it is likely that the more tenured and experienced older officers are not sharing their knowledge with other officers who work by their side.

This finding seems to be contrary to previous research that found that experts (who are also likely to be older and more tenured) are more likely to share information with their co-workers (Constant et al., 1994; Thomas-Hunt et al., 2003). To reconcile these differences in findings, I believe that we need to revisit the impact that the organizational factors can play. In most business organizations, age and tenure are typically seen as assets. Younger employees often look to older employees for advice and counseling. In the police organization, physical ability and risk-taking are important aspects of police work. As officers become more tenured, they are likely to move up the chain of command to more managerial (and less physical) positions. Older officers who remain at the officer rank become less able to compete with their younger counterparts. These older officers are less likely to communicate with other officers of their rank (most of whom are younger) and are more likely to communicate with other older officers who have moved to higher ranking positions (i.e., and farther communication distances).

7.2 Implications

This dissertation has implications for both researchers and practitioners interested in knowledge, knowledge management, and knowledge sharing. In looking at previous research, the way in which the term “knowledge” has been treated has resulted in much disdain for the area of knowledge management. In fact, it seems that in many

professional circles, knowledge management has been relegated to last year's fad. This is very unfortunate given the value that knowledge can have for an organization. However, while there is value to be found in knowledge sharing, this research indicates that we also need to consider the organizational environment and factors that can affect the outcomes of knowledge sharing.

7.2.1 Implications for Research

The implications of this dissertation for the research community are three-fold. The first implication is having a clear definition of knowledge on which to base our research. The second implication deals with expanding the research centered around knowledge sharing to include different research areas that can affect knowledge sharing. The third implication is describing the organizational context including the different organizational factors that surround the knowledge sharing process.

In this dissertation, the strict definition of knowledge and knowledge representations put forth provides a clear distinction that can be useful to researchers and practitioners alike. This definition of knowledge provides a consistent framework upon which strategies and technologies for knowledge management can be based. Until there is a cohesive definition of knowledge, the research and literatures on knowledge, knowledge management, and knowledge sharing will remain fractured.

Another theoretical implication of this dissertation is the integration of the different concepts of knowledge sharing, communication distance across different organizational boundaries, and organizational factors into one study. Examining

knowledge-sharing practice in this robust way provides a more comprehensive understanding of how knowledge sharing works. For example, many studies that discuss the effect of communication distance and knowledge sharing, report increased productivity as knowledge sharing at higher communication distances occurs (e.g., Ancona & Caldwell, 1992a; Choi & Kim, 1999; Cummings, 2004; Keller, 2001). Other research investigated knowledge sharing and a single organizational factor, such as structure (e.g., Tsai, 2002) or culture (e.g., Jarvenpaa & Staples, 2001). This dissertation builds upon that existing research by combining together these influential aspects of communication distance and organizational factors and the relationship between the two in determining how knowledge sharing practices will affect organizational outcomes.

The organizational factors of structure, culture, hierarchy-in-practice, work task complexity and coordination, geographic and temporal distances were the critical features combined to form a framework that can describe the organizational environment surrounding knowledge sharing practices. Comparing the results of this dissertation to the different findings in other research studies suggest that given a particular combination of organizational factors, performance can be impaired by knowledge sharing at higher communication distances. Accounting for the organizational factors that exist in an organization results in implications for how these factors interact with each other to influence knowledge sharing behavior.

Although this research centers on a police organization, the research questions and hypotheses can easily be posed at other organizations that may differ in one or more organizational factors. For example, a hospital setting has many parallels to a police

organization. With attending physicians, residents, interns, nurses, and medical students, there is a chain of command organizational structure. Between these individuals, there are different levels of task complexity and coordination, and communication across different distances, such as rank, specialty work group, or shift. This dissertation demonstrates the importance of considering and reporting organizational factors as a vital step in conducting research in organizational knowledge sharing. As a discipline, researchers in knowledge sharing need to look beyond individual studies of organizations and view the whole body of research, taking in account the different types of organizational factors. By doing so, we can more truly understand the knowledge sharing process and factors that influence it.

7.2.2 Implication for Practice

There are a number of implications of this research for practitioners. First, organizations need to realize the value of the knowledge that exists in the minds of their employees. They can then develop a strategy to not only promote the sharing of knowledge within their organization, but also encourage individuals to act upon that knowledge to the benefit of the organization. Second, organizations need to uncover the potential unintended consequences of knowledge sharing. The third implication is in acknowledging the role that organizational factors within an organization can have on knowledge sharing and organizational outcome and how to deal with these organizational factors. Fourth, organizations should examine the use of knowledge sharing technology in different ways to fully understand its effects.

Managers seeking to expand knowledge sharing within their organizations need to carefully consider not only how their existing organizational factors can impact individual's motivation to share knowledge, but also the potential unintended consequences of knowledge sharing behaviors. Managers need to ask themselves how the current organizational structure, culture, and task complexity required can influence knowledge sharing behaviors. Given the culture and hierarchy-in-practice, how is ownership of knowledge valued in the organization and what are the incentives to communicate with others to share knowledge. Task complexity and external work situations also warrant some thought to justify the potential knowledge gained as a result of the engaging in communication as opposed to instead utilizing the time and effort for the task at hand. Managers need to understand the tradeoff that the increase effort to share knowledge may have on productivity. Given that some of these organizational factors may be easier to change than others, managers should consider whether the types of organizational policy changes should be introduced to encourage knowledge sharing.

Managers should also consider these organizational factors when looking to implement technologies for knowledge sharing. Issues of geographical and temporal distance are important factors that different communication technologies can address. While the ability to match technology characteristics with characteristics of the work environment is essential to successful technology use, managers should also consider the level at which the potential technology can create a shared context for knowledge sharing. In cases where the shared environmental context provides insight for the

decision making process, technologies that utilize a rich and highly contextual channel will allow for more dynamic and meaningful knowledge sharing than lean technologies.

This dissertation also calls attention to the pattern of knowledge sharing technology use. By this, I argue that managers need to consider different ways in which these technologies are used to understand its effects. In addition to observing the amount or frequency of technology use, managers should also consider how technology is used to connect different individuals and groups. Organizations looking to implement communication technologies must consider the possibility that the establishment of communication lines outside of organizational boundaries may lead to a decline in productivity rather than increased productivity. This research supports the concept that not only is there a limitation to the benefit of communication, but also it is the organizational and work environment that may dictate the extent and manner to which knowledge sharing is advantageous to the organization.

7.3 Limitations

Several limitations of this field study are important to note. The organizational characteristics of the police, which made this research interesting, may have also served as a drawback to the collection of data. Given the strong culture of the police, many of the survey questions, especially those dealing with job perceptions, may have come across as being part of a psychological test (to which police officers are occasionally subjected). Although confidentiality of the collected data was stressed, police officers

may have been apprehensive about answering questions about cohesiveness and job satisfaction candidly with fears of possible ramifications from supervising officers.

For productivity measures, I chose to use number of arrests and primary officer cases. In addition to being objective measures captured by the police, I felt that these measures reflected a form of productivity within the agency. Officers who make a high number of arrests or who have a high workload of primary officer cases are considered highly productive and are highly regarded within the police organization. However, both of these measures are not solely based on performance but are subject to many environmental factors. Oftentimes in police work, pure luck can play a large part to making an arrest. Because primary officer cases are also based on assignment by a police dispatcher, a portion of this measure is not controlled by the officer. Although I considered evaluation of individual performance as a possible outcome measure for this study, I was not able to access these records due to their sensitive measures.

Because the data reported in this dissertation is cross-sectional and an experimental design was not used, claims about causality cannot be substantiated. It is possible that productivity was not a result of knowledge sharing, but rather productivity results in increased knowledge sharing and communication. Similarly, perhaps job perceptions such as feelings of cohesiveness or stressfulness influenced officers' communication behaviors.

Although this dissertation revolves around the concept of knowledge and knowledge sharing, given the definition of knowledge that I used, I was unable to empirically measure knowledge sharing. The decision to use communication behavior

was made because communication, as a key element of knowledge sharing, would encompass the knowledge sharing process.

Finally, because this dissertation involves a single organization, it is unclear as to whether the findings are unique to this particular organization. Although in my description of the organization, I discussed the general characteristics of the police, I cannot be sure that there were not other characteristics unique to this organization that may have influenced the findings.

7.4 Future Research

This dissertation opens the door for a number of opportunities for future research. Much work is needed to build upon the finding that organizational factors and knowledge sharing across different organizational boundaries can affect productivity and job perceptions. There are a number of ways in which these relationships can be further developed and tested. The concept of knowledge sharing can be better developed and expanded to include behaviors beyond the use of a single technology. Utilizing a research design that addresses causality can be used to test the models presented in this study. Finally, replicating these findings in other types of organizations including an analysis on the organizational factors is recommended to better understand the role of that these factors play on knowledge sharing.

Future research should more closely examine and develop measures to capture knowledge sharing. Evaluating the content of the communication messages in a qualitative study will help to uncover the purpose of the communication behavior, which

can help with a better understanding of knowledge sharing. In addition, different measures of knowledge sharing that include interactions outside the use of this particular technology should also be incorporated into this research.

To truly be able to understand the effect of a knowledge sharing technology on productivity, an experimental design should be used. In this police organization, there are plans to release other technologies that make knowledge sharing across different organizational boundaries possible. Utilizing a quasi-experimental design that employs control and experimental groups to look at knowledge sharing technology use over time can help address issues of causality between knowledge sharing and productivity.

A key factor in this study is the breakdown of organizational factors and how they affect knowledge sharing practices and outcomes. Other knowledge sharing research utilizing a discussion of these factors is needed to be able to expand the findings of this study to other organizational contexts. It would be quite interesting to replicate this study in different types of organizations that share similar organizational factors to see how they affect knowledge sharing.

7.5 Conclusion

The tragedy of September 11, 2001 has resulted in massive organizational changes in attempts to increase our ability to share knowledge. Establishing knowledge sharing and communication networks and dissolving organizational boundaries to facilitate knowledge sharing is difficult. While the need to share knowledge across boundaries is no doubt important (especially in extreme situations like 9/11), we must

consider the unintentional consequence that this increased knowledge sharing behavior may have on current duties and levels of productivity.

This dissertation bridges the areas of knowledge sharing, communication technology and organizational behavior to provide some understanding on what are the effects and costs of knowledge sharing on productivity and job perceptions. Drawing data from actual communication logs, organizational productivity measures, as well as self-report questionnaires, this field study within a police organization indicates that the use of knowledge sharing technology to communicate with external groups can negatively impact day-to-day productivity and perceptions towards work. If this is the result of knowledge sharing between groups within a single law enforcement organization, you have to wonder what the effects of knowledge sharing will be between different agencies.

APPENDIX A: SURVEY

General Demographic Information: All information will be kept confidential.

Total time at this job classification: _____ months _____ years

Gender (circle one): Male Female

Age: _____ years

Please describe your general job tasks:

Total time with TPD: _____ months _____ years

List previous TPD classifications/positions, locations worked and time spent at each:

Predominant Ethnic Background (check one):

_____	African-American, Non-Hispanic Origin	_____	Hispanic
_____	Native American; Alaskan Native	_____	Caucasian
_____	Asian; Pacific Islander	_____	Other

Highest education level (check one)

_____	Some high school	_____	College degree
_____	High school degree	_____	Graduate degree
_____	1-2 years of college/Trade school	_____	Postgraduate degree

<u>How experienced are you with the following:</u>	Very Experienced (Expert, knows some tricks)	Experienced (Can use comfortably, no problems)	Neither Experienced nor Inexperienced	Inexperienced (Know about, but not really comfortable using it yet)	Very Inexperienced (Almost no knowledge, wouldn't know where to start)
1. Computers in general	*	*	*	*	*
2. World Wide Web/Internet	*	*	*	*	*
3. Microsoft Word/Word Perfect	*	*	*	*	*
4. Microsoft Excel/ Lotus 1-2-3	*	*	*	*	*
5. Netscape / Internet Explorer or other Web browser	*	*	*	*	*
6. Groupwise E-Mail	*	*	*	*	*

7. RMS system	*	*	*	*	*
8. ELVIS mugshot system	*	*	*	*	*
9. Coplink	*	*	*	*	*

<u>How often do you use the following:</u>	Never	About once/week	About 3 times a week	About once a day	Many times every day
1. Computers in general	*	*	*	*	*
2. World Wide Web/Internet	*	*	*	*	*
3. Microsoft Word/Word Perfect	*	*	*	*	*
4. Microsoft Excel/ Lotus 1-2-3	*	*	*	*	*
5. Netscape / Internet Explorer or other Web browser	*	*	*	*	*

<u>For work, how often do you use the following to access information (either by contacting another person or by accessing some computer system)?</u>	Never (either don't have or haven't used)	About once/week	About 3 times a week	About once a day	Many times every day
1. Regular telephone	*	*	*	*	*
2. Your Cell Phone	*	*	*	*	*
3. Your Pager	*	*	*	*	*
4. Groupwise E-Mail	*	*	*	*	*
5. MTC/CAD System	*	*	*	*	*
6. RMS System	*	*	*	*	*
7. ELVIS mugshot system	*	*	*	*	*
8. Coplink	*	*	*	*	*

An important part of police work is being able to get information from the right person at the right time. For example, this information can be regarding a particular case, verifying information, administrative issues, request assistance, feedback, advice or just information in general on what's going on (more informal).

Please list in rank order up to 5 people you contact (either formally or informally) most often to get any type of information. These people can be of any position or rank, in any unit or department, either in TPD or any other agency (law enforcement or city agency).

	Person	Position/Dept. or Agency	In general, type of information you contact them for	How you usually contact them (call, email, visit in person, at a formal meeting, etc.)
1				
2				
3				
4				
5				

You also serve as a good source of information for others. Please list up to 5 people who have contacted you for information.

	Person	Position/Dept. or Agency	In general, type of information they contact you for	How they contact you (call, email, visit in person, at a formal meeting, etc.)
1				
2				
3				
4				
5				

Often in our jobs, we are told about software packages that are available to help make work easier. For the following questions, imagine that you were given a new software package for some aspect of your work. It doesn't matter specifically what this software does, only that it is intended to make your job easier and that you have never used it before.

The following questions ask you to indicate whether you could use this unfamiliar software package under a variety of conditions. For each of the conditions, please indicate whether you think you would be able to complete the job using the software package. Then, for each condition that you answered "yes," please rate your confidence by circling a number from 1 to 10, where 1 means "Not at all confident," 5 indicates "Moderately confident," and 10 indicates "Totally confident."

For example, consider the following item:

Thank you for completing this survey, which ask about your opinions on your work and technology. All surveys will be kept confidential. The only person who will have access to the surveys is the principal researcher, Rosie Hauck. If you have any questions, please feel free to contact her at xxx-xxxx.

Below are a number of statements each of which you may agree or disagree with depending on your own personal evaluation of your present job.	Strongly disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
My job is extremely stressful.	*	*	*	*	*
I have very strong ties with my present job which would be difficult to break.	*	*	*	*	*
Most of my personal life goals are job-oriented.	*	*	*	*	*
Very few stressful things happen to me while at work.	*	*	*	*	*
The most important things that happen to me involve my present job.	*	*	*	*	*
Most of my interests are not centered around my job.	*	*	*	*	*
I like to be absorbed in my job most of the time.	*	*	*	*	*
I consider my job to be very central to my existence.	*	*	*	*	*
Usually I feel detached from my job.	*	*	*	*	*
I feel a great deal of stress because of my work.	*	*	*	*	*
I am very much involved personally in my job.	*	*	*	*	*
I almost never feel stressed at work.	*	*	*	*	*
I live, eat, and breathe my job.	*	*	*	*	*
To me, my job is only a small part of who I am.	*	*	*	*	*

Below are a number of statements each of which you may agree or disagree with depending on your own personal opinions regarding promotions.	Strongly disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
In my opinion, <u>PROMOTIONS</u> are...					
... politically motivated.	*	*	*	*	*
... what every officer hopes to achieve.	*	*	*	*	*
... fairly distributed.	*	*	*	*	*
... based on 'who you know' rather than 'what you do'	*	*	*	*	*
... based on good team work	*	*	*	*	*

... based on good individual work	*	*	*	*	*
<i>If I don't get promoted, it's probably because...</i>	Strongly disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
... I don't want to be promoted.	*	*	*	*	*
... I didn't deserve it.	*	*	*	*	*
... of the 'system'.	*	*	*	*	*
... of lack of departmental resources.	*	*	*	*	*
... I need more experience.	*	*	*	*	*
... I need more training.	*	*	*	*	*

Below are a number of statements each of which you may agree or disagree with depending on your own personal opinions regarding rewards and recognitions.	Strongly disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
In my opinion, REWARDS AND RECOGNITIONS are...					
... politically motivated.	*	*	*	*	*
... what every officer hopes to achieve.	*	*	*	*	*
... fairly distributed.	*	*	*	*	*
... based on 'who you know' rather than 'what you do'	*	*	*	*	*
... based on good team work	*	*	*	*	*
... based on good individual work	*	*	*	*	*
<i>If I don't get rewarded or recognized, it's probably because...</i>	Strongly disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
... I don't want to be.	*	*	*	*	*
... I didn't deserve it.	*	*	*	*	*
... of the 'system'.	*	*	*	*	*
... of lack of departmental resources.	*	*	*	*	*
... I need more experience.	*	*	*	*	*
... I need more training.	*	*	*	*	*

How often do you typically talk about <u>WORK-RELATED</u> issues with...	Never	Rarely (from once to a few times a month)	Sometimes (about once a week)	Occasionally (about once every couple of work days)	All the time (many times every day)
...Other officers within <u>your squad</u>	*	*	*	*	*
... Other officers within <u>your sector/beat</u>	*	*	*	*	*
...Other officers in <u>another squad</u> but in the <u>your same division</u>	*	*	*	*	*
...Other officers in <u>another sector/beat</u> but in the <u>your same division</u>	*	*	*	*	*
...Other officers in other divisions	*	*	*	*	*
... Detectives at C19	*	*	*	*	*
... Your immediate sergeant	*	*	*	*	*
... Other sergeants in <u>your division</u>	*	*	*	*	*
... Other sergeants in other divisions	*	*	*	*	*
... Sergeants of the detective units at C19	*	*	*	*	*
... Your squad's lieutenant	*	*	*	*	*
... Other lieutenants in <u>your division</u>	*	*	*	*	*
... Other lieutenants in other divisions	*	*	*	*	*
... Your division's captain	*	*	*	*	*
... Other captain(s)	*	*	*	*	*
... Other commanders (Asst. chiefs, and chief)	*	*	*	*	*
... Personnel from other agencies (e.g. STPD, PCSO)	*	*	*	*	*

How often do you typically talk about <u>SOCIALLY-RELATED</u> issues with...	Never	Rarely (from once to a few times a month)	Sometimes (about once a week)	Occasionally (about once every couple of work days)	All the time (many times every day)
...Other officers within <u>your squad</u>	*	*	*	*	*
... Other officers within <u>your sector/beat</u>	*	*	*	*	*
...Other officers in <u>another squad</u> but in the <u>your same division</u>	*	*	*	*	*
...Other officers in <u>another sector/beat</u> but in the <u>your same division</u>	*	*	*	*	*
...Other officers in other divisions	*	*	*	*	*
... Detectives at C19	*	*	*	*	*
... Your immediate sergeant	*	*	*	*	*
... Other sergeants in your division	*	*	*	*	*
... Other sergeants in other divisions	*	*	*	*	*
... Sergeants of the detective units at C19	*	*	*	*	*
... Your squad's lieutenant	*	*	*	*	*
... Other lieutenants in your division	*	*	*	*	*
... Other lieutenants in other divisions	*	*	*	*	*
... Your division's captain	*	*	*	*	*
... Other captain(s)	*	*	*	*	*
... Other commanders (Asst. chiefs, and chief)	*	*	*	*	*
... Personnel from other agencies (e.g. STPD, PCSO)	*	*	*	*	*

Below are a number of statements each of which you may agree or disagree with depending on your own personal opinions regarding cohesion.	Strongly disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
The other officers <u>within my squad</u> are my friends.	*	*	*	*	*
There is little cohesiveness within my squad.	*	*	*	*	*
My fellow squad members are satisfied with being a member of the squad.	*	*	*	*	*
There is a lot of group spirit in my squad.	*	*	*	*	*
The other officers <u>within my sector/beat</u> are my friends.	*	*	*	*	*
There is little cohesiveness within my sector/beat.	*	*	*	*	*
My fellow sector/beat members are satisfied with being a member of the squad.	*	*	*	*	*
There is a lot of group spirit in my sector/beat.	*	*	*	*	*
The other officers <u>within my division</u> are my friends.	*	*	*	*	*
There is little cohesiveness within my division.	*	*	*	*	*
My fellow sector/beat members are satisfied with being a member of the division.	*	*	*	*	*
There is a lot of group spirit in my division.	*	*	*	*	*
The other officers <u>within the agency</u> are my friends.	*	*	*	*	*
There is little cohesiveness within the agency.	*	*	*	*	*
My fellow agency members are satisfied with being a member of the agency.	*	*	*	*	*
There is a lot of group spirit in the agency.	*	*	*	*	*

The following questions deal with job satisfaction.	Extremely Dissatisfied	Dissatisfied	Neutral	Satisfied	Extremely Satisfied
How satisfied are you with the nature of the work you perform?	*	*	*	*	*
How satisfied are you with the person who supervises you?	*	*	*	*	*
How satisfied are you with your relations with others in the organization?	*	*	*	*	*
How satisfied are you with the pay you receive for your job?	*	*	*	*	*
How satisfied are you with the opportunities that exist in this organization for advancement [promotion]?	*	*	*	*	*
Considering everything, how satisfied are you with your current job situation?	*	*	*	*	*

Please indicate how important you feel the following activities and responsibilities of senior police management are.	Not at all Important	Not really Important	Neutral	Important	Very Important
Discipline members of the department when necessary	*	*	*	*	*
Insure departmental members effectively and efficiently do their jobs	*	*	*	*	*
Provide a disciplined and organized work environment	*	*	*	*	*
Cooperate with the media and citizen groups	*	*	*	*	*

Fairness in the following questions means the extent to which a person's contributions to their work are related to the rewards received. Money and recognition are examples of rewards.	Rewards are not distributed fairly at all	Very little fairness	Some fairness	Quite fairly distributed	Rewards are very fairly distributed
To what extent are you fairly rewarded considering the <i>responsibilities</i> that you have?	*	*	*	*	*
To what extent are you fairly rewarded in view of the amount of <i>education and training</i> that you have had?	*	*	*	*	*
To what extent are you fairly rewarded in view of the amount of <i>experience</i> that you have?	*	*	*	*	*
To what extent are you fairly rewarded for the <i>amount of effort</i> that you have put forth?	*	*	*	*	*
To what extent are you fairly rewarded for <i>work that you have done well?</i>	*	*	*	*	*
To what extent are you fairly rewarded for the <i>stresses and strains</i> of your job?	*	*	*	*	*

To what extent does having more technology give you an edge in dealing with...	Not at all	Slightly	Moderately	Strongly	Completely
... other TPD patrol officers	*	*	*	*	*
... receiving rewards	*	*	*	*	*
... TPD detectives units	*	*	*	*	*
... the public/community	*	*	*	*	*
... the courts/lawyers	*	*	*	*	*
... your supervisors (e.g., sergeants, lieutenants)	*	*	*	*	*

For each question, circle the response which best describes your satisfaction in general with the <u>information you are currently able to access through various means.</u>	Almost never	Some of the time	About half the time	Most of the time	Almost always
Are you able to access the precise information you need?	*	*	*	*	*
Is the information accurate?	*	*	*	*	*
Do you get the information you need in time?	*	*	*	*	*
Does the information content meet your needs?	*	*	*	*	*
Are you satisfied with the accuracy of the information?	*	*	*	*	*
Is the information you get usually clear?	*	*	*	*	*
Can you access up-to-date information?	*	*	*	*	*
Are you able to get sufficient information?	*	*	*	*	*

For each question, circle the response which best describes your satisfaction with the <u>CAD/MTC system</u> .	Almost never	Some of the time	About half the time	Most of the time	Almost always
Does CAD/MTC provide the precise information you need?	*	*	*	*	*
Is CAD/MTC accurate?	*	*	*	*	*
Do you think the output is presented in a useful format?	*	*	*	*	*
Is CAD/MTC user friendly?	*	*	*	*	*
For each question, circle the response which best describes your satisfaction with the <u>CAD/MTC system</u> .	Almost never	Some of the times	About half the time	Most of the time	Almost always
Do you get the information you need in time?	*	*	*	*	*
Does the information content meet your needs?	*	*	*	*	*
Are you satisfied with the accuracy of CAD/MTC?	*	*	*	*	*
Does the CAD/MTC provide reports that seem to be just about exactly what you need?	*	*	*	*	*
Is the information clear?	*	*	*	*	*
Is CAD/MTC easy to use?	*	*	*	*	*
Does CAD/MTC provide up-to-date information?	*	*	*	*	*
Does CAD/MTC provide sufficient information?	*	*	*	*	*

Rank the following sources of information (you can add in your own sources) in terms of its importance for you to do your job [1 being the most important, 8/9/10 being the least important]:

- | | |
|---|---|
| _____ Other officers in my division | _____ The CAD system |
| _____ Other officers in other divisions | _____ The public/community |
| _____ My supervisor | _____ The command staff (Lt's, Cpt's, AC's) |
| _____ Detectives from the investigative units | _____ Other: _____ |
| _____ The crime analysts | _____ Other: _____ |

Please indicate to what extent you would agree with either of the following descriptions of your “patrol environment”. Please choose the answer that best describes your personal viewpoint.

	A lot of the time	Some of the time	Neither	Some of the time	A lot of the time	
Peaceful	*	*	*	*	*	Violent
Trusting	*	*	*	*	*	Suspicious
Dangerous	*	*	*	*	*	Safe
Stressful	*	*	*	*	*	Relaxing
Friendly	*	*	*	*	*	Hostile

Thank you so much for your valuable feedback! If you have any questions, please do not hesitate to contact me (Rosie Hauck) at xxx-xxxx.

APPENDIX B: HUMAN SUBJECTS APPROVAL

Human Subjects Protection Program
http://vpr2.admin.arizona.edu/human_subjects



1350 N. Vine Avenue
 P.O. Box 245137
 Tucson, AZ 85724-5137
 (520) 626-6721

12 February 2002

Roslin Hauck, M.A., Ph.D. Candidate
 Advisors: Suzanne Weisband, Ph.D. and Sherry Thatcher, Ph.D.
 Management Information Systems
 McCelland Hall, Rm 430
 PO BOX 210108

RE: **BSC B02.35 UNCOVERING THE EFFECTS OF INFORMATION AND
 KNOWLEDGE SHARING TECHNOLOGY IN POLICE WORK**

Dear Ms. Hauck:

We received your research proposal as cited above. The procedures to be followed in this study pose no more than minimal risk to participating subjects. Regulations issued by the U.S. Department of Health and Human Services [45 CFR Part 46.110(b)] authorize approval of this type project through the expedited review procedures, with the condition(s) that subjects' anonymity be maintained. Although full Committee review is not required, a brief summary of the project procedures is submitted to the Committee for their endorsement and/or comment, if any, after administrative approval is granted. This project is approved effective **12 February 2002** for a period of one year.

The Human Subjects Committee (Institutional Review Board) of the University of Arizona has a current assurance of compliance, number M-1233, which is on file with the Department of Health and Human Services and covers this activity.

Approval is granted with the understanding that no further changes or additions will be made either to the procedures followed or to the consent form(s) used (copies of which we have on file) without the knowledge and approval of the Human Subjects Committee and your College or Departmental Review Committee. Any research related physical or psychological harm to any subject must also be reported to each committee.

A university policy requires that all signed subject consent forms be kept in a permanent file in an area designated for that purpose by the Department Head or comparable authority. This will assure their accessibility in the event that university officials require the information and the principal investigator is unavailable for some reason.

Sincerely yours,

Theodore J. Glattke, Ph.D.

Chair

Social and Behavioral Sciences Human Subjects Committee

TJG:tl

cc: Departmental/College Review Committee

APPENDIX C: STATISTICAL ANALYSIS TABLES

Independent Variables	Step 1	Step 2	Step 3
CF	.02	.05	.05
CF ²	-.04	-.06	
Shift		.28***	.33**
CF X Shift			.06
CF ² X Shift			-.09
F	.09	4.16**	2.58*
ΔR ²	.00	.08	.00
R ² (Adj R ²)	.00 (-.01)	.08 (.06)	.08 (.05)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table A. Hierarchical Regression Analyses of Productivity (Arrest) and Communication Frequency (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
CF	.07	.09	.09
CF ²	-.04	.04	.05
Shift		.15+	.09
CF X Shift			-.07
CF ² X Shift			.10
F	.82	1.61	1.10
ΔR ²	.01	.02+	.01
R ² (Adj R ²)	.01 (-.00)	.03 (.01)	.04 (.00)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table B. Hierarchical Regression Analyses of Productivity (Primary Officer Cases) and Communication Frequency (standardized regression coefficients β)

Independent Variables	Cohesiveness		Job Satisfaction		Distributed Justice	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
CF	.07	.07	.08	.08	.11	.10
Shift	.08	.08	-.03	-.03	-.05	-.06
CF X Shift		-.11		.03		-.20*
F	.79	1.08	.56	.40	1.10	2.83*
ΔR ²	.01	.01	.01	.01	.02	.04
R ² (Adj. R ²)	.01 (-.00)	.02 (.00)	.01 (-.00)	.01 (-.01)	.02 (.00)	.06 (.04)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table C. Hierarchical regression analyses of Communication Frequency and Shift on Work Perceptions (Cohesiveness, Job Satisfaction, and Distributive Justice) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2
CF	.13	.14
Shift	.05	.05
CF X Shift		.04
F	1.47	1.04
ΔR^2	.02	.00
R^2 (Adj. R^2)	.02 (.01)	.02 (.00)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table D. Hierarchical regression analyses of Communication Frequency and Shift on Stress (standardized regression coefficients β)

Independent Variables	Step1	Step 2	Step 3	Step 4
Close	-.07	-.08	-.12	-.10
Med		.04	.03	.03
Far			.09	.08
Shift				.25**
Close X Shift				.02
Med X Shift				-.15
Far X Shift				.07
F	.70	.43	.55	2.10*
ΔR^2	.00	.00	.01	.08
R^2 (Adj R^2)	.01 (.00)	.01 (-.01)	.01 (-.01)	.09 (.05)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table E. Hierarchical Regression Analyses of Communication Distance (Work group) and SHIFT on Productivity (Number of Arrests) (standardized regression coefficients β)

Independent Variables	Step1	Step 2	Step 3	Step 4
Close	.28**	.27**	.25**	.27*
Med		.03	.02	.00
Far			.05	.03
Shift				.15+
Close X Shift				-.02
Med X Shift				-.03
Far X Shift				.01
F	12.78***	6.39	4.33	2.30*
ΔR^2	.08	.00	.00	.02
R^2 (Adj R^2)	.08 (.07)	.08 (.07)	.08 (.06)	.10 (.06)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table F. Hierarchical Regression Analyses of Communication Distance (Work group) and Shift on Productivity (Number of PO Cases) (standardized regression coefficients β)

Independent Variables	Step1	Step 2	Step 3	Step 4
Close	.08	.01	.10	.13
Med		.19*	.22*	.20*
Far			-.20*	-.25*
Shift				.07
Close X Shift				.04
Med X Shift				.08
Far X Shift				-.17+
F	.98	2.80+	3.42*	2.02+
ΔR^2	.01	.03	.03	.03
R^2 (Adj R^2)	.01 (.00)	.04 (.02)	.07 (.05)	.09 (.05)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table G. Hierarchical Regression Analyses of Communication Distance (Work group) and SHIFT on Job Perception (Cohesiveness) (standardized regression coefficients β)

Independent Variables	Step1	Step 2	Step 3	Step 4
Close	.07	.05	.09	.10
Med		.05	.06	.05
Far			-.08	-.08
Shift				-.04
Close X Shift				.01
Med X Shift				.05
Far X Shift				.01
F	.76	.56	.61	.37
ΔR^2	.01	.00	.01	.01
R^2 (Adj R^2)	.01 (.00)	.01 (-.01)	.01 (-.01)	.02 (-.03)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table H. Hierarchical Regression Analyses of Communication Distance (Work group) and Shift on Job Perception (Job Satisfaction) (standardized regression coefficients β)

Independent Variables	Step1	Step 2	Step 3	Step 4
Close	.15+	.18*	.25*	.26*
Med		-.09	-.07	-.10
Far			-.15	-.17+
Shift				-.04
Close X Shift				-.02
Med X Shift				.10
Far X Shift				-.05
F	3.21+	2.10	2.31+	1.20
ΔR^2	.02	.01	.02	.01
R^2 (Adj R^2)	.02 (.02)	.03 (.02)	.05 (.03)	.06 (.01)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table I. Hierarchical Regression Analyses of Communication Distance (Work group) and SHIFT on Job Perception (Distributive Justice) (standardized regression coefficients β)

Independent Variables	Step1	Step 2	Step 3	Step 4
Close	-.09	-.15+	-.11	-.05
Med		.16+	.18*	.09
Far			-.10	-.14
Shift				.03
Close X Shift				.02
Med X Shift				.24*
Far X Shift				-.09
F	1.23	2.35+	1.92	1.82+
ΔR^2	.01	.02	.01	.05
R^2 (Adj R^2)	.01 (.00)	.03 (.02)	.04 (.02)	.08 (.04)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table J. Hierarchical Regression Analyses of Communication Distance (Work group) and Shift on Stress (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	-.09	-.09	-.10
Far		-.02	-.01
Shift			.27***
Close X Shift			-.06
Far X Shift			.01
F	1.20	.63	2.54*
ΔR^2	.01	.00	.07
R^2 (Adj R^2)	.01 (.00)	.01 (-.01)	.08 (.05)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table K. Hierarchical Regression Analyses of Communication Distance (Temporal work group) and SHIFT on Productivity (Number of arrests) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	.27***	.29***	.30**
Far		-.20**	-.22**
Shift			.16*
Close X Shift			-.02
Far X Shift			-.07
F	11.10***	9.20***	4.73***
ΔR^2	.07	.04	.03
R^2 (Adj R^2)	.07 (.06)	.11 (.10)	.14 (.11)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table L. Hierarchical Regression Analyses of Communication Distance (Temporal work group) and Shift on Productivity (PO Cases) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	.10	.10	.18+
Far		-.03	-.09
Shift			.08
Close X Shift			.11
Far X Shift			-.23**
F	1.38	.76	2.13+
ΔR^2	.01	.00	.06
R^2 (Adj R^2)	.01 (.00)	.01 (.00)	.07 (.04)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table M. Hierarchical Regression Analyses of Communication Distance (Temporal work group) and Shift on Job Perception (Cohesiveness) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	.09	.09	.14
Far		-.02	-.05
Shift			-.05
Close X Shift			.10
Far X Shift			-.11
F	1.11	.57	.74
ΔR^2	.01	.00	.02
R^2 (Adj R^2)	.01 (.00)	.01 (-.01)	.03 (-.01)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table N. Hierarchical Regression Analyses of Communication Distance (Temporal work group) and Shift on Job Perception (Job Satisfaction) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	.08	.08	.10
Far		-.03	-.07
Shift			-.07
Close X Shift			.02
Far X Shift			-.17*
F	.86	.48	1.14
ΔR^2	.01	.00	.03
R^2 (Adj R^2)	.01 (.00)	.01 (-.01)	.04 (.01)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table O. Hierarchical Regression Analyses of Communication Distance (Temporal work group) and Shift on Job Perception (Distributive Justice) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	-.05	-.05	.04
Far		-.01	-.03
Shift			.01
Close X Shift			.19+
Far X Shift			-.02
F	.42	.21	.87
ΔR^2	.01	.00	.02
R^2 (Adj R^2)	.00 (.00)	.00 (-.01)	.03 (.00)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table P. Hierarchical Regression Analyses of Communication Distance (Temporal work group) and Shift on Job Perception (Stress) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	.04	.08	.02
Far		-.16+	-.12
Shift			.25**
Close X Shift			.07
Far X Shift			-.05
F	.20	1.96	3.05*
ΔR^2	.00	.02	.06
R^2 (Adj R^2)	.00 (-.01)	.02 (.01)	.09 (.06)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table Q. Hierarchical Regression Analyses of Communication Distance (Reported) and Shift on Productivity (Number of Arrest) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	.12	.18*	.18*
Far		-.20*	-.20*
Shift			-.12
Close X Shift			-.04
Far X Shift			-.01
F	2.54	4.36*	1.77
ΔR^2	.02	.04	.00
R^2 (Adj R^2)	.02 (.01)	.05 (.04)	.05 (.02)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table R. Hierarchical Regression Analyses of Communication Distance (Reported) and Shift on Productivity (Primary Officer Cases) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	.44***	.48***	.49***
Far		-.04	-.06
Shift			-.04
Close X Shift			-.17*
Far X Shift			.04
F	40.10***	21.7***	8.88***
ΔR^2	.20	.02	.01
R^2 (Adj R^2)	.20 (.19)	.21 (.20)	.22 (.19)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table S. Hierarchical Regression Analyses of Communication Distance (Reported) and SHIFT on Job Perception (Cohesiveness) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	.18*	.19*	.21*
Far		-.04	-.06
Shift			-.04
Close X Shift			-.17*
Far X Shift			.04
F	5.57*	2.89+	2.10+
ΔR^2	.03	.00	.03
R^2 (Adj R^2)	.03 (.03)	.03 (.02)	.06 (.03)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table T. Hierarchical Regression Analyses of Communication Distance (Reported) and SHIFT on Job Perception (Job Satisfaction) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	.17*	.21*	.25**
Far		-.13	-.15+
Shift			-.16*
Close X Shift			-.11
Far X Shift			.07
F	4.91*	3.70*	2.80*
ΔR^2	.03	.02	.04
R^2 (Adj R^2)	.03 (.03)	.04 (.03)	.08 (.05)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table U. Hierarchical Regression Analyses of Communication Distance (Reported) and SHIFT on Job Perception (Distributive Justice) (standardized regression coefficients β)

Independent Variables	Step 1	Step 2	Step 3
Close	-.04	-.02	-.04
Far		-.06	-.05
Shift			.04
Close X Shift			.13
Far X Shift			-.05
F	.25	.42	.74
ΔR^2	.00	.00	.02
R^2 (Adj R^2)	.00 (-.01)	.01 (-.01)	.02 (-.01)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table V. Hierarchical Regression Analyses of Communication Distance (Reported) and Shift on Stress Level (standardized regression coefficients β)

Independent Variables	Communication Frequency
Age	-.12
Computer Use	.00
Comm Tool Use	.10
Tech Attitude	.17*
Shift	-.10
F	2.06+
ΔR^2	.07
R^2 (Adj R^2)	.07 (.03)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table W. Hierarchical regression analyses for Model II: Antecedents and Communication frequency (standardized regression coefficients β)

Independent Variables	Close	Far
Age	-.21*	-.08
Computer Use	.09	.02
Comm Tool Use	.08	.02
Tech Attitude	-.02	.04
Shift	-.12	.04
F	1.76	.52
ΔR^2	.06	.02
R^2 (Adj R^2)	.06 (.03)	.02 (-.02)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table X. Hierarchical regression analyses for Model II: Antecedents and Communication Distance (Work Group) (standardized regression coefficients β)

Independent Variables	Close	Far
Age	-.19*	-.03
Computer Use	.08	-.02
Comm Tool Use	.06	.10
Tech Attitude	.08	.00
Shift	-.15+	-.01
F	1.93+	.30
ΔR^2	.06 (.03)	.01 (-.02)
R^2 (Adj R^2)		

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table Y. Hierarchical regression analyses for Model II: Antecedents and Communication Distance (Temporal Group) (standardized regression coefficients β)

Independent Variables	Close	Far
Age	-.15+	.33***
Computer Use	.11	.02
Comm Tool Use	.16*	.15+
Tech Attitude	.23*	.20*
Shift	.12	.02
F	6.27***	6.14***
ΔR^2	.16	.16
R^2 (Adj R^2)	.16 (.14)	.16 (.14)

*** $p < .001$, ** $p < .01$, * $p < .05$, + $p < .10$

Table Z. Hierarchical regression analyses for Model II: Antecedents and Communication Distance (Reported) (standardized regression coefficients β)

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