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ORGANIZATIONAL CAPABILITIES AS PREDICTORS OF EFFECTIVE KNOWLEDGE MANAGEMENT: AN EMPIRICAL EXAMINATION

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by
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Kimberly K. Anderson

We hereby certify that this Dissertation submitted by Kimberly K. Anderson conforms to acceptable standards, and as such is fully adequate in scope and quality. It is therefore approved as the fulfillment of the Dissertation requirements for the degree of Doctor of Business Administration.

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2009

CERTIFICATION STATEMENT

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ABSTRACT

ORGANIZATIONAL CAPABILITIES AS PREDICTORS OF EFFECTIVE KNOWLEDGE MANAGEMENT: AN EMPIRICAL EXAMINATION

By

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Knowledge management has become one of the most important trends in business, yet many knowledge management initiatives fail. To understand the success and failure of knowledge management, firms must identify and assess the organizational capabilities required for the effort to prosper, which is the focus of this study. Literature has offered important theoretical grounding for this study with regard to organizational capability as a predictor of knowledge management effectiveness, but empirical examination is lacking. The capabilities have been identified as knowledge infrastructure capability (consisting of cultural, structural, and technological) and knowledge process capability (consisting of knowledge acquisition, conversion, application, and protection). The research model was adopted from Gold, Malhotra, and Segars (2001). This research broke new ground in the field of knowledge management by examining the relationships between knowledge infrastructure capability, knowledge process capability, and organizational effectiveness from the dual perspective of the team (within business units) in contrast to the organization (across business units).

Organizations develop knowledge infrastructure to drive desired behaviors, yet knowledge workers develop processes to circumvent the organization's infrastructure (cultural and structural barriers). This may contribute to the problem of knowledge management failure. However, the relationships between knowledge infrastructure and knowledge processes have not been empirically examined, until this study.

In addition, most knowledge management research is conducted at the organization level, yet most knowledge management implementation occurs at the team level (project teams, business units, social groups). To help bridge the gaps between theory and practice, this study aligned the unit of analysis more closely with the practitioners' level of implementation. Using only the organization as the unit of analysis would provide little guidance for business leaders in how they can influence the success of knowledge management programs, and it would present an incomplete picture when assessing the relationships between organizational capabilities and knowledge management effectiveness. The organization perspective helps with generalizability of this study, while the team perspective leads to results of a more informative and prescriptive nature for practitioners. Because the field of knowledge management is driven by practical need, this study offers many important managerial implications.

Data was collected from several business units of a Fortune 100 multinational firm and assessed using Structural Equation Modeling. The structural models were developed to test the hypothesized relationships and answer the research questions. As a result, this research provides empirical evidence that knowledge management capabilities are a contributing factor of organizational effectiveness. In addition, it can be concluded that firms with superior absorptive capacity and knowledge integration processes will improve their knowledge management capability.

The results of this study include the findings that knowledge infrastructure drives knowledge processes, that organization-level knowledge processes drive team-level knowledge processes, and that knowledge protection is seen as a corporate responsibility rather than a team or individual responsibility. Overall, the findings conform to the literature and lend credibility to Gold et al.'s (2001) theory that effective knowledge management, as measured by its impact on organizational performance, is dependent on the firm's knowledge infrastructure capability and knowledge process capability.

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Finally, I would like to recognize Edward Murphy, eponymous of Murphy's Law, for his influence showed up so much during this dissertation that he deserves to be recognized.

Table of Contents

List of Tables

List of Figures

Chapter I

Introduction to the Problem

Knowledge is considered the new wealth of organizations by which superior business performance and a competitive advantage can be achieved (Al-Alawi, Al-Marzooqi, & Mohammed, 2007; Amit & Schoemaker, 1993; Barney, 1991; Bohn, 1994; Drucker, 1992; Gloet & Terziovski, 2004; Grover & Davenport, 2001; Hoopes & Postrel, 1999; Jolly & Thérin, 2007; Kalling, 2003; Liu & Tsai, 2007; Prahalad & Hamel, 1990; Stewart, 1991, 1997; Teece, 1982). Accordingly, Al-Alawi et al. (p. 22) wrote, "knowledge management is currently one of the hottest topics in information technology and management literature." Knowledge management has become one of the most important trends in business because organizations are trying to achieve greater value from the knowledge they possess (Grossman, 2006; MacGillivray, 2003), such as finding better ways to value, assimilate, and apply knowledge to create new knowledge (Denning, 2006). More than 25% of Fortune 500 companies employ Chief Knowledge Officers and another 43% are planning to do so within a few years (Bose, 2004). In addition, approximately 81% of the largest U.S. and European companies use some form of knowledge management (Becerra-Fernandez, Gonzalez, & Sabherwal, 2004). However, it has been difficult for firms to implement and maintain effective knowledge management programs (Gold, Malhotra, & Segars, 2001; Lucier & Torsilieri, 1997; Malhotra, 1998; Minonne, 2007; Rigby, Reichheld, & Schefter, 2002; Storey & Barnett, 2000).

The estimates of knowledge management failure range from 50% to 70%, interpreted to mean that not all major objectives were met (Ambrosio, 2000, as cited in

Turban, Aronson & Liang, 2005, p. 524). Companies have spent billions of dollars in information-technology investments hoping for the results that knowledge management promises (Sveiby, 1997). However, the investments have yielded marginal results. Lucier and Torsilieri (1997) found that approximately 84% of knowledge management programs fail to have any real impact. There is great interest in explaining this phenomenon so that firms can realize the promise of knowledge management while sidestepping the pitfalls (Denning, 2006). Practitioners are interested in justifying their investment in knowledge management activities (Grossman, 2006; Turban & Aronson, 2001), and both academics and practitioners want to understand how to build effective knowledge management systems (Jennex & Olfman, 2004).

Attributes of Knowledge Management Failure

A review of the literature reveals several reasons why knowledge management initiatives may fail or prosper. Much of the failure is attributed to information-technology systems being merely relabeled as knowledge management systems (Gold et al., 2001; Lawton, 2001; Minonne, 2007; Tiwana, 2002; Wilson, 2002). Gold et al. affirmed, most knowledge management programs are, in reality, information-technology programs built to manage a firm's data and information. Tiwana found that vendors were rebranding their information-technology products as knowledge management tools and systems. Consequently, when information-technology systems failed to produce any real results, the concept of knowledge management was cast in doubt. As a result, knowledge management lost much of the "widespread fanfare" it had received until the early 2000s (Swartz, 2003). However, in the past few years a resurgence of interest in knowledge management has emerged (Denning, 2006). Universities and colleges are offering

specialized programs in knowledge management, academic research relating to knowledge management is increasing (Grossman, 2006; Serenko, Bontis, & Hardie, 2007), and knowledge management is recognized as an important aspect of national economic growth (Malhotra, 2003).

The failures also have been attributed to nontechnical factors, such as a lack of strategic alignment with the firm's objectives. Zack (1999a) found that too often firms implement a knowledge management program without a strategic purpose, and then try to work backward to explain why it might create a strategic advantage. More recently, the failures have been attributed to organizational culture, structure (Stankowsky, 2005), and processes (Gold et al., 2001). Lawton (2001) noted that at least half of failed knowledge management initiatives are due to firms not considering their deployment methodologies, which, according to Gold et al., depend on the firm's capabilities. Gold et al. argue that the problem of ineffective knowledge management is that firms are not considering their capabilities before implementing a knowledge management program.

Attributes of Knowledge Management Effectiveness

Davenport and Prusak (1998, p. 173) posited that knowledge management is effective only if treated as a "human-interaction exercise" with technology playing a "facilitative and supportive role." Egbu (2000) noted the significance of the human factor by suggesting that 90% of a successful knowledge management initiative is people and 10% is technology. This notion is largely supported in the literature. For example, Cavaleri, Seivert, and Lee (2005, p. 214) suggested that 80% of the funding for knowledge management initiatives should be allocated toward nontechnical human investments, and the other 20% toward technology investments. The literature is replete

with examples of nontechnical investments, which can be attributed to three main factors: organizational culture and structure, and business processes (e.g., Alavi, Kayworth, & Leidner, 2006; Becerra-Fernandez et al., 2004; Davenport, Jarvenpaa, & Beers, 1996; Goh, 2003; Gold et al., 2001; O'Dell & Grayson, 1998; Orlikowski, 2000; Stankowsky, 2005; Sutton, 2001; Verkasalo & Lappalainen, 1998; Walczak, 2005; Widen-Wulff & Ginman, 2004; Yang & Chen, 2007).

Background of the Problem

Driving Forces

Beginning in the early 1990s, the idea of knowledge management was a response to increasing competition resulting from advancing technology and the demands of more sophisticated customers. This not only created the need to operate on a global scale and manage more interdependencies, but also provided a tool to manage information and help transform it into useful knowledge (Mattson, Hooshang, & Salehi-Sangari, 2000). The phenomenon of "brain drain" (employees leave a company and take valuable tacit knowledge with them) was considered a critical detriment to a company's survivability (Rosenblatt & Shaeffer, 2000) and competitive advantage (DeLong & Mann, 2003). As a result, knowledge became increasingly recognized as an important asset to be managed (e.g., Davenport, DeLong, & Beers, 1998; Teece, 1998). Along with labor and capital, intangible assets became accepted as a third factor of production (Romer, 1990). Drucker (1992) claimed that knowledge is perhaps the only sustainable source for a competitive advantage. Both the scholarly and the practitioner literature left little doubt that knowledge was a corporate asset that deserved attention.

Knowledge management took off as technology initiatives manifested through the development of expert systems in the late 1980s and knowledge-based systems in the early 1990s. These early technologies were not strongly adopted by the business community due to their poor usability and complexity, which rendered them ineffective (O'Brien, 1997). The Internet explosion in the mid 1990s occurred at the same time as the intensifying interest in knowledge management as firms tried to exploit technologies to capture, transfer, and codify information to produce knowledge (Davenport & Prusak, 1998). The advancement of communication made possible by the more sophisticated networking technology had enabled firms to harness information about their markets, employees, best practices, ventures, alliances, and processes like never before. Companies had no choice but to deploy networking technologies to stay competitive (Porter, 2001, p. 64). However, they spent billions of dollars in information-technology investments that yielded marginal results (Sveiby, 1997). While academia has been touting the potential rewards of successful knowledge management, practitioners are experiencing failure (Denning, 2006; Gold et al., 2001; Malhotra, 1998; Rigby et al., 2002; Storey & Barnett, 2000).

The research literature has emphasized that firms must move beyond information management into the scope of knowledge management in order to recognize, accumulate, create, transform, and distribute knowledge (e.g., Bose, 2004; Dawson, 2000; Goh, 2003; Gold et al., 2001; Ju, Li, & Lee, 2006; C-P. Lee, Lee, & Lin, 2007; Paisittanand, Digman, & Lee, 2007; Yang & Chen, 2007). This involves the development of a supportive culture, structure, and in addition to a technological architecture that facilitates the effective flow of knowledge (Alavi et al., 2006; Bose, 2004; Goh, 1998; Gold et al.;

O'Dell & Grayson, 1998; Orlikowski, 2000; Sutton, 2001; Verkasalo & Lappalainen, 1998; Walczak, 2005). Yet, despite growing awareness among practitioners that organizational culture and structure are critical components of knowledge management success, Al-Alawi (2005) observed that firms are still deploying technology while ignoring the cultural and structural issues that are critical to knowledge management success. Al-Alawi et al. (2007) observed that these weaknesses in knowledge management continue to exist and are barriers to knowledge management success. For example, counter-productive organizational cultures may promote individualistic behavior whereby people gain a sense of worth from hoarding their know-how rather than sharing it.

Theoretical Foundation

Knowledge management is a multifaceted, emerging discipline that can be examined from many perspectives. This study assesses knowledge management in the broader field of organizational behavior in the context of overlapping relationships between absorptive capacity (Cohen & Levinthal, 1990), knowledge-integration (Grant, 1996, 1997), organizational capability (Gold et al., 2001), organizational learning (Nonaka & Takeuchi, 1995; Senge, 1990), and social capital (Nahapiet & Ghoshal, 1998; Zander & Kogut, 1995). These disciplines evolved from early economic-based theories of the firm, which later developed into the resource-based view of the firm. A more focused view stemming from the resource-based view is the knowledge-based view of the firm. The research model adopted for this study, the organizational-capabilities-perspective theory developed by Gold et al., is grounded in social-capital theory, knowledge-integration, the resource-based view, and the knowledge-based view of the firm.

Social Capital

For an organization to use knowledge as a resource or capability, it must develop an absorptive capacity —a concept introduced by Cohen and Levinthal (1990) meaning the ability to value, assimilate, and apply knowledge to create new knowledge. Creating new knowledge requires the presence of social capital (Gold et al., 2001; Grant, 1997; Nahapiet & Ghoshal, 1998). In the context of knowledge management, the idea of social-capital theory is that the social interactions of people become a resource for creating and storing collective knowledge (Nahapiet & Ghoshal). Social capital is the collective sum of the resources that are held in, accessible through, and derived from a network of social relationships (Nahapiet & Ghoshal). From the perspective of social capital theory, Grant (1996) argued that the firm's collective knowledge resources that are networked, linked, and transferred to the organization define organizational capability. The seminal work of Grant provided the framework for defining the process of knowledge integration.

Knowledge Integration

Knowledge can be held by individuals as well as collectively by the organization (Spender, 1996). Collective knowledge exists when the efforts of people with complementary skills are combined (Grant, 1996), and through the process of knowledge integration, that collective knowledge is transformed to the organization (Grant, 1996; Nahapiet & Ghoshal, 1998). Firms with better knowledge-integration processes will have stronger knowledge management capability (Grant, 1996, 1997; Newell & Huang, 2003), making them better equipped to sustain competitiveness (Chuang, 2004; Drucker, 1992; Grant, 1996).

Organizational Capability Theory

The theory of knowledge management effectiveness from the perspective of organizational capability was developed by Gold et al. (2001) (see Figure 1). The theory is built on the two fundamental concepts of social-capital (its role in creating intellectual assets) and knowledge-integration (its role in creating knowledge synthesis). Gold et al. provide a definitional and empirical context for assessing knowledge management from the perspective of organizational capabilities that lead to improved business performance, as measured by organizational effectiveness.

Gold et al. (2001) argued that a firm's predisposition to organizational effectiveness lies in its knowledge management *infrastructure* and *process* capabilities. The *infrastructure capability* consists of three key infrastructures, cultural, structural, and technological, because together they enable the maximization of social capital (Gold et al.). The cultural infrastructure is comprised of shared contexts (Appleyard, 1996; DeLong, 1997; Gold et al.; Leonard & Sensiper, 1998; Von Krogh, 1998). The structural infrastructure comprises both norms and trust mechanisms (Gold et al.; Nonaka, 1990; O'Dell & Grayson, 1998; Pedhazur & Schmelkin, 1991). The technical infrastructure refers to the firm's technology-enabled connections (Brown & Duguid, 1998; Davenport & Klahr, 1998; Davenport & Prusak, 1998; Gold et al.; Leonard, 1995; Leonard & Sensiper; Teece, 1998). *Process capability* consists of four dimensions of knowledge management activities: knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection. Gold et al. chose these four dimensions because they comprise the minimum set of knowledge management activities investigated when developing the concept.

The field is struggling to define knowledge management effectiveness (Gold et al., 2001), largely because it is a nebulous concept, complex in its description (Chakravarthy, 1987). Grossman (2006) noted that assessing knowledge management effectiveness is the least developed aspect in the field. Gold et al. argued that organizational effectiveness is the outcome of the combined effectiveness of knowledge infrastructure capability and knowledge process capability. However, little empirical evidence exists to support Gold et al.'s theory. Therefore, the relationships between the constructs of knowledge infrastructure capability, knowledge process capability, and organizational effectiveness were empirically examined in this study.

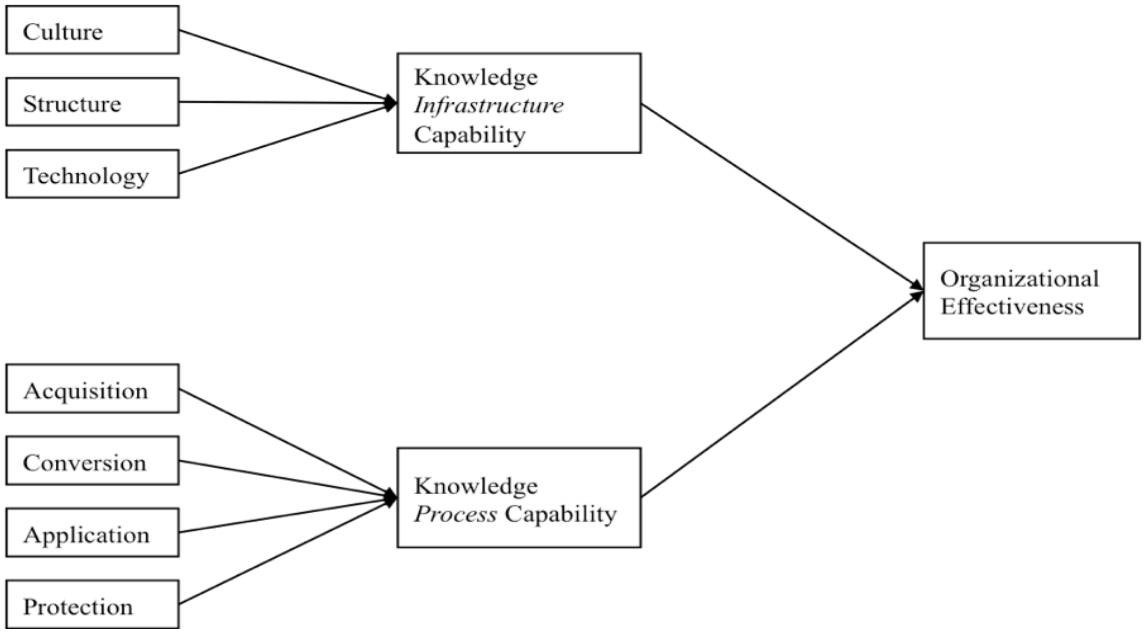

Figure 1. Organizational capabilities model of knowledge management.

From "Knowledge Management: An Organizational Capabilities Perspective," by A. Gold, A. Malhotra, & A. Segars, 2001, Journal of Management Information Systems, 18(1), p. 193.

Knowledge Management Infrastructure Capability

Becoming a knowledge organization involves a radical organizational transformation including the recasting and rebuilding of assumptions, structures, and value systems. In short, a firm must develop the capabilities that allow it to recognize opportunities for knowledge integration (Gold et al., 2001; Grant, 1996, 1997) and as a result, maximize social capital (Gold et al.; Nahapiet & Ghoshal, 1998). Gold et al. argue that social capital is maximized through three dimensions of infrastructure capability: structural, cultural, and technological.

Cultural. The cultural component refers to the firm's vision and values, and the attitudes toward learning and knowledge transfer (Gold et al., 2001; Hult, Hurley, Giunipero, & Nichols, 2000; Janz, Wetherbe, Davis, & Noe, 1997; Senge, 1990). Culture is a key component to knowledge management. Chin-Loy & Mujtaba (2007, p. 16) empirically found "substantial evidence that organizational culture is positively related to knowledge management programs." Organizational culture influences the adoption of knowledge management (P. Sanchez, 2004), and is one of the most significant hurdles of knowledge management effectiveness to overcome (Gold et al., 2001; Hinds & Aronson, 2002; H. Lee & Choi, 2003). Although shaping the culture to align with knowledge management goals is essential (Davenport & Klahr, 1998; Davenport et al., 1998; DeLong, 1997), in practice it is a complex undertaking (Roth, 2004; P. Sanchez), particularly in large or hierarchically structured and bureaucratic organizations (Brown & Duguid, 1998; Grant, 1996; Nonaka, 1994). Cultural shifts are more easily achieved in companies with fewer employees, smaller groups in large organizations, and firms characterized as entrepreneurial (Becerra-Fernandez et al., 2004), due to the flexibility of

the subcultures that exist in these smaller groups (Janz & Prasarnphanich, 2003). In large organizations, it may be more effective to implement knowledge management in teams defined by social networks (Allee, 2008), and then link the teams intra-organizationally (Peachey, 2006; Serenko et al., 2007).

Structural. Structure refers to the formal organizational structure, as well as the presence of norms and trust mechanisms (Gold et al., 2001; Nonaka, 1991; O'Dell, Essaides, Ostro, & Grayson, 1998). An effective knowledge management structure is one that encourages creativity and agility (Nonaka, 1996, 1997; Ruggles, 1998), such as when knowledge workers use technology differently than for what the application was designed (Orlikowski, 2000). It is necessary for leveraging the firm's technological architecture and communication networks (Gold et al.). Although unintended, structural elements often have inhibited collaboration and the sharing of knowledge (Gold et al.; O'Dell & Grayson, 1998), resulting in a barrier to effective knowledge management because collaboration is essential for knowledge creation and transfer (Alavi & Leidner, 2001). However, Peachey (2006, p. 81) found structure was not a significant predictor of knowledge management effectiveness, and believes it can be explained by Orlikowski's (2000) argument that people will circumvent the structure by developing their own processes to do their job.

Technological. The technological infrastructure refers to the technology-enabled information, knowledge, and communication systems (the ties that exist in a firm) (Gold et al., 2001). The technological infrastructure, in the form of a robust communication network, eliminates communication barriers between business units (Gold et al.; Holsapple & Joshi, 2001), and allows the flows of knowledge to be integrated (Edgington

& Chen, 2002). Researchers have noted that technology comprises an important element for the creation of knowledge (e.g., Davenport & Prusak, 1998; Leonard, 1995; Leonard & Sensiper, 1998; Teece, 1998). It is a critical enablement tool of a knowledge management program because it facilitates the flow of information and knowledge (Alavi & Leidner, 2001).

Knowledge Management Process Capability

To leverage the infrastructure (cultural, structural, and technological), knowledge management processes are needed so that knowledge can be efficiently captured, reconciled, stored, shared, and integrated (Almeida, 1996; Appleyard, 1996; Davenport et al., 1996; Grant, 1996; Leonard, 1995; Nonaka & Konno, 1998; Nonaka & Takeuchi, 1995; Porter-Liebskind, 1996; Szulanski, 1996). Davenport et al. (1996) defined a business process as a set of activities with a start, finish, and identifiable outputs. Dawson (2000) asserted that business processes are knowledge processes when the activities are guided by knowledge, and surmised that all business processes are fundamentally knowledge processes. Gold et al. (2001) noted that there are four fundamental business-process capabilities required for effective knowledge management: (a) collecting and creating useful knowledge (*knowledge acquisition*), (b) storing it in a repository and making it easily accessible (*knowledge conversion*), (c) exploiting and usefully applying it (*knowledge application*), and (d) preventing its inappropriate use (*knowledge protection*). The process of knowledge sharing was not called-out as a separate construct in this study because it was addressed within the constructs of knowledge-process capability, specifically the process activities of knowledge acquisition, knowledge conversion, and knowledge application.

Knowledge acquisition. Knowledge acquisition includes business activities oriented toward obtaining knowledge (Gold et al., 2001). Many terms have been used in the literature to describe these processes (e.g., acquire, seek, generate, create, capture, collaborate, and interact), but the common theme is the accumulation of knowledge. Knowledge acquisition is essentially the process of separating knowledge from an external source (Verkasalo & Lappalainen, 1998).

Knowledge conversion. Conversion processes are those oriented toward making existing knowledge useful (Davenport et al., 1996; Gold et al., 2001; Verkasalo & Lappalainen, 1998). To create value from existing knowledge, the knowledge conversion process is dependent on a firm's ability to organize, integrate, combine, structure, coordinate, or distribute knowledge (Davenport & Prusak, 1998). The knowledge must be structured and stored in a way that allows for searching, indexing, retrieving, and sharing so that it can be converted (Alavi & Leidner, 2001).

Knowledge application. Once the knowledge is converted, it is applied. Knowledge-application processes are those oriented toward the actual use of the knowledge (Davenport et al., 1996; Gold et al., 2001; Verkasalo & Lappalainen, 1998). It includes the effective storage and retrieval mechanisms that enable a firm to access knowledge (C-P. Lee et al., 2007).

Knowledge protection. For a firm to generate and preserve a competitive advantage, it is vital that its knowledge be protected (Porter-Liebskind, 1996). Security-oriented knowledge management processes are those designed to protect the firm's knowledge from illegal or inappropriate use or theft (Gold et al., 2001). An extensive

review of the literature revealed that in the field of knowledge management, the significance of knowledge protection is largely ignored.

Process Capability Dual Perspective Assessment

Knowledge management programs are often implemented at the team level, such as project teams, business units, and social network groups due to the complexities involved with a company-wide implementation (Bixler, 2002; Bollinger & Smith, 2001; Connelly & Kelloway, 2003; Janz & Prasarnphanich, 2003; Peachey, 2006; Serenko et al., 2007; Walczak, 2005). Yet, most knowledge management assessment is performed at the organization level (Serenko et al.). A review of the practitioner literature revealed that knowledge workers, particularly project teams, develop processes to circumvent the organization's infrastructure (cultural and structural barriers). This was also noted in the knowledge management literature (e.g., Orlikowski, 2000; Peachey). Therefore, the relationships of process capability to infrastructure capability and organizational effectiveness should be examined from the perspective of the team in addition to the organization. Because the field of knowledge management is driven by practical need, this study assessed knowledge-management process capability from a dual perspective: within business units (team perspective) and across business units (organization perspective) as illustrated in the research model (see Figure 2). No known research exists that examines these relationships.

Statement of the Problem

The problem is that companies tend to launch knowledge management programs without consideration of the capabilities required for the effort to prosper, making it difficult to guarantee any degree of success (Gold et al., 2001). Part of this problem, as

argued by Kalling (2003, p. 67), is a lack of practical guidance due to "relatively few knowledge management texts that make an explicit connection between knowledge and performance." The development of effective knowledge management is discussed in the literature, and prescribed by vendors, often from the perspective of the organization as a whole without consideration for the organization's size or structure (Serenko et al., 2007). The problem with using only the organization as the unit of analysis is that it provides little guidance for business leaders (Hedberg, 1981) in how they can influence the success of knowledge management programs (Grant, 1996; Janz & Prasarnphanich, 2003; Lynn, Reilly, & Akgün, 2000; Serenko et al.).

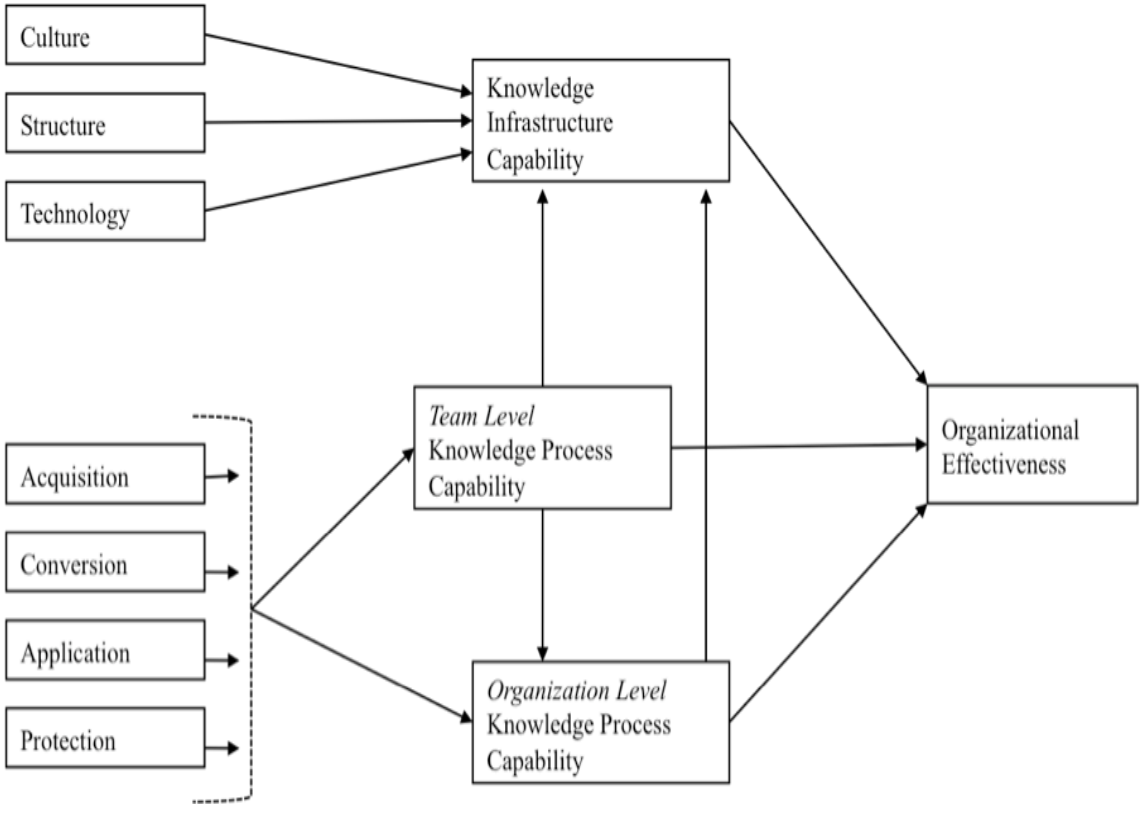

Figure 2. Research model.

Knowledge management research could provide more value if the unit of analysis (individual, team, or organization) is aligned with the practitioner's level of implementation. No known studies exist that examine knowledge management process capability whereby the team is the unit of analysis, which fails to take into account that today's knowledge workers collaborate in teams (Janz & Prasarnphanich, 2003), and that knowledge is created by individuals and groups through their social interactions (social networks and communities of practice) (Grant, 1996; Nonaka & Takeuchi, 1995). Consequently, there is little guidance for practitioners on implementing *effective* knowledge management programs (Janz & Prasarnphanich; Lynn et al., 2000).

Purpose of this Study

The purpose of this study is to identify and assess the relationships between organizational effectiveness, infrastructure capability, and process capability. To help bridge the gap between theory and practice, the units of analysis are both the team and the organization. The purpose is also to provide empirical validation of the Gold et al. (2001) theory that organizational effectiveness is the combined measure of knowledge infrastructure capability and knowledge process capability, which helps to fill the void of standards for assessing effectiveness. The research model uses measures of the three subdimensions of infrastructure capability (technology, structure, and culture), the four subdimensions of process capability (acquisition, conversion, application, and protection), and a single dimension of effectiveness.

Research Questions

1. To what extent can organizational effectiveness be predicted by assessing knowledge infrastructure capability and knowledge process capability?

2. What is the relationship between the knowledge-infrastructure capability and knowledge-process capability?

3. To what extent does team level knowledge management process capability influence the organization?

Significance of the Study

The discipline of knowledge management lacks standards for assessing knowledge management effectiveness (Grossman, 2006). As Grossman (p. 243) stated, "If the discipline of knowledge management is to survive and make a long-lasting contribution, it will need to achieve greater levels of standardization and better metrics to assess its effectiveness." This research helps to fill the void of assessment standards through empirical validation of Gold et al.'s (2001) theory that organizational effectiveness is the outcome of the combined effectiveness of infrastructure capability and process capability. In addition, it helps to bridge the gap between knowledge management theory and practice by aligning the unit of analysis in this research more closely with the practitioners' level of implementation. This study is the first to examine the relationships of knowledge-management process capability from the team perspective in contrast to the organization perspective. The organization-perspective helps with generalizability of the study, while the team-perspective leads to results of a more informative and prescriptive nature for practitioners.

Definition of Terms

The major concepts in this study are knowledge management, knowledge infrastructure capability, knowledge process capability, and organizational effectiveness. These concepts are defined in the following paragraphs based on their use in this study.

Knowledge-infrastructure capability and *infrastructure capability* are terms used interchangeably throughout this study. They refer to "the capability to manage infrastructures in the organization in order to support and facilitate organizational activities" (Paisittanand et al., 2007, p. 85).

Knowledge integration is defined as "the process of exploring existing knowledge and creating new knowledge within organizations" (Janczak, 2004, p. 211).

Knowledge management refers to "a systematic and integrative process of coordinating organization-wide activities of acquiring, creating, storing, sharing, diffusing, developing, and employing knowledge by individuals and groups in pursuit of major organizational goals" (Rastogi, 2000, p. 40).

Knowledge-management effectiveness refers to the degree to which an organization realizes its knowledge management goals: a definition borrowed from Daft's (1995, p. 53) definition of organizational effectiveness.

Knowledge-process capability and *process capability* are terms used interchangeably throughout this study. They refer to "the capability of a process to transform knowledge that is stored in the form of standard operating procedures and routines throughout the firm into valuable organizational knowledge, experience, and expertise" (Paisittanand et al., 2007, p. 85).

Organizational effectiveness refers to "the degree to which an organization realizes its goals" (Daft, 1995, p. 53).

Social capital refers to "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" (Nahapiet & Ghoshal, 1998, p. 244).

Team and *group* are terms used interchangeably throughout this study. A group is defined as "two or more persons who are interacting with one another in such a manner that each person influences and is influenced by each other person" (Shaw, 1971, p. 10).

Delimitations

To ensure manageability, this study did not include open-ended item measures. Based on the ideal population and sample for this study, as discussed in Chapter III, the researcher chose to not include employees who are not direct hires, such as temporary employees, contractors, and consultants.

Assumptions

This research is based on the assumption that participants will answer objectively and honestly. As contended by Cooper and Emory (1995), it is important that each person understands the concepts and words in the context of their own experience. They recommend controlling the frame of reference by either interviewing to learn the frame of reference of the respondent, or specifying the frame of reference for them (Cooper & Emory, p. 309). The frame of reference was specified for the participants of the study. Where ideas or terms may have had multiple meanings due to the diversity of participants (geographically, culturally, organizationally, and functionally), the meanings were defined based on key informants' knowledge of the organization. It was assumed that the

key informants were the most knowledgeable of how the concepts being studied are applied in the organization. It was also assumed that language was not a barrier because the participants have full comprehension of the English language, written and spoken.

Organization of the Study

Chapter I presented the research project with the supporting theoretical framework for carrying out the research, and background pertinent to the problem. This chapter also presented the purpose of the study, the research questions this study aimed to answer, and the significance of the study. It defined key terms used in this research and provided the delimitation and assumptions of this research. Chapter II contains the review of literature and research of the problem being investigated. Chapter III addresses the methodology and procedures that were used to carry out this research effort. Chapter IV contains the result of the analysis and findings of the study. Chapter V concludes the study with a summary and analysis of the findings, and a discussion of recommendations for further research.

Chapter II

Literature Review

This chapter offers a sound basis for understanding the concept of knowledge management effectiveness from the perspective of organizational capabilities. It includes a deep discussion of the theoretical evolution of knowledge management from early economic-based theories through the most recent theories in the field, as they relate to this topic. A discussion of the different schools of thought also is included to provide context around the concept of knowledge management as it is used in this study. Finally, the foundational theories as they pertain to each of the variables in this research are discussed, including organizational learning, social capital, knowledge integration, and organizational performance.

The Knowledge in Knowledge Management

The quest to obtain knowledge and effectively use it goes back as far as the human thought (Speigler, 2000). For centuries, the definition of knowledge has been debated in the field of Epistemology—Theory of Knowledge. As explained by Davenport and Prusak (1998), "Epistemologists spend their lives trying to understand what it means to know something" (p. 5). However, the literature in the field of knowledge management often avoids the epistemological view of knowledge (Minonne, 2007) and characterizes knowledge in evolutionary terms, from data, to information, to knowledge (Hinds & Aronson, 2002). In economic-based literature, knowledge is often complemented with explanations of the differences between knowledge, information, and data, which are influenced by information theory (Bollinger & Smith, 2001).

Data, Information, and Knowledge

Entering into a knowledge management program without understanding the differences between data, information, and knowledge can lead to "dangerous and costly mistakes" (Sveiby, 1997, p. 24). Davenport and Prusak (1998) stated, "Confusion about what data, information, and knowledge are—how they differ, what those words mean has resulted in enormous expenditures on technology initiatives that rarely deliver what the firms spending the money needed or thought they were getting" (p. 1).

Data. Hinds and Aronson (2002) defined data as the raw material for the production of information. Davenport and Prusak (1998) referred to data as "a set of discrete, objective facts about events. … There is no inherent meaning in data" (pp. 2–3).

Information. Information is the product of structuring data and adding relevance and purpose (Davenport & Prusak, 1998, p. 2). Information is "data that makes a difference" because without context, information is simply a string of data (Davenport & Prusak, p. 3).

Knowledge. Knowledge is information in action (O'Dell et al., 1998). In other words, knowledge is information applied to solve a problem (Hinds & Aronson, 2002). The working definition of knowledge offered by Davenport and Prusak (1998) exemplifies the value of knowledge and why it is so difficult to manage:

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

The terms *data* and *information* are used interchangeably in the literature, just as the terms *information* and *knowledge* are interchanged (see for example Baldwin, 2001). Much of the knowledge management literature points to the need to differentiate between

these terms (Minonne, 2007), particularly because many failed knowledge management initiatives are a result of the confusion between these terms (Malhotra, 1998). As Meadow (1995) implied, it is common for researchers to vaguely apply the terminology, which adds to the ambiguity of the concept of knowledge management:

> I am one of those who have published a formal definition (Meadow, 1992) together with distinctions among such related terms as *data*, *knowledge*, *intelligence*, and *wisdom*. Yet, I often find myself, as well as my colleagues, using the word *information* very casually, ignoring my own definitions. (p. 202)

Explicit, Implicit, and Tacit Knowledge

Knowledge falls into three categories: explicit, implicit, and tacit. Nickols (2000) offered a descriptive explanation (see Figure 3), which characterizes knowledge by its ability to be articulated. Nichols explained that if knowledge has been articulated, it is explicit. If knowledge can be articulated but has not been articulated, it is implicit. If knowledge has not been articulated because it cannot be, it is tacit.

In attempting to define the knowledge in knowledge management, Meyer and Sugiyama (2007) offered a dimensional classification of knowledge (see Figure 4). Meyer and Sugiyama empirically found that explicit, implicit, and tacit knowledge are not mutually exclusive due to the varying degrees of codifiability between them. In developing their model, they pointed to the research of Kogut and Zander (1992) who argued that tacit knowledge can be codified (explicated) and then measured by its degree of codification, thus hinting toward a dimensional character of non-explicit knowledge. Meyer and Sugiyama pointed to the research of M. Li and Gao (2003) who argued that implicit knowledge also includes a degree of tacitness that would lie somewhere between explicit and tacit on the continuum.

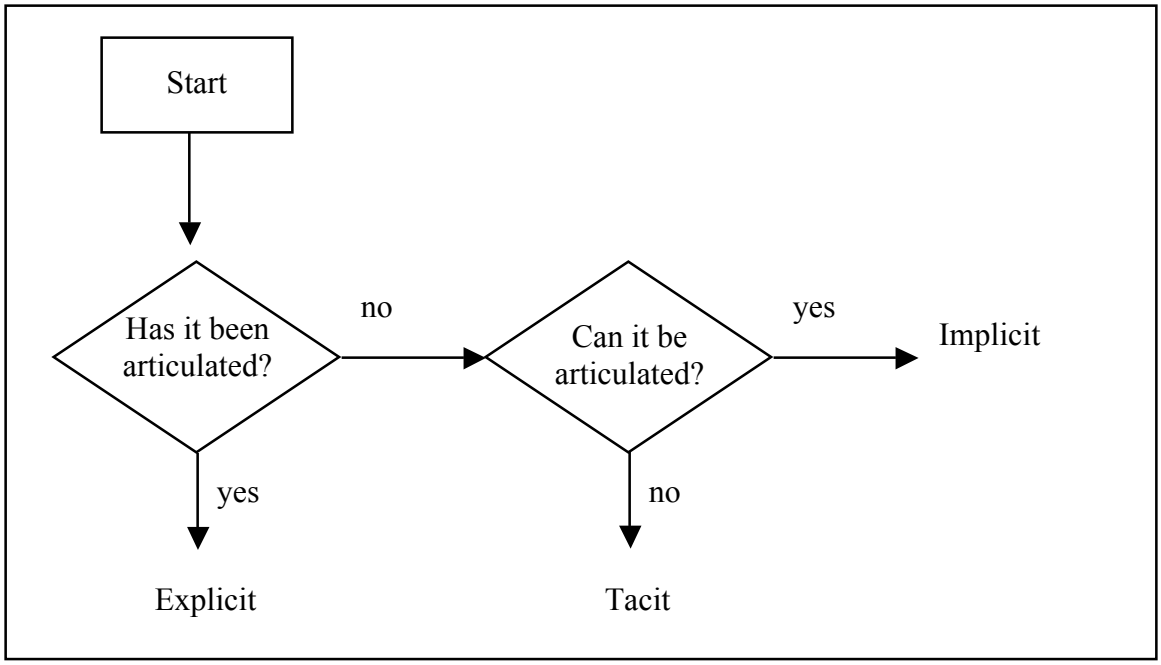

Figure 3. Knowledge Articulation Model.

From "The Knowledge in Knowledge Management," by G. Nickols, 2000. In The Knowledge Management Yearbook 2000-2001, by J. Cortada & J. Woods (Eds.), Boston: Butterworth-Heineman, p. 14.

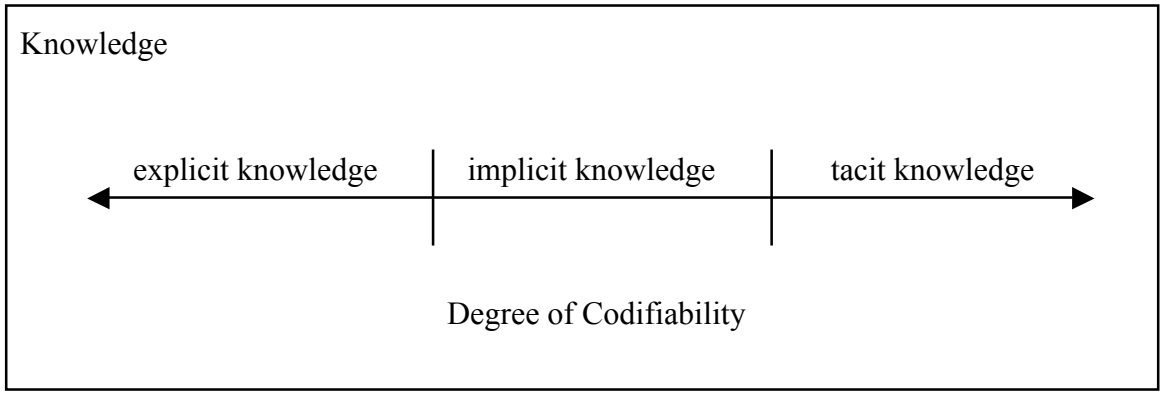

Figure 4. Dimensional classification of knowledge.

From "The Concept of Knowledge in KM: A Dimensional Model," by B. Meyer & K. Sugiyama, 2007, Journal of Knowledge Management, 11(1), p. 20.

Explicit knowledge. Nonaka (1991) theorized that explicit knowledge is formal and systematic, such as product specifications, computer programs, and mathematical formulas. Explicit knowledge is considered to be information that has been captured in the form of text, tables, diagrams, product specifications, and reports (Nickols, 2000). As

such, the management of explicit knowledge is understood to be the management of information (Alavi & Leidner, 2001; Raisinghani, 2000; Wilson, 2002). Generally, the management of knowledge is understood to be the management of the *processes* that convert tacit knowledge into the organization's explicit knowledge (Hansen, Nohria, & Tierney 1999; Minonne, 2007; Nonaka & Takeuchi, 1995; Raisinghani).

Implicit knowledge. A review of the literature reveals that implicit knowledge is sometimes referred to as "corporate memory" (e.g., Silver, 2000) and is understood to be the firm's "lessons learned" (Cross & Baird, 2000). Implicit knowledge is the knowledge that individuals know they know, as well as the knowledge they do not know they know, because they have not had a chance to express it (Wilson, 2002). By applying knowledge management practices, implicit knowledge can be made explicit (Meyer & Sugiyama, 2007).

Tacit knowledge. The chemist turned philosopher, Michael Polanyi (1959) observed that people can perform actions without being able to explain them, and can explain actions without being able to perform them. Polanyi (1966) introduced tacit knowledge by example:

> We know more than we can tell. We know a person's face, and can recognize it among a thousand faces. We recognize the moods of the human face without being able to tell, except quite vaguely, by what signs we know it. (pp. 4–5)

However, Nonaka (1991) is credited with introducing tacit knowledge into knowledge management and establishing knowledge management as an important factor of organizational performance (Nonaka & Konno, 1998; Nonaka & Takeuchi, 1995). Tacit knowledge is the combination of an individual's instinct, insight, learning, understanding, and experience (Nonaka, 1991). Tacit knowledge is not easily expressed, as it cannot be easily articulated. Horvath (2000) defined tacit knowledge as "unspoken

know-how," and argued that it is one of the most valuable assets in a firm. Business leaders are motivated to convert tacit knowledge into organizational knowledge (such as in their products and services), instead of it residing exclusively in their employees' heads (Bajaria, 2000; Hinds & Aronson, 2002). When tacit knowledge is not recorded or shared, firms believed they were missing-out on an untapped resource (Bishop, 2000), which is epitomized in the well-known and often quoted statement made by Lew Platt, CEO of Hewlett-Packard: "If only HP knew what HP knows, we would be three times as profitable."

The tacit issue. A review of the literature reveals a debate about whether tacit knowledge can or should be managed (Haldin-Herrgard, 2000), and whether or not it should be explicated (Zack, 1999b). Making tacit knowledge explicit could challenge what an organization knows, resulting in social or political impropriety (Zack, 1999b). Zack (1999b) explained that the organization might not be able to "see beyond its habits and customary practices" to create an atmosphere conducive to explicating tacit knowledge (p. 48). In addition, Zack (1999b) stated that "making private knowledge public could result in a redistribution of power" (p. 48), which could in turn have a profound effect on the organization's culture (Zack, 1999b, 2003).

Zack (1999a) contends that potentially explicable knowledge, if left unarticulated, represents a lost opportunity. However, Zack (1999b) also asserted that 'attempting to make inherently inarticulable knowledge explicit may result in losing the essence of that knowledge causing performance to suffer.' In an explanation of this concept Zack (1999b) offered, 'determining when to make articulable knowledge explicit (i.e., exploiting an opportunity) and when to leave inarticulable knowledge in its native form

(respecting both the inherent strengths and limits of tacit knowledge) is central to managing an appropriate balance between tacit and explicit knowledge. (p. 48)

Davenport and Prusak (1998) argue that it is more efficient to provide access to people with tacit knowledge than it is to try to capture and codify the tacit knowledge in people. They explained that it is because the organization's most valuable tacit knowledge is "generally limited to locating someone with the knowledge, pointing the seeker to it, and encouraging them to interact" (p. 71).

Defining Knowledge Management

Knowledge management allows an organization to exploit its intangible assets to create value through improved company performance (Davenport & Prusak 1998). It involves creating a learning culture to continuously create, share, and use knowledge for the purposes of developing new opportunities (Nonaka & Takeuchi, 1995; Senge, 1990). Knowledge management hinges on the notion that employees possess knowledge (tacit knowledge) that can be used to achieve superior business performance (Al-Alawi et al., 2007; DeTienne & Jackson, 2001; Drucker, 1992; Gloet & Terziovski, 2004; Grover & Davenport, 2001; Hoopes & Postrel, 1999; Jolly & Thérin, 2007; Kalling, 2003; Liu & Tsai, 2007). The basic idea is that employee knowledge can be guided, managed, controlled, or manipulated for a desired outcome (Land, Nolas, & Amjad, 2005), usually through a formalized process for capturing individual expertise and experience (Appleyard, 1996; Gloet & Terziovski; C-P. Lee et al., 2007; J. N. Lee, 2001; Porter-Liebskind, 1996; Spender, 1996), transforming it to the organization through integration (Edgington & Chen, 2002; Grant, 1996, 1997) for the purposes of knowledge re-use, which creates new knowledge (Nonaka, 1991; Nonaka & Takeuchi, 1995), thus resulting

in improved performance through improved capabilities (Bose, 2004; Dawson, 2000; Goh, 2003; Gold et al., 2001; Ju et al., 2006; C-P. Lee et al., 2007; J. N. Lee, 2001; Paisittanand et al., 2007; Yang & Chen, 2007), such as improved ability to innovate (DeLong, 1997; Duffy, 1999, 2000; Leonard, 1995; Leonard & Sensiper, 1998).

Duffy (2000, p. 64) defined knowledge management as "a process that drives innovation by capitalizing on organizational intellect and experience." Gloet and Terziovski (2004) described knowledge management as an umbrella term encompassing the fields of knowledge creation, knowledge sharing, knowledge mapping and indexing, knowledge distribution and storage, and knowledge valuation and metrics. Alavi and Leidner (2001) described knowledge management as distinct but interdependent processes to create, store, retrieve, transfer, and apply knowledge. Davenport and Prusak (1998) defined knowledge management as "a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences. … It originates and is applied in the mind of knowers" (p. 5). Rastogi (2000) defines knowledge management as "a systematic and integrative process of coordinating organization-wide activities of acquiring, creating, storing, sharing, diffusing, developing, and employing knowledge by individuals and groups in pursuit of major organizational goals" (p. 40).

After an extensive review of the literature, it is apparent that a universally accepted definition of knowledge management does not exist. Many researchers have noted the same conclusion (e.g., Chen & Hsiang, 2007; Housel & Hom, 1999, p. 27; L. Li & Zhao, 2006; Plessis, 2007). Knowledge management is a nebulous concept due to its

status as an emerging multi-faceted discipline that lacks a solid theoretical foundation (Grossman, 2006).

In this research, the definition of knowledge management is adopted from Lakshman (2007): "Knowledge management is an organizational capability that allows people in organizations, working as individuals, or in teams, projects, or other such communities of interest, to create, capture, share, and leverage their collective knowledge to improve performance" (p. 55).

Theoretical Lineage of Knowledge Management

Economic-Based Theories

To fully appreciate the influence of knowledge management on firms, it is helpful to situate it in a deeper context beginning with neoclassical economic-based theories of the firm. As noted by Pathirage, Amaratunga, and Haigh (2007), in the past decade knowledge has been treated as a valuable resource for achieving superior performance, which has been reflected in different mainstreams as the resource-based view (Barney, 1991; Wernerfelt, 1995), competency-based competitive advantage (Leonard-Barton, 1992; Nonaka & Takeuchi, 1995; Prahalad & Hamel, 1990), organizational capability approach (Barney; Gold et al., 2001; Spender, 1996; Teece, Pisano, & Shuen, 1997) and the knowledge-based view (Grant, 1996, 1997; Sveiby, 2001). This section outlines these streams of thought.

Neoclassical Economic Based Theories of the Firm

Neoclassical economic-based theories that look at why firms exist provide the early foundation for explaining the emergence of today's knowledge management

discipline. In an attempt to theoretically define the firm, Nobel Prize winner, Ronald Coase (1937), introduced the highly influential transaction-cost theory. Penrose (1959) expanded Coase's theory by adding the notion that the best measure of the size of a firm is by its productive resources.

Motivated by the need to measure the value of information in an organization, Shannon (1948) introduced the Mathematical Theory of Communication, which later grew into Information Theory. In an attempt to understand how organizations behave in situations of uncertainty, Simon (1955) introduced the Tenets of Bounded Rationality, which linked the procedures of human choice to organizational policy and processes. It was later expanded by March and Simon (1958) with the notion that firms, when faced with recurring organizational decisions, will develop performance programs that drive optimal decision making. Building on this premise, in 1963, Cyert and March (1992) introduced one of the most influential contributions to understanding organizational behavior—the Behavioral Theory of the Firm. They challenged the orthodoxy by redefining the view of the firm as a complex and multifarious organization characterized by its uniqueness. The centrality of the theory is that the firm possesses unique capabilities that are difficult for others to imitate or replicate, including replication by the firm itself (Cyert & March; March & Simon).

Forty years after the initial introduction of transaction-cost theory by Coase (1937), the idea resurfaced with Williamson (1975) suggesting that a transaction (exchange of a good or service) should be the unit of analysis in organizational-behavior studies. Williamson's transaction-cost approach is the theory that the firm is composed of contractual transactions between individuals or groups and the firm "adopts the structure

that offers the lowest transaction costs for the exchanges" (Choo & Bontis, 2002, p. 8). In the transactions, a firm should avoid the hazards of opportunism that can occur under conditions of uncertainty or bounded rationality (Williamson). While transaction costs used to be described as "the glue that holds an organization together" (Brown & Duguid, 1998, p. 90), with the new resourced-based view of the firm (Wernerfelt, 1984) and the emerging knowledge economy, the firm's internal resources became the "glue".

Resource-Based View of the Firm

In the 1980s, Wernerfelt (1984) coined the term "resource-based view," which has become a core idea in strategic-management theory. Until this time, organizational resources were treated primarily as tangible assets. With the resource-based view, it was no longer about what a company owned, but rather what it was capable of through core competencies (McGee & Prusak, 1993). The resource-based view addresses the performance of a firm. When introduced, it challenged the notion of how firms achieve superior business performance and sustain a competitive advantage. With the transaction-cost approach, competitive advantage referred to the external competitive environment (Porter, 1980), but that changed with the resource-based view. Internal proficiencies (core competencies) became the source that yielded a competitive advantage (Drucker, 1992; Leonard-Barton, 1992; Nonaka & Takeuchi, 1995), as long as the core competency was difficult to imitate, widely leveraged by the company, and provided customer benefits (Prahalad & Hamel, 1990). Working from these ideas, Barney (1991) proposed that a firm has four basic resources: financial assets, physical assets, human assets, and organizational assets. To achieve a sustained competitive advantage the firm must

develop these resources into capabilities that meet four conditions: value, rareness, inimitability, and non-substitutability (Barney).

With the resource-based view, instead of adapting to the external environment the firm could exploit its resources and capabilities given external opportunities (Barney, 1991; Grant, 1991; Wernerfelt, 1984). Instead of firms being viewed as a collection of tangible assets (land, labor, and capital), they are viewed as a collection of internal resources, including knowledge that is not easily replicated, and therefore a source of sustained competitive advantage (Amit & Schoemaker, 1993; Chuang, 2004; Drucker, 1992; Narasimha, 2000)

Knowledge-Based View of the Firm

The transition from the resource-based view to the knowledge-based view has been called the "knowledge paradigm shift" (e.g., Allee, 2000). The knowledge-based view emerged from strategic-management literature (e.g., Grant, 1996, 1997; Nonaka & Takeuchi, 1995; Spender, 1996), which extends the resource-based view of the firm.

Proponents of the knowledge-based view argue that knowledge is the most strategically significant resource because it is difficult to imitate, is socially complex (Drucker, 1992), and provides the firm with the potential for long-term competitive advantage (Gold et al., 2001; Nonaka & Takeuchi, 1995; Spender, 1996; Sveiby, 2001; Teece et al., 1997). The internal proficiencies that yield a competitive advantage are the firm's capabilities (Drucker, 1992; Leonard-Barton, 1992) developed through its knowledge resources (Teece, 1998). In other words, the competitive advantage of knowledge lies in the knowledge that defines the firm's capabilities (Birchall & Tovstiga, 1999, 2002).

In the resource-based view, knowledge was treated as a generic resource as it did not distinguish between different types of knowledge-based capabilities (Apostolou & Mentzas, 2003). Grant (1996) linked the resource-based view of the firm to the knowledge-based view when he proposed that the firm's collective knowledge resources, that have been networked, linked, and transferred to the organization, define organizational capability. Drucker (1992) proposed that knowledge resources are ubiquitous and limited only to the firm's ability to recognize them. Drucker asserted that they are embedded in multiple entities, "including organizational culture and identity, routines, policies, systems, and documents, as well as individual employees" (p. 164).

Knowledge resources are different from other resources, as pointed out by Apostolou and Mentzas, (2003):

1. Knowledge assets are not inherently scarce, unlike resources can be in the resource-based view.
2. Knowledge assets are regenerative, meaning that in addition to the outputs of products and services, new relevant knowledge may emerge.
3. Knowledge assets often increase in value the more they are used, whereas in the resource-based view the resources exhibit decreasing returns to use.

Establishing a knowledge management program for sustaining business performance and competitive advantage, according to Ndela & du Toit (2001), starts with recognizing or rediscovering assets that the firm is not using to its full potential. Other researchers argue that it starts with integrating a knowledge management strategy into the corporate strategy so that there is no distinction (e.g., Wysocki & DeMichiell, 1997; Zack, 1999a). Stewart (1997) argued that without a strategic purpose, knowledge resources cannot be

defined or managed. Similarly, Zack (1999a) argued that without strategic purpose, firms that implement knowledge management programs work backward to explain the strategic significance.

When knowledge is content specific, tacit, and embedded in routines, it is difficult for competitors to obtain, thus it becomes a source of competitive advantage (Lado & Zhang, 1998; Narasimha, 2000; Ndela & du Toit, 2001; Zack, 1999a). For competitors to acquire similar knowledge they would have to have similar experiences, which would take too much time (Zack, 1999a). Furthermore, the more a firm knows, the more it can learn (Nonaka & Takeuchi, 1995; Senge, 1990), which results in the new knowledge complementing the existing knowledge to create a "knowledge synergy" unavailable to competitors (Zack, 1999a). The importance of understanding the impact of knowledge management on organizational performance is surmised by Hoopes and Postrel (1999, p. 845) who stated, "If the strategy field is to continue to pursue organizational knowledge as the most interesting resource underlying competitive advantage, it is imperative to undertake direct measurement of knowledge sharing's effect on performance."

Knowledge Management Schools of Thought

Knowledge Management is a multi-dependent emerging discipline that can be examined from many perspectives. To provide context, this section includes discussion on the different schools of thought that have emerged in the field of knowledge management, including Value Network Analysis, Social Network Analysis, Information Theory, and Intellectual Capital.

Value Network Analysis

A value chain describes the linear progression of how raw materials are shaped through the production process. Allee (1999, p. 121) referred to the value chain as an old mindset rooted in industrial-age business models and stated, "even with the inclusion of knowledge or information as the input, it is still a mechanistic worldview … [and] stems from a linear business model that is rooted in the industrial age production line."

Emphasizing the need to reshape theories and practice in light of the knowledge-based view, Allee (1999, 2000) developed the concept of the *value-network*, a nonlinear process whereby the concepts of knowledge flows and exchanges are nonlinear and make more sense given the nature of knowledge. The value network is a web of relationships in an organization that generate value (Allee, 2000). Allee (1999) defined value beyond traditional monetary means to include knowledge, benefits, or service; for example, knowledge could be exchanged for customer loyalty, such as when a software company gives away its programming language to develop a loyal user base (Allee, 1999). The discipline of value-network analysis (Allee 1999, 2000) is a methodology of analyzing the value networks, which are interwoven, interdependent, and multidirectional, for the purposes of converting financial and nonfinancial assets into other forms of value. The value-network analysis discipline links to the theory of the learning organization (Nonaka & Takeuchi, 1995; Senge, 1990) and social-network analysis (Allee, 1999; Liebowitz, Ayyavoo, Nguyen, Carran, & Simien, 2007).

Social Network Analysis

While the value-network analysis refers to the interactions of business functions *within* an organization (Allee, 2008), the concept of social-network analysis refers to the

interactions *between* social groups (Liebowitz et al., 2007). In terms of knowledge management, the discipline of social-network analysis is used to determine the value of social capital, which is the value of the social relationships in the organization (Nahapiet & Ghoshal, 1998; Zander & Kogut, 1995). When attempting to identify the more specific knowledge flows and knowledge gaps in an organization, it is called *knowledge-flow analysis* (Liebowitz et al.). When attempting to identify the network of expert communities, which are also known as communities of practice (Wenger, 2004), it is sometimes referred to as *organizational-network analysis* (Allee, 2008). According to Liebowitz et al., "These techniques are gaining popularity due to today's environment of social networking and the research showing that informal networks derive the power over the formal organizational chart networks" (p. 1140).

Information Theory

Davenport and Prusak (1997) linked information theory to knowledge management by exploring how appropriately or inappropriately both information and knowledge are used and managed in an organization. Davenport and Prusak (1997) contended that information from computers is less valuable than information from other sources, and coined the term "information ecology" to describe this concept. The full "information ecology" value can be realized when a firm can combine different sources of information into useful knowledge (Davenport & Prusak, 1997). This school of thought uses the fundamental principles of the Nonaka and Takeuchi (1995) knowledge-creation theory in which people express tacit knowledge so that it can be formulated into explicit codified knowledge for sharing with others, which is a fundamental concept in the field of organizational learning.

Intellectual Capital

A different school of thought emerged from the early economic-based theories that influenced the development of knowledge management—intellectual capital. The modern use of the term knowledge management stems from economic theory during the intellectual-capital movement, which was most prevalent from 1980 through 1999 (Sullivan, 2000). In the early 1990s, distinctions began to emerge between intellectual capital and knowledge management and they have since branched into different disciplines.

Intellectual capital is a term having different definitions in theories of management and economics, but the central idea is the distinction between tangible assets (like buildings and land) and intellectual or intangible assets (like patents and copyrights) (Bontis, 1998, 1999; Edvinsson & Malone, 1997; Kaes, 1999; Marti, 2000; Narasimha, 2000; Teece, 1998). The first findings of intellectual capital came from economist Paul Romer who in the 1980s published a series of papers referred to as the New Theory of Growth (also called Endogenous Growth Theory). This theory emphasized that economic growth results from increasing returns associated with new knowledge (Romer, 1986). Romer's research was based on the fundamental findings of Robert Solow, the 1985 Nobel Prize winner. Solow used mathematical formulas to explain how economic growth takes place and discovered that when the factors of production (land, labor, capital) reach their optimal composition, growth will eventually stop and all countries will reach a point of convergence. In reality, this is not true and Romer (1990) discovered that there was a missing variable in Solow's formulas—intangibles. Romer (1990) attributed intangibles (such as knowledge, innovation, and intellectual capital) as Solow's missing variable,

which came to be known as the "Solow Residual." Romer's work was the foundational impetus that led to intellectual capital as a discipline. It increased the momentum of exploring intangibles from the resource-based view, which developed into intellectual capital, and then later from the knowledge-based view, which developed into knowledge management.

Intellectual capital gained ground as a discipline in the 1990s when firms became increasingly aware of the value of their intangibles. If business performance was to be accurately measured (Edvinsson & Malone, 1997), alternative approaches in accounting were needed other than assigning intangibles to the category of goodwill (W. J. Martin, 2000). Firms became eager for a sound way to value their knowledge as assets (W. J. Martin, 2000) and adjusted from the management and measurement of physical and financial assets to the cultivation and dissemination of intangible assets (Bontis, 1998, 1999; Edvinsson & Malone; Koenig, 1998; W. J. Martin, 2000; Teece, 1998).

Sveiby (1997) was the first to address the human-capital dimension of intellectual capital and divided an organization's intellectual assets into three categories: structural, customer capital, and individual capital. Sullivan (2000, p. 241) pointed out that Sveiby's contribution offered a "rich and tantalizing view of the potential for valuing the enterprise based upon the competences and knowledge of its employees." Inspired by Sveiby's (1997) concepts, Edvinsson and Malone (1997) found ways to quantify the intangible assets at Skandia, a Swedish insurance company where Edvinsson was employed. Edvinsson developed a technique to quantify intangible assets and created his own version of Kaplan and Norton's (1992) Balanced Scorecard. According to Sullivan

(2000), it became known as one of the most successful stories of knowledge management application from the perspective of intellectual-capital measurement.

Supporters of the intellectual-capital measurement perspective considered intellectual capital to be an umbrella term under which knowledge was merely one of the intangible assets to be measured (e.g., Bontis, 1998; DeLong, 1997; Edvinsson & Malone, 1997; Marti, 2000; Teece, 1998). Intellectual capital was defined as intellectual property (such as patents, data, software, copyrights), and knowledge that is neither property nor human, such as processes (Edvinsson & Malone), culture (DeLong), core competencies (Prahalad & Hamel, 1990) and innovation (Arrow, 1962; Leonard, 1995; Pablos, 2003). During this time a different view of intellectual capital surfaced—knowledge management—rooted in the field of organizational behavior, specifically the disciplines of strategy, innovation, and organizational learning.

Supporters of the knowledge management view (versus the intellectual-capital view) regarded knowledge as a firm's key resource for obtaining a competitive advantage (e.g., Birchall & Tovstiga, 1999, 2002; Drucker, 1992; Koenig, 1998; Leonard-Barton, 1992; Nonaka & Takeuchi, 1995). The two concepts of knowledge management and intellectual capital diverged as intellectual capital became more rooted in the financial and accounting disciplines centered on measuring the monetary value of intangible assets (Birchall & Tovstiga, 1999, 2002; Edvinsson & Malone, 1997; Koenig). Intellectual capital was the catalyst for viewing knowledge as a strategic asset from which to sustain a competitive advantage.

Foundational Theories within the Field of Organizational Behavior

The concept of organizational capabilities to achieve knowledge management effectiveness is rooted in the broader theoretical field of organizational behavior through overlapping relationships between absorptive capacity (Cohen & Levinthal, 1990), knowledge-integration (Grant, 1996, 1997), organizational capability (Gold et al., 2001), organizational learning (Nonaka & Takeuchi, 1995; Senge, 1990), and social capital (Nahapiet & Ghoshal, 1998; Zander & Kogut, 1995). The theoretical bases of these concepts are outlined in this section.

Social Capital Theory

Social-capital theory is a core concept in the disciplines of organizational behavior, economics, and sociality (Nahapiet & Ghoshal, 1998), and plays an important role in knowledge management. From the view of social capital, Zander and Kogut (1995) developed constructs whereby knowledge was treated as synonymous with organizational capabilities and proposed that a company is a repository of "social knowledge"—the know-how and information within employees and developed through their interactions. Zander and Kogut suggested that a firm must "be understood as a social community specializing in the speed and efficiency in the creation and transfer of knowledge" (p. 503). The value of their contribution to the field of organizational behavior is noted by Nahapiet and Ghoshal: "This is an important and relatively new perspective on the theory of the firm" (p. 242). Nahapiet and Ghoshal posited that social capital comprises both the social network and the knowledge that is mobilized through that network, and defined it as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an

individual or social unit" (p. 244). While Nahapiet and Ghoshal explored the role of social capital in the creation of intellectual capital (specifically organizational knowledge), Koenig (1998, p. 227) dismissively defined social capital as "what has been added to Intellectual Capital to create Knowledge Management."

Absorptive Capacity and Knowledge Integration

How well a firm can build new knowledge depends on its ability to absorb new knowledge from a variety of sources (Kogut & Zander, 1992) and then integrate that knowledge into its knowledge base (Cohen & Levinthal, 1990; Hansen et al., 1999; Leonard, 1995; Leonard & Sensiper, 1998; Newell & Huang, 2003). For *knowledge integration* to occur, firms must develop an *absorptive capacity*—a concept introduced by Cohen and Levinthal concerned with the ability to value, assimilate, and apply new knowledge. A firm's absorptive capacity indicates the existence of internal knowledge that allows a firm to recognize, comprehend, and use knowledge from external sources (Cohen & Levinthal; Kogut & Zander). Jolly and Thérin (2007) asserted that absorptive capacity is a function of the education level and permeability of employees, the technological infrastructure, and management support. Absorptive capacity is essential for developing and maintaining organizational capabilities (Bhatt, 2001). It enables a firm to learn, reflect, and relearn (Lin, 2007).

Knowledge can be held by individuals as well as collectively by the organization (Spender, 1996). Collective knowledge occurs when the efforts of people with complementary skills are combined (Grant, 1996), and through knowledge integration that collective knowledge is transformed to the organization (Grant, 1996; Nahapiet & Ghoshal, 1998; Newell & Huang, 2003).

Direct knowledge integration requires two organizational capabilities—the capability to combine knowledge from a variety of sources, and the capability to transfer that knowledge (Awazu, 2004; Grant, 1996). It also includes the transfer of knowledge over time, which means using documented past experiences to solve current problems (Awazu).

Grant (1996) offered a framework that defines three dependent aspects of knowledge integration—the efficiency of integration, scope of integration, and flexibility of integration. As explained by Gold et al. (2001), the efficiency of integration means that the more frequently knowledge management processes are carried out, the more routine and efficient they become; scope of integration refers to the variety of knowledge that is integrated; and flexibility of integration refers to how a firm combines its newly acquired knowledge with its existing knowledge base. Knowledge is integrated through either organizational routines or direct mechanisms (Grant, 1996). Knowledge integration by organizational routine requires a firm to have an established communication infrastructure (Gold et al.; Grant, 1996; Newell & Huang, 2003). To sustain competitiveness, a firm must develop the capabilities to integrate knowledge effectively (Chuang, 2004; Drucker, 1992). Thus, firms with better knowledge-integration processes will have stronger knowledge management capability (Grant, 1996; Ju et al., 2006; Newell & Huang), which makes firms better equipped to sustain competitiveness (Grant, 1997; Ju et al.). Knowledge integration is considered a capability (Grant, 1996), such as the combination of expertise from several individuals for the purposes of making strategic moves (B. Martin, 2000).

Consistent with the knowledge-based view, superior business performance will result from the firm's ability to integrate and use new knowledge (Leonard, 1995; Leonard & Sensiper, 1998; Spender & Grant, 1996). In other words, competitive advantage will stem from the firm's ability to learn faster than its competitors (Easterby-Smith et al., 1998; Jolly & Thérin, 2007).

Organizational Learning

The concept of organizational learning presumes that a company can quickly adapt to change, anticipate problems, and use existing knowledge to apply new knowledge (Nahapiet & Ghoshal, 1998, 2007) and, therefore, knowledge management is integral to organizational learning (Bixler, 2002; Janz & Prasarnphanich, 2003; Schulz, 2001). The resurgence of interest in organizational learning in the early 1990s (e.g., Brown & Duguid, 1998; Huber, 1991; Senge, 1990; Walsh & Ungson, 1991) became the basis for the distinctions made between "organizational learning" and "the learning organization" seen in the literature today (e.g., Easterby-Smith & Lyles, 2003; Malhotra, 1996; Ortenblad, 2001, 2004).

The concept of the learning organization refers to an ideal type of entity with the capacity to learn and thus prosper (Easterby-Smith & Lyles, 2003; Ortenblad, 2001). To achieve superior business performance, the learning organization will embrace change (Cummings & Worley, 1997) and develop the abilities to create, acquire, share, and apply knowledge (Garvin, 1993; Ortenblad, 2001, 2004; Senge, 1990).

Much of the focus in knowledge management and organizational learning involves the ability to transfer the tacit knowledge (expertise and know-how) of individuals and groups to the organization level so that it can be widely distributed

(Raisinghani, 2000). When knowledge is explicated it becomes information, and when information is used as it moves through the organization it becomes knowledge (Hansen et al., 1999; Minonne, 2007; Raisinghani). In Nonaka's (1994) seminal theory of organizational-knowledge creation, knowledge is converted from tacit to explicit, or explicit to tacit in a perpetual spiral as it moves through an organization. New organizational resources, including knowledge, are created through the processes of combination and exchange (Gold et al., 2001; Nonaka, 1994), which require the presence of social capital (Nahapiet & Ghoshal, 1998).

Learning occurs through collaborative interaction with individuals and peer groups (Bixler, 2002; Hansen et al., 1999; Kogut & Zander, 1992; Ortenblad, 2001, 2004), because a collaborative environment facilitates the sharing of tacit knowledge (Alavi & Leidner, 2001; Nonaka, 1994; Nonaka & Konno, 1998). Therefore, a peer group (team) structure is an essential characteristic of organizational learning (Hult, 1998; Hult et al., 2000; Janz & Prasarnphanich, 2003; Janz et al., 1997; Senge, 1990), and a key characteristic of knowledge-based organizations (Nonaka & Konno; Nonaka & Takeuchi, 1995).

Organizational Resources and Capabilities

Research within the knowledge-based view emphasizes the critical role of knowledge for achieving a competitive advantage, while the perspective of organizational capability focuses on developing resources to improve organizational performance. However, the concepts of resources and capabilities are often intermingled in the literature (Bitar & Hafsi, 2007).

A capability is typically firm specific, while resources are not (Makadok, 2001). Resources consist of both intangible and tangible assets (Amit & Shoemaker, 1993), while capabilities are process-based resources that are less visible and less tangible than other resources (Gorman & Thomas, 1997). Grant (1991) distinguished capabilities from resources by defining a resource as an input of the production process and a capability as the use of the resources. Later, Grant (1996) defined organizational capabilities as the firm's ability to network, link, and integrate its knowledge resources. Collis (1994) defined an organizational capability as "the socially complex routines that determines the efficiency with which firms physically transform inputs into outputs" (p. 145).

Capabilities are the product of the organization's entire system, including the accumulation of skills, routines, and processes (Bitar & Hafsi, 2007; Collis, 1994). They refer to the deployment of a firm's resources for the purposes of generating value and achieving objectives (Dutta, Narasimhan, & Rajiv, 2005). However, companies tend to launch knowledge management programs without consideration of their capabilities, which is a key contributing factor to the problem of knowledge management failure (Gold et al., 2001; Yang & Chen, 2007). If the goal is knowledge management effectiveness, then it is paramount to understand the organizational capabilities necessary to achieve that goal.

Knowledge Management Capabilities: Infrastructure and Processes

Knowledge-management initiatives will fail if investments in organizational resources and capabilities are inappropriate (Wiig, 1994). Therefore, the development of organizational knowledge management capabilities will contribute to organizational effectiveness (Gold et al., 2001; Yang & Chen, 2007). Davenport and Prusak (1998)

observed that many firms have reached a plateau with their knowledge management programs, thus considering the programs to have failed, and suggested focusing on the development of core capabilities.

Gold et al. (2001) posited that a firm's predisposition to knowledge management effectiveness lies is its knowledge infrastructure and process capabilities. The premise of Gold et al.'s theory is the question: Is the organization capable of knowledge management success? In examining the issue of knowledge management failure, Gold et al. provided a definitional and empirical context of knowledge management effectiveness from the perspective of organizational capabilities. The Gold et al. organizational capability theory is based on the underlying theoretical frameworks of social-capital (its role in creating intellectual assets) and knowledge-integration (its role in creating knowledge synthesis), which are grounded in the theories of the resource-based view and knowledge-based view of the firm.

For an organization to use its knowledge as a resource or capability it must develop an absorptive capacity (Cohen & Levinthal, 1990), which is a prerequisite to knowledge integration (Grant, 1996). Creating knowledge requires existing knowledge to be combined and exchanged (Nonaka & Takeuchi, 1995), and this process requires the presence of social capital (Gold et al., 2001; Nahapiet & Ghoshal, 1998). Therefore, maximizing social capital will maximize knowledge creation. Gold et al. argued that social capital could be maximized through three key infrastructures—cultural, structural, and technological—the combination of which comprises the infrastructure capability construct. The infrastructure capability constructs laid out by Gold et al. are aligned with previous research, such as the often-cited work of Ruggles (1998), who in a study of 431

U.S. and European companies found that the barriers of knowledge management efforts include culture (54%), structure (28%), technology (22%), and reward and incentive systems (19%).

Grant (1996) proposed that organizational capabilities are the outcome of knowledge-integration. Gold et al. (2001) empirically developed that concept into the organizational capability theory of knowledge management effectiveness. The mainstream literature, particularly from the knowledge-based view, considers employees' tacit knowledge a critical resource that should be transferred to the organization, hence, integrated by the organization (e.g., Grant, 1996; Nonaka & Konno, 1998; Nonaka & Takeuchi, 1995; Raisinghani, 2000; Yang & Chen, 2007). Therefore, it stands to reason that firms should develop knowledge-integration capabilities. J. N. Lee's (2001) empirical research revealed that knowledge integration is a key capability for effective knowledge sharing. Gold et al. operationalized knowledge integration through four knowledge management process activities—acquisition, conversion, application, and protection.

Knowledge management processes are required to leverage the infrastructure for the purposes of storing, transforming, and transporting knowledge efficiently throughout the organization (Almeida, 1996; Appleyard, 1996; Gold et al., 2001; Grant, 1996; C-P. Lee et al., 2007; J. N. Lee, 2001; Leonard, 1995; Nonaka & Konno, 1998; Nonaka & Takeuchi, 1995; Porter-Liebskind, 1996; Spender, 1996; Yang & Chen, 2007). Developing both infrastructure and process capability enables a firm to integrate and use new knowledge and, therefore, create new knowledge (Nahapiet & Goshal, 1998; Nonaka & Takeuchi, 1995). For that reason, new knowledge can be considered the product of an

effective knowledge management program. Accordingly, effective knowledge management is believed to contribute to organizational performance and lead to a competitive advantage (Amit & Schoemaker, 1993; Chuang, 2004; Drucker, 1992; Jolly & Thérin, 2007; Kogut & Zander, 1992; Narasimha, 2000; Spender & Grant, 1996).

Organizational Effectiveness

Organizational effectiveness is broadly defined by Daft (1995, p. 53) as the ability to reach organizational goals as measured by the firm's performance, whereby performance is the optimal measure of a firm assessed by productivity, effectiveness, and employee morale. Employee morale is outside the context of this research, but productivity and effectiveness provide appropriate measures and can be used as proxies for organizational performance (Kalling, 2003; C-P. Lee et al., 2007; J. N. Lee, 2001). External factors (consisting of economic growth, profitability, intensity of competition, and user preferences) and internal factors (consisting of cost structure, efficiency, size of the firm, and revenue) all play a part in organizational effectiveness (Gold et al., 2001; C-P. Lee et al.; J. N. Lee). Therefore, three aspects can be used to measure organizational effectiveness: innovativeness, adaptability, and efficiency. The indicators of these aspects are an improved ability to innovate, anticipate surprises, and coordinate efforts, quicker commercialization of new products and services, quicker response to market change, and reduced redundancy of information and knowledge (Gold et al.).

Gold et al. (2001) argued that organizational effectiveness is the outcome of the combined effectiveness of knowledge-infrastructure capability and knowledge-process capability. However, this argument lacks solid empirical evidence. Therefore, this study tested the hypotheses that infrastructure capability and process capability are correlated

with organizational effectiveness (see Figure 5), which helps to answer Research Question 1.

Research Question 1: To what extent can organizational effectiveness be predicted by assessing knowledge infrastructure capability and knowledge process capability?

Hypothesis 1. Infrastructure capability is positively related to organizational effectiveness.

Hypothesis 2. Organization-process capability is positively related to organizational effectiveness.

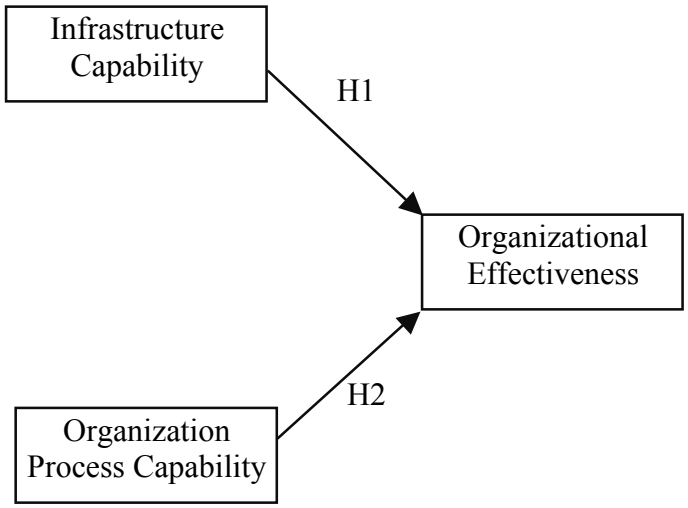

Figure 5. Constructs of research hypotheses 1 and 2.

Knowledge Infrastructure Capability

The literature is replete with examples of critical elements of effective knowledge management, including organizational culture, structure, technology, and processes (e.g., Alavi et al., 2006; Becerra-Fernandez et al., 2004; Chin-Loy & Mujtaba, 2007; Goh,

1998, 2003; Gold et al., 2001; O'Dell & Grayson, 1998; Orlikowski, 2000; Stankowsky, 2005; Sutton, 2001; Verkasalo & Lappalainen, 1998; Walczak, 2005; Widen-Wulff & Ginman, 2004; Yang & Chen, 2007). Yet, a review of the literature revealed a lack of empirical research regarding the relationship of any one of these elements (culture, structure, technology, and processes) with company performance or knowledge management effectiveness, and even fewer studies that considered these elements collectively. The content and theoretical grounding of infrastructure capability, consisting of cultural, structural, and technological infrastructures, are explained in this section.

Cultural Infrastructure Capability

The cultural component of infrastructure capability refers to the firm's vision and values, the attitudes toward learning, and the cultural influences on interaction and collaboration. One of the most significant hurdles to effective knowledge management is organizational culture (Gold et al., 2001; Lee & Choi, 2003; Hinds & Aronson, 2002) due to the difficulties in shaping the culture to align with knowledge management goals (Roth, 2004; Sanchez, 2004).

Interaction. Interaction is an important component of organizational culture, knowledge transfer (Nonaka & Konno, 1998), and social networking (Zander & Kogut, 1995). Interaction creates new ideas and, for this reason, is essential for the innovation process (Arrow, 1962; Leonard, 1995; Leonard & Sensiper, 1998). Interaction and collaboration should be encouraged so that employees not working in close proximity can share perspectives, relationships, and context (O'Dell & Grayson, 1998). The culture should encourage a sense of involvement and contribution through interaction (Davenport

et al., 1996; O'Dell & Grayson) to promote necessary change to meet organizational goals (Kanter, Stein, & Jock, 1992; Nonaka & Takeuchi, 1995).

Vision. A shared corporate vision is defined as the corporate vision that is clearly communicated by management and shared by employees throughout the organization (Kanter et al., 1992; Leonard, 1995). A clearly communicated vision creates a sense of unity and gives employees a needed sense of purpose, resulting in better attitudes toward knowledge sharing (Davenport et al., 1998; Gold et al., 2001; O'Dell & Grayson, 1998). It is intended to generate change by means of a clear purpose conveying the organization's desired direction (Kanter et al., 1992).

Values. Corporate values are an essential part of the corporate culture (Leonard, 1995). Values establish the types of knowledge management activities that will be tolerated and encouraged (Davenport & Prusak, 1998; Gold et al., 2001; Leonard, 1995). Trust and openness, as noted by Gold et al., are frequently cited as the values that promote knowledge management behaviors (e.g., Von Krogh, 1998). Firms that highly value knowledge will have a culture of trust and promote problem solving by employees at all levels (Gold et al.; O'Dell & Grayson, 1998); will rate experience, expertise, and innovation higher than rank and tenure (Davenport et al., 1998); and will highly value experimentation, innovation, and new ideas (Gold et al.).

Cultural change. A critical success factor of knowledge management is the firm's ability to change (Marshall, Prusak, and Shpilberg, 1996; Sutton, 2001). Zack (2003) asserted that while many firms comprehend the competitive necessity of developing effective knowledge management programs, few understand how to carry out the cultural changes required to make it happen. Shaping the organizational culture is difficult (Roth,

2004; Sanchez, 2004). Cultural shifts are more easily achieved in companies with fewer employees, smaller groups in a large organization, and firms characterized as entrepreneurial (Becerra-Fernandez et al., 2004). This is due to the subcultures that exist in smaller groups whereby the employees exhibit more flexibility toward cultural change (Janz & Prasarnphanich, 2003; Walczak, 2005).

Subcultures. While the group will have the organizational culture in common, it will also have a unique subculture shared by the individuals within the group (Cooke & Rousseau, 1998; Trice, 1993) who will exhibit different problem solving and knowledge-sharing behaviors (Huang, Newell, Galliers, & Pan, 2003; Janz & Prasarnphanich, 2003). A corporate subculture, as defined by Schein (1992), is

> A pattern of basic assumptions, invented, discovered or developed by a given group as it learns to cope with its problems of external adaptation and internal integration, that has worked well enough to be considered valid and therefore is to be taught to new members as the correct way to perceive, think and feel in relation to those problems. (p. 12)

A subculture is a localized variation of the organization's culture resulting from pressures within a group to have shared values and expectations (Balthazard, Cooke, & Potter, 2006). Peachey (2006) empirically found that a subculture had a stronger influence than the overarching corporate culture on the team's knowledge management activities. Peachey surmised that although knowledge management may be effective in a team, it may be ineffective across the organization, and therefore suggested further testing of this assumption.

Structural Infrastructure Capability

The structural component of infrastructure capability refers to the formal organizational design structure, and the incentive and reward systems. Organizational

structure is cited in the literature as having a positive impact on knowledge sharing (Goh, 2003; Gopalakrishnan & Santoro, 2004; Yang & Chen, 2007). The structural infrastructure enables a firm to leverage its technological architecture (Gold et al., 2001; Holsapple & Joshi, 2001; Leek, Turnbull, & Naude, 2003; Orlikowski, 2000; Walczak, 2005; Yang & Chen, 2007).

Hierarchical design structure. Grant (1996) asserted that a traditional hierarchical structure is more useful for processing information than for integrating knowledge. Nonaka (1994) suggested that hierarchical structures do not facilitate tacit-to-tacit knowledge transfer due to the personal nature of tacit knowledge. Brown and Duguid (1998) pointed out that hierarchical structures have inherent weaknesses that are not conducive to effective knowledge management. Hierarchical structures predispose a firm to distinguish strategy (knowledge required at the top) from tactics (knowledge used at the bottom), and thinkers (mental labor) from doers (manual labor), which means ignoring the value of knowledge creation at all levels in the firm (Brown & Duguid). Accordingly, a hierarchical structure will be problematic when higher-level decisions require the tacit knowledge of lower-level employees (Grant, 1996).

Knowledge-based design structure. Nonaka (1991, 1994) posited that knowledge-based organization designs are flatter and more dynamic, will empower people at all levels, and appreciate intellect as a resource. Sanchez and Mahoney (1996) suggested that flexibility is an essential structural design component of an effective knowledge management system. Sutton (2001) added that flexibility enables the firm to adapt as new knowledge is acquired.

Reward and incentive systems. Organizational structure can promote or inhibit interaction and collaboration (O'Dell & Grayson, 1998). It is a natural human tendency to hoard knowledge and to guardedly look at the knowledge shared by others (Cole-Gomolski, 1997; Davenport & Prusak, 1998). Personal knowledge is perceived as a source of power, which is a sense of value and status achieved through expertise (Quinn, Anderson, & Finkelstein, 1996). Sharing that expertise creates a fear of diminished value (Al-Alawi et al., 2007). Rewarding individualistic behavior encourages and promotes knowledge hoarding (O'Dell & Grayson) because it encourages people to distinguish themselves from their coworkers (Bock, Zmud, Kim, & Lee, 2005; Huber, 2001; Janz & Prasarnphanich, 2003). Extrinsic, materialistic rewards are less effective than intrinsic rewards for encouraging collaboration and tacit-to-tacit knowledge transfer (Peachey, 2006; Wasko & Faraj, 2005). Reward systems are often based on individual efforts and should be structured around sharing knowledge (Scheraga, 1998) and collaboration (Gold et al., 2001).

Organizational structure of teams. Proponents of the knowledge-based view argue that organizations should be structured by their social networks and not by demographic criteria (e.g., Reagan, Zuckerman, & McEvily, 2004). This concept is supported by research emphasizing that today's knowledge workers collaborate in teams (e.g., Janz & Prasarnphanich, 2003; Liebowitz et al., 2007). The organizational structure of teams emphasizes collaboration and interaction, which are antecedents of organizational learning (Hult, 1998; Hult et al., 2000). Bixler (2002) empirically found that knowledge transfer and collaboration occur more in small groups. Bollinger and Smith (2001) empirically revealed that most knowledge sharing occurs in business units

instead of across business units. This is supported by the perspective of the knowledge-based view whereby effective knowledge management requires integrating knowledge that resides in individuals and groups (Grant, 1996, 1997), and therefore a team-based design structure is pertinent to creating value for the organization through knowledge use (Janz & Prasarnphanich, 2003).

Walczak (2005) found that knowledge transfer across business units is most effective when organized around cross-functional teams, and further revealed that knowledge management effectiveness is best achieved through a grassroots implementation approach by lower-level management. However, Gold et al. (2001) warned that optimization of knowledge sharing in a business unit could suboptimize the sharing of knowledge across the organization. Still, Peachey (2006) empirically revealed that structure was not a significant predictor of knowledge management effectiveness and suggested it can be explained by Orlikowski's (2000) argument that people will circumvent the structure to get their job done.

Technological Infrastructure Capability

The technology component of infrastructure capability refers to the technology-enabled ties in a firm. The technological infrastructure in the form of a robust communication network eliminates communication barriers that occur between business units (Gold et al., 2001; Holsapple & Joshi, 2001; Leek et al., 2003). It enables employees to circumvent the artificial and imposed barriers of structure and culture (Orlikowski, 2000). Through the linkage of information and communication systems, previous flows of information and knowledge can be integrated (Edgington & Chen, 2002; Gold et al.). It has been noted that technology comprises an important element in

the creation of new knowledge (e.g., Davenport & Prusak, 1998; Leonard, 1995; Leonard & Sensiper, 1998; Teece, 1998) and, therefore, innovation (e.g., Duffy, 1999, 2000; Gloet & Terziovski, 2004; Ju et al., 2006; Leonard, 1995; Plessis, 2007; Therin, 2003). Technology enablement is seen in the areas of business intelligence, collaboration, distributed learning, knowledge discovery, knowledge mapping, opportunity generation, and security (Grant, 1997; Leonard, 1995).

Constructs of Knowledge Infrastructure Capability

While technology is a critical enabler of knowledge management (Alavi & Leidner, 2001), effective knowledge management requires social support (cultural and structural) in addition to technological solutions (Butler, 2003). Although cultural, structural, and technological infrastructures are posited as significant predictors of infrastructure capability (Gold et al., 2001), they lack empirical validation. Rooted in the above findings, this study tested the following hypotheses (see Figure 6), which help to answer Research Question 1.

Hypothesis 3. Culture is a significant component of infrastructure capability.

Hypothesis 4. Structure is a significant component of infrastructure capability.

Hypothesis 5. Technology is a significant component of infrastructure capability.

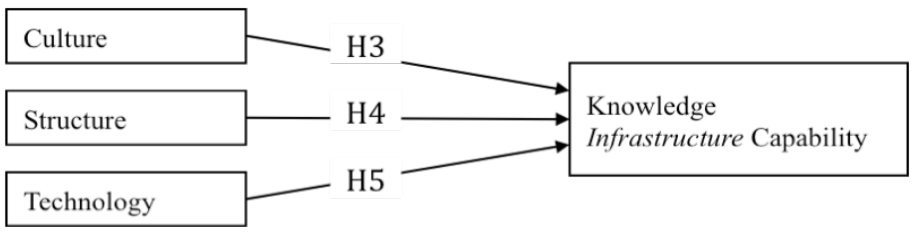

Figure 6. Constructs of research hypotheses 3, 4, and 5.

Knowledge Process Capability

To leverage infrastructure, knowledge management processes must be present that store, transform, and transfer knowledge (Davenport et al., 1996; Gold et al., 2001; C-P. Lee et al., 2007; J. N. Lee, 2001). Effective knowledge management requires the organization to form processes that encourage the flow of knowledge (Allee, 2000; Liebowitz et al., 2007).

Numerous attempts to define knowledge management processes have been made. Ruggles (1998) identified three knowledge management processes: generation, codification, and transferring. Nonaka and Takeuchi (1995) posited four knowledge-conversion processes: socialization, externalization, combination, and internalization. Bhatt (2001) identified five process activities of knowledge flow: creation, validation, formatting, distribution, and application. Egbu, Gaskell, and Howes (2001) identified seven knowledge process activities: creation, capturing, sharing, transferring, implementation, exploitation, and measuring. Tiwana (2002) suggested four steps in knowledge management activities: creating new, packaging and assembling, applying, and reuse and revalidation. Bose (2004) identified five key enablers: strategy, culture, infrastructure, technology, and measurement. However, regardless of the particular knowledge activity, without the process of knowledge integration, knowledge management programs will not succeed (Gold et al., 2001; Grant, 1997; Ju et al., 2006).

Gold et al. (2001) identified four fundamental knowledge management processes: knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection. Lin (2007, p. 644) argued that the four processes identified by Gold et al. are "sufficiently broad to permit complete analysis of organizational KM [knowledge

management] capabilities." This research concurs with Lin's argument based on an extensive review of the academic and practitioner literature.

Knowledge Acquisition Process

Acquisition refers to knowledge management processes oriented toward knowledge accumulation (Gold et al., 2001). An important aspect of knowledge acquisition is innovation, whereby new knowledge is created from the application of existing knowledge (Gold et al.; C-P. Lee et al., 2007; Nahapiet & Ghoshal, 1998; Nonaka & Takeuchi, 1995). This refers to the improved use of existing knowledge, such as the knowledge that is created through experimentation (Leonard-Barton, 1992), and knowledge that is acquired by identifying knowledge gaps (differences between what is known and what should be known), such as through benchmarking (Zack, 1999a, 1999b). Benchmarking is the identification of best practices from which to identify gaps and opportunities for improvement in the firm's practices (Marti, 2000). This requires an absorptive capacity to recognize, understand, and capture knowledge from a variety of sources (Cohen & Levinthal, 1990; Kogut & Zander, 1992; Porter-Liebskind, 1996), and knowledge-integration to effectively apply that knowledge (Gold et al.; Grant, 1997).

Knowledge Conversion Process

Once knowledge is acquired, it has to be prepared for use. The conversion-oriented process refers to the activities of making the firm's existing knowledge useful (Gold et al., 2001). Armistead (1999) posited that the conversion process is a basic input–output knowledge-transformation process (see Figure 7).

The inputs (consisting of data, information, knowledge, customer knowledge, and embedded knowledge materials) are converted to produce the outputs (consisting of

intellectual capital, enhanced knowledge, and knowledge embedded in products and customers), which in turn become inputs. Armistead's (1999) model is a cyclical knowledge conversion process. Accordingly, the process of knowledge-conversion can be seen as a process of knowledge creation (Grant, 1996; Nonaka & Takeuchi, 1995). Gold et al. (2001) asserted that the processes to enable knowledge conversion include the firm's ability to integrate (Porter-Liebskind, 1996), organize (Davenport & Klahr, 1998; O'Dell & Grayson, 1998), combine structure, coordinate (Sanchez & Mahoney, 1996), or distribute knowledge (Davenport et al., 1996; Davenport et al., 1998; Zander & Kogut, 1995). The knowledge must be structured and stored in a way that allows for searching, indexing, retrieving, and sharing so that it can be converted (Alavi & Leidner, 2001).

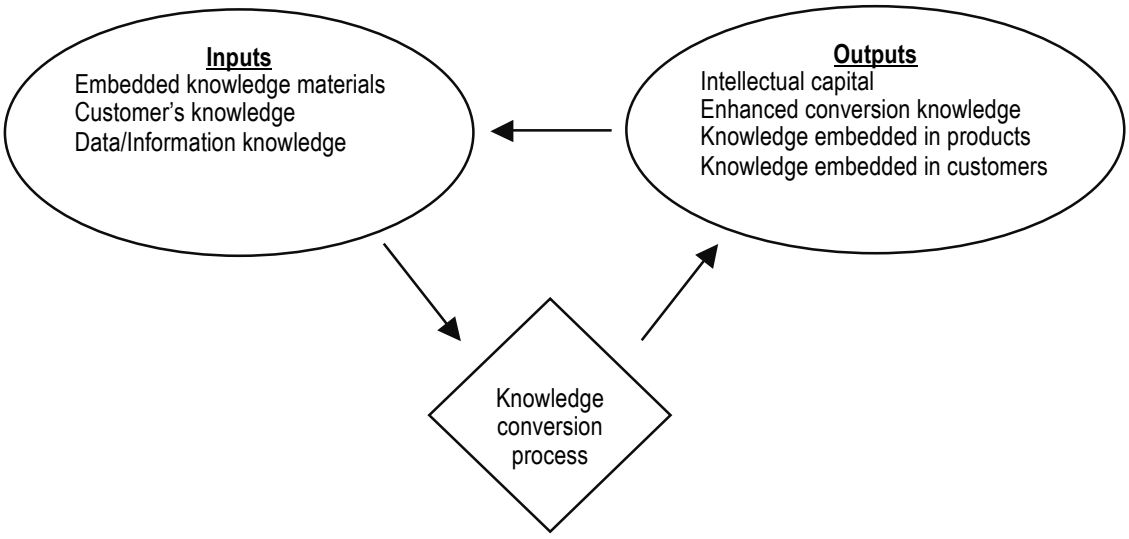

Figure 7. Input-Output Knowledge Conversion Model.

From "Knowledge Management and Process Performance," by C. Armistead, 1999, *Journal of Knowledge Management, 3*(2), p. 144.

Knowledge Application Process

Once the knowledge is converted, it is applied. The knowledge-application process refers to the processes that are oriented toward the actual use of the knowledge after it is converted (Gold et al., 2001; Verkasalo & Lappalainen, 1998).

Zack (1999b) proposed that knowledge as a process cannot be separated from its respective action—application. This means that knowledge without application is considered information, as supported by the aforementioned definitions of knowledge: knowledge is information applied to solve a problem (Hinds & Aronson, 2002), and knowledge is information in use (O'Dell et al., 1998). Nonaka and Takeuchi (1995) argued that the process of applying tacit knowledge occurs at the precise moment when new knowledge is acquired and put to use.

C-P. Lee et al. (2007) defined knowledge application as the effective storage and retrieval mechanisms that enable access to knowledge. They further explained that while the conversion process structures and organizes knowledge so it can be retrieved and shared, the application process is the actual process of knowledge retrieval and knowledge sharing.

Gold et al. (2001) noted that the literature has paid little attention to the outcomes of effectively applying knowledge: "it seems to be largely assumed or implied as opposed to treated explicitly" (p. 191). An extensive review of the literature finds concurrence with Gold et al. For example, researchers such as Nonaka and Takeuchi (1995), Bhatt (2001), Egbu et al. (2001), and Tiwana (2002) offered knowledge creation as a critical component of effective knowledge management, but seemed to assume that it will be effectively applied after it is created.

Knowledge Protection Process

Security-oriented processes are those "designed to protect the knowledge within an organization from illegal or inappropriate use and theft" (Gold et al., 2001, p. 192). For a firm to generate and preserve a competitive advantage, it is vital that its knowledge is protected. Without security, knowledge loses its rareness and inimitability, the key qualities that make it a source of competitive advantage (Gold et al.; Lin & Lee, 2005; Porter-Liebskind, 1996). Bock et al. (2005) empirically found that the only time knowledge sharing is intentionally limited is when industrial espionage is a concern. Protecting knowledge involves the use of technology and also appropriate policies and procedures. An extensive review of the literature revealed that in the field of knowledge management, little discussion exists regarding the significance of knowledge protection.

Constructs of Knowledge Process Capability

A number of studies discussed the importance of applying, converting, and applying knowledge for achieving knowledge management effectiveness. Yet, few studies examine the role of knowledge protection in knowledge management, and even fewer have empirically examined knowledge process capability. Therefore, it is valuable to broaden the understanding of knowledge processes as a dependent capability of knowledge management effectiveness. As such, this study tested Gold et al.'s (2001) theory that knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection are significant components of the organization's knowledge management process capability. Based on the discussion, the following hypotheses were tested (see Figure 8).

Hypothesis 6. Knowledge acquisition is a significant component of organization-process capability.

Hypothesis 7. Knowledge conversion is a significant component of organization-process capability.

Hypothesis 8. Knowledge application is a significant component of organization-process capability.

Hypothesis 9. Knowledge protection is a significant component of organization-process capability.

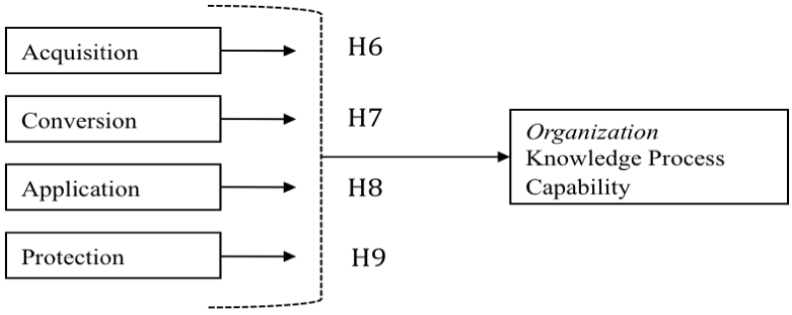

Figure 8. Constructs of research hypotheses 6, 7, 8, and 9.

Dual Perspective Assessment of Knowledge Process Capability

Most knowledge management assessment is performed at the organization level and, therefore, the literature in the field is too general when describing the organizations in which knowledge management has a high probability of success (Serenko et al., 2007). Using only the organization as the unit of analysis fails to consider that knowledge is created through the interaction of individuals and teams (Grant, 1996; Nonaka, 1991; Nonaka & Takeuchi, 1995), and that today's knowledge workers collaborate and interact

in teams (Janz & Prasarnphanich, 2003; Liebowitz et al., 2007), thereby creating knowledge through dialogue and discussion (Nonaka, 1991).

Connelly and Kelloway (2003) empirically demonstrated that as an organization grows, intra-organizational knowledge sharing diminishes due to changes in social interactions between teams. Walczak (2005) empirically revealed that knowledge management processes are more successful when implemented in smaller groups, such as a project team or business unit. This is supported by Serenko et al.'s (2007) findings that knowledge management processes are more effective when developed in smaller groups of a large organization first and then linked intra-organizationally. A review of the practitioner literature on knowledge management revealed that firms find it too complex and ineffective to attempt a company-wide implementation that requires change beyond technological systems, and therefore tend toward team-level implementation.

A characteristic of a knowledge-based firm is the empowerment of people at all levels (Nonaka, 1991, 1994). In such environments, people are empowered to develop processes to circumvent the cultural and structural barriers that keep them from getting their job done (Orlikowski, 2000). This is also true of teams who develop their own knowledge management processes to meet specific needs regarding the use information and knowledge (Peachey 2006). In knowledge-based firms, Peachey found that teams are more influenced by their own subculture than by the corporate culture, which is partly responsible for the problems of duplicated efforts and ad-hoc knowledge management processes across the firm.

No known studies exist that examine knowledge management processes using the team as the unit of analysis. Using only the organization as the unit of analysis would provide little guidance on how business leaders can influence the success of knowledge management programs (Grant, 1996; Hedberg, 1981; Janz & Prasarnphanich, 2003; Lynn et al., 2000), and thereby would present an incomplete picture when assessing the relationship of organizational capabilities with knowledge management effectiveness.

If teams develop processes to circumvent the organization's infrastructure, it stands to reason that instead of infrastructure driving the firm's desired knowledge management behaviors, the team's knowledge management activities may determine the development of the infrastructure. Yet, this theory has never been examined. This research broke new ground in the field of knowledge management by examining this supposition.

Based on the discussion, it is hypothesized that team process capability has a relationship to infrastructure capability (see Figure 9), and organizational effectiveness (see Figure 10). This study tested the following hypotheses, which help to answer Research Questions 2 and 3.

Research Question 2: What is the relationship between knowledge-infrastructure capability and knowledge-process capability?

Hypothesis 10. Team-process capability is positively related to infrastructure capability.

Hypothesis 11. Team-process capability is positively related to organization-process capability.

Hypothesis 12. Organization process capability is positively related to infrastructure capability.

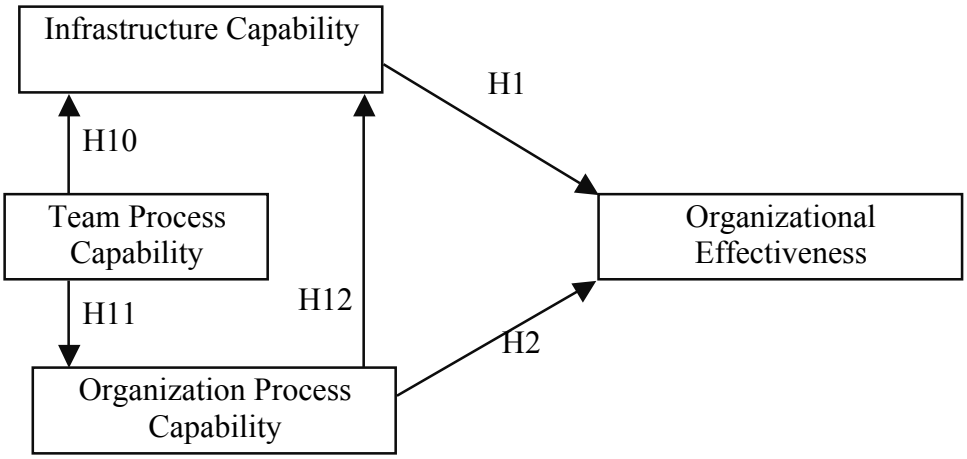

Figure 9. Constructs of research hypotheses 10, 11 and 12.

Research Question 3. To what extent does team-level knowledge process capability influence the organization?

Hypothesis 13: Knowledge acquisition is a significant component of team-process capability.

Hypothesis 14: Knowledge conversion is a significant component of team-process capability.

Hypothesis 15: Knowledge application is a significant component of team-process capability.

Hypothesis 16: Knowledge protection is a significant component of team-process capability.

Hypothesis 17: Team-process capability is positively related to organizational effectiveness.

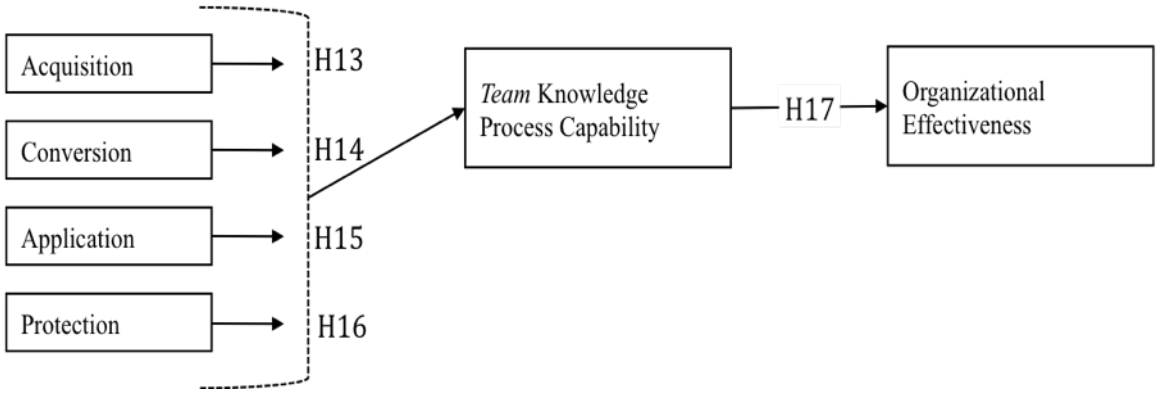

Figure 10. Constructs of research hypotheses 13, 14, 15, 16, and 17.

Summary

Knowledge management has become one of the most important trends in business, yet it is difficult for firms to achieve knowledge management effectiveness. To understand the success and failure of knowledge management, the firm must identify and assess the capabilities required for the effort to prosper (Gold et al., 2001), which is the focus of this study. Literature has offered important theoretical grounding for this study with regard to organizational capability as a predictor of effectiveness. The capabilities have been identified as infrastructure capability (consisting of cultural, structural, and technological) and process capability (consisting of knowledge acquisition, conversion, application, and protection) (Gold et al., 2001). Assessment of the relationships between infrastructure capability, process capability, and organizational effectiveness is lacking. In addition, research will be more valuable if the unit of analysis is aligned with the practitioner's level of knowledge management implementation. Therefore, this study assessed knowledge-process capability from the team perspective in contrast to the organization perspective. This relationship has not been examined in the literature, so this study provides a valuable contribution to the body of knowledge. The research methodology by which these relationships were examined is outlined in Chapter III.

Chapter III

Methodology

The purpose of this study is to identify and assess the relationships between organizational effectiveness, infrastructure capability, and process capability. To help bridge the gap between theory and practice, the units of analysis were both the team and the organization. The purpose is also to provide empirical validation of the Gold et al. (2001) theory that organizational effectiveness is the combined measure of knowledge infrastructure capability and knowledge process capability, which helps to fill the void of standards for assessing effectiveness. The organizational-capability-perspective theory developed by Gold et al. is a useful theoretical foundation, and provides the surrogate constructs for this research.

Research Questions

The research questions that were investigated are as follows:

1. To what extent can organizational effectiveness be predicted by assessing knowledge infrastructure capability and knowledge process capability?
2. What is the relationship between knowledge-infrastructure capability and knowledge-process capability?
3. To what extent does team knowledge management process capability influence the organization?

Population and Sample

The population for this study is Fortune 100 multinational, knowledge-based companies with a technological architecture in place. A knowledge based design structure was chosen because this design is more conducive to achieving effective knowledge

management than hierarchical structures (Nonaka, 1994). Other characteristics of the population are: a) individuals familiar with the organization's vision, values, objectives, structural elements, business processes, and the knowledge management programs; and b) knowledge workers involved in the daily flow of information and knowledge who use technology as a communication medium. It does not include employees ranked in the upper echelon, such as the CEO, President, and Vice President. This decision was based on the assumption that the highest-ranking employees would be too far removed from the daily flow of information and knowledge within and between different teams. The population was defined to align with the objectives of this study.

Because the population is too large to attempt a survey of all the members, a smaller sample was carefully chosen to reflect the stratum criteria of the population. Research in the literature often samples a few highly ranked employees from several companies who are removed from the daily knowledge flow, while this study sampled several employees from one large company who are involved in the daily knowledge flow. The aim of the sample size was approximately 250 employees in a Fortune 100 company. To represent the research population, the characteristics of the sample consisted of knowledge workers who: (a) rank from individual contributor through director; (b) are located in different functional teams across each of the geographical theaters in the company; (c) are familiar with the organization's structure, processes, knowledge management programs, and the company's vision, values, and objectives; and (d) use technology as a communication medium. The geographical theaters in the sample included: (a) the United States and Canada (US/Can); (b) Asia Pacific and Japan (APAC); (c) Europe, the Middle East, and Africa (EMEA); and (d) India. The India

theater is an outsourced company contracted solely by the main company identified for this study. The researcher was responsible for distributing the instruments and collecting data from the selected sample. A random sampling method was used to select a sufficient number of test subjects who meet the stratum criteria, such as location and rank. Then, the researcher worked with a few key people in the company to employ a purposeful stratified sampling method to select the teams that meet the stratum criteria and thus are most representative of the population. This type of sampling method facilitates comparisons and is common in quantitative research (Patton, 1990).

Data Collection

Data was collected through a formal survey. The items were randomly dispersed in the questionnaire, and a Likert-type scale was used to capture the respondents' level of agreement, ranging from 1 (strongly disagree) to 7 (strongly agree). The survey was administered electronically using the survey tool Survey Monkey, and the collected data was downloaded into spreadsheets. Only the researcher had access to the Survey Monkey tool. Electronic data-collection efforts result in higher response rates than traditional mail methodology (Baruch & Holtom, 2008).

Efforts to reduce non-response bias included administering the survey by email through the directors of the firm because the firm had indicated that a higher response rate is achieved when surveys are emailed by directors to their subordinates. The firm anticipated quick responses and indicated that those who complete the surveys usually do so within 10 days, and any non-response would be due to participants being on leave (vacation or other time off). Because of the sampling method used in the study, the researcher had no knowledge about which participants were on leave during the data

collection period. In return for participation, the researcher agreed to share the statistical results with the company.

The email to the participants included an introduction, description of the study, its purpose, a URL link to the web survey, and notifications that it will remain confidential and anonymous. To further ensure that enough responses were received for a valid analysis, follow-up reminder emails were sent. To enable control, the researcher worked with the managers and directors in sending reminder emails, which included a blanket "thank you" for those who had responded, and asked those who had not responded to do so within a specified time frame. The decision for how long to keep the survey open was determined by the response rate so that a satisfactory number of responses were received. It was expected that 250 surveys would be sent and at least 200 returned, representing an 80% response rate. However, 276 members were contacted and a total of 244 responses were received, representing a response rate of 88.4%. At the suggestion of the firm, the response rate of teams (not the responses) were tracked on an internal Wiki for each team to see because the firm had found that this spurs competitiveness, which increases the response rate. There were no personal identifiers, as the respondents remained anonymous.

At the survey website, participants were notified again that they will remain anonymous and their responses will remain confidential, and by completing the questionnaires they were providing their informed consent. Survey Monkey allows various survey designs. This survey was designed so that participants must answer all questions before proceeding to the next set of questions and before they could submit the survey. This increased the number of complete surveys.

IRB Process

Prior to executing the survey, the researcher received the required approval from the Nova Southeastern University Institutional Review Board (IRB). The researcher completed training modules and submitted the required IRB forms including a consent form clarifying the purpose, procedure, benefits, and potential harm of the study.

Instrumentation

The data collection instrument is comprised of four sections consisting of quantitative scaled response questions, which allows collection in a short period of time and encourages a high response rate (Sekaran, 2003). The first section is a list of the questions that comprise the analysis of knowledge-infrastructure capability, which uses measures of three subdimensions—cultural, structural, and technological. The second section consists of the questions that comprise team-level process capability and organization-level process capability respectively, whereby the same questions were asked from two different perspectives, for example, "My team has …," and "My organization has…." The third section consists of a list of questions that comprise organizational effectiveness.

The validity of the instrument was established in earlier research (Gold et al., 2001). A pretest is recommended by Burns and Bush (2003) to understand concerns about the questions so they can be revised before executing the main survey. Therefore, the instrument was pretested with a small sample of respondents to ensure the questions were clear and understood, and to identify problems the respondents may have encountered, as suggested by Zikmund, (2000).

Item Measures

The constructs identified for this study were adopted from Gold et al. (2001). Gold et al. (p. 193) noted that knowledge management lacks a strong empirical base and, therefore, derived the measures from "theoretical statements made in the literature or from assessments within the practitioner literature on knowledge management." The constructs use multiple-item measures, which increase accuracy and consistency when measuring the variables (Churchill, 1979; Nunnally, 1978). Measuring the variables with Likert-type scales facilitates standardizing and quantifying the relative effects (Gold et al.). The item measures for each of the constructs are outlined in this section. With each of the four process activities, the item measures were duplicated to represent both the organization perspective and the team perspective.

Knowledge Infrastructure Capability Item Measures

Cultural infrastructure. A strong knowledge culture encourages interaction and collaboration to promote the necessary change to meet organizational goals (Kanter et al., 1992; Nonaka & Takeuchi, 1995). The goals should be clearly communicated through the firm's vision and values, and should emphasize the role of knowledge in achieving the firm's goals (Gold et al., 2001). Cultural infrastructure was measured with a Likert-type scale ranging from 1 = strongly disagree to 7 = strongly agree (see Table 1).

Structural infrastructure. The structural component refers to the formal organizational design structure, and the incentive and reward systems. Organizational structure is cited in the literature as having a positive impact on knowledge sharing (Goh, 2003; Gopalakrishnan & Santoro, 2004; Yang & Chen, 2007) and enabling a firm to leverage its technological architecture (Gold et al., 2001; Holsapple & Joshi, 2001; Leek

et al., 2003; Orlikowski, 2000; Walczak, 2005; Yang & Chen, 2007). Structural infrastructure was measured with a Likert-type scale ranging from 1 = strongly disagree to 7 = strongly agree *(s*ee Table 2*)*.

Technological infrastructure. The technology component of infrastructure capability refers to the technology-enabled ties that exist within a firm. The technological infrastructure in the form of a robust communication network eliminates communication barriers that occur between business units (Gold et al., 2001; Holsapple & Joshi, 2001; Leek et al., 2003), and enables employees to circumvent the artificial and imposed barriers of structure and culture (Orlikowski, 2000). Technological infrastructure was measured with a Likert-type scale ranging from 1 = strongly disagree to 7 = strongly agree *(s*ee Table 3*)*.

Table 1

Item Measures of Cultural Infrastructure

Variable name	Item
	In my organization…
CI1	Employees understand the importance of knowledge to corporate success.
CI2	High levels of participation are expected in capturing and transferring knowledge.
CI3	Employees are encouraged to explore and experiment.
CI4	On-the-job training and learning are valued.
CI5	Employees are valued for their individual expertise.
CI6	Employees are encouraged to ask others for assistance when needed.
CI7	Employees are encouraged to interact with other groups.
CI8	Employees are encouraged to discuss their work with people in other workgroups.
CI9	Overall organizational vision is clearly stated.
CI10	Overall organizational objectives are clearly stated.
CI11	Knowledge is shared with other organizations (e.g., partners, trade groups).
CI12	The benefits of sharing knowledge outweigh the costs.
CI13	Senior management clearly supports the role of knowledge in our firm's success.

Table 2

Item Measures of Structural Infrastructure

Variable name	Item
	My organization (‘s)…
SI1	Structure* of departments and divisions inhibits interaction and sharing of knowledge.
SI2	Structure promotes collective rather than individualistic behavior.
SI3	Structure facilitates the discovery of new knowledge.
SI4	Structure facilitates the creation of new knowledge.
SI5	Bases our performance on knowledge creation.
SI6	Has a standardized reward system for sharing knowledge.
SI7	Designs processes to facilitate knowledge exchange across functional boundaries.
SI8	Has a large number of strategic alliances with other firms.
SI9	Encourages employees to go where they need for knowledge regardless of structure.
SI10	Managers frequently examine knowledge for errors/mistakes.
SI11	Structure facilitates the transfer of new knowledge across structural boundaries.
SI12	Employees are readily accessible.

Structure is defined as the rules, policies, procedures, processes, hierarchy of reporting relationships, incentive systems, and departmental boundaries that organize tasks in the firm.

Table 3

Item Measures of Technological Infrastructure

Variable name	Item
	My organization. . .
TI1	Has clear rules for formatting or categorizing it product knowledge.
TI2	Has clear rules for formatting or categorizing process knowledge.
	My organization uses technology that allows. . .
TI3	Employees to collaborate with others *inside* the organization.
TI4	Employees to collaborate with others *outside* of the organization.
TI5	People in multiple locations to learn as a group from a *single* source or at a single point in time.
TI6	People in multiple locations to learn as a group from *multiple* sources or at multiple points in time.
TI7	It to search for new knowledge.
TI8	It to map the location of specific types of knowledge (i.e., an individual, or database).
TI9	It to retrieve and use knowledge about its products.
T10	It to retrieve and use knowledge about its processes.
TI11	It to retrieve and use knowledge about its markets.
TI12	It to retrieve and use knowledge about its competitors.

Knowledge Process Capability Item Measures

Acquisition-oriented processes. Acquisition refers to the knowledge management processes oriented toward knowledge accumulation (Gold et al., 2001), improved use of existing knowledge (Leonard-Barton, 1992), and knowledge acquired by identifying the differences between what is known and what should be known (Zack, 1999a, 1999b). Acquisition-oriented processes were measured with a Likert-type scale ranging from 1 = strongly disagree to 7 = strongly agree. The item measures for organization acquisition processes are in Table 4, and for the team acquisition processes in Table 5.

Table 4

Item Measures of Organization Acquisition Processes

Variable name	Item
	My organization…
AQ1	Has processes for acquiring knowledge about our customers.
AQ2	Has processes for generating knowledge from existing knowledge.
AQ3	Has processes for acquiring knowledge about our suppliers.
AQ4	Uses feedback from projects to improve subsequent projects.
AQ5	Has processes for distributing knowledge throughout the organization.
AQ6	Has processes for exchanging knowledge with our business partners.
AQ7	Has processes for intra-organizational collaboration.
AQ8	Has processes for acquiring knowledge about new products/services in our industry.
AQ9	Has processes for acquiring knowledge about competitors in our industry.
AQ10	Has processes for benchmarking performance.
AQ11	Has teams devoted to identifying best practices.
AQ12	Has processes for exchanging knowledge between individuals.

Table 5

Item Measures of Team Acquisition Processes

Variable name	Item
	My team…
TAQ1	Has processes for acquiring knowledge about our customers.
TAQ2	Has processes for generating knowledge from existing knowledge.
TAQ3	Has processes for acquiring knowledge about our suppliers.
TAQ4	Uses feedback from projects to improve subsequent projects.
TAQ5	Has processes for distributing knowledge throughout the organization.
TAQ6	Has processes for exchanging knowledge with our business partners.
AQ7	Has processes for intra-organizational collaboration.
AQ8	Has processes for acquiring knowledge about new products/services in our industry.
AQ9	Has processes for acquiring knowledge about competitors in our industry.
AQ10	Has processes for benchmarking performance.
AQ11	Has teams devoted to identifying best practices.
AQ12	Has processes for exchanging knowledge between individuals.

Conversion-oriented processes. Once knowledge is acquired, it has to be prepared for use. The conversion–oriented process refers to the activities of making the firm's existing knowledge useful (Gold et al., 2001). The knowledge must be structured and stored in a way that allows for searching, indexing, retrieving, and sharing so that it can be converted (Alavi & Leidner, 2001). Conversion-oriented processes was measured with a Likert-type scale ranging from 1 = strongly disagree to 7 = strongly agree. The item measures for organization conversion processes are in Table 6, and item measures for team conversion processes are in Table 7.

Table 6

Item Measures of Organization Conversion Processes

Variable name	Item
	My organization…
CP1	Has processes for converting knowledge into the design of new products/services.
CP2	Has processes for converting competitive intelligence into plans of action.
CP3	Has processes for filtering knowledge.
CP4	Has processes for transferring organizational knowledge to individuals.
CP5	Has processes for absorbing knowledge from individuals into the organization.
CP6	Has processes for absorbing knowledge form partners into the organization.
CP7	Has processes for distributing knowledge throughout the organization.
CP8	Has processes for integrating different sources and types of knowledge.
CP9	Has processes for organizing knowledge.
CP10	Has processes for replacing outdated knowledge.

Table 7

Item Measures of Team Conversion Processes

Variable name	Item
	My team…
CP1	Has processes for converting knowledge into the design of new products/services.
CP2	Has processes for converting competitive intelligence into plans of action.
CP3	Has processes for filtering knowledge.
CP4	Has processes for transferring organizational knowledge to individuals.
CP5	Has processes for absorbing knowledge from individuals into the organization.
CP6	Has processes for absorbing knowledge form partners into the organization.
CP7	Has processes for distributing knowledge throughout the organization.
CP8	Has processes for integrating different sources and types of knowledge.
CP9	Has processes for organizing knowledge.
CP10	Has processes for replacing outdated knowledge.

Application-oriented processes. The knowledge-application process refers to the processes that are oriented toward the actual use of the knowledge after it is converted (Gold et al., 2001; Verkasalo & Lappalainen, 1998). Nonaka & Takeuchi (1995) argue that the process of applying tacit knowledge occurs at the point when new knowledge is acquired and put to use. C-P. Lee et al. (2007) define knowledge application as the effective storage and retrieval mechanisms that enable a firm to access knowledge. More specifically, while the conversion process structures and organizes knowledge so that it can be retrieved and shared, the application process is the actual retrieval and sharing process. Application-oriented processes was measured with a Likert-type scale ranging from 1 = strongly disagree to 7 = strongly agree. The item measures for organization application processes are in Table 8, and the team application processes are in Table 9.

Protection-oriented processes. Security-oriented processes are those "designed to protect the knowledge within an organization from illegal or inappropriate use and theft" (Gold et al., 2001, p. 192). For a firm to generate and preserve a competitive advantage, it is vital that its knowledge is protected. Knowledge protection process was measured with a Likert-type scale ranging from 1 = strongly disagree to 7 = strongly agree. The item measures for organization protection processes are in Table 10, and the item measures for the team protection processes are in Table 11.

Table 8

Item Measures of Organization Application Processes

Variable name	Item
	My organization…
AP1	Has processes for applying knowledge learned from mistakes.
AP2	Has processes for applying knowledge learned from experiences.
AP3	Has processes for using knowledge in development of new products/services.
AP4	Has processes for using knowledge to solve new problems..
AP5	Matches sources of knowledge to problems and challenges.
AP6	Uses knowledge to improve efficiency.
AP7	Uses knowledge to adjust strategic direction.
AP8	Is able to locate and apply knowledge to changing competitive conditions.
AP9	Makes knowledge accessible to those who need it.
AP10	Takes advantage of new knowledge.
AP11	Quickly applies knowledge to critical competitive needs.
AP12	Quickly links sources of knowledge in solving problems.

Table 9

Item Measures of Team Application Processes

Variable name	Item
	My team…
AP1	Has processes for applying knowledge learned from mistakes.
AP2	Has processes for applying knowledge learned from experiences.
AP3	Has processes for using knowledge in development of new products/services.
AP4	Has processes for using knowledge to solve new problems..
AP5	Matches sources of knowledge to problems and challenges.
AP6	Uses knowledge to improve efficiency.
AP7	Uses knowledge to adjust strategic direction.
AP8	Is able to locate and apply knowledge to changing competitive conditions.
AP9	Makes knowledge accessible to those who need it.
AP10	Takes advantage of new knowledge.
AP11	Quickly applies knowledge to critical competitive needs.
AP12	Quickly links sources of knowledge in solving problems.

Table 10

Item Measures of Organization Protection Processes

Variable name	Item
	My organization…
PP1	Has processes to protect knowledge from inappropriate use inside the organization.
PP2	Has processes to protect knowledge from inappropriate use outside the organization.
PP3	Has processes to protect knowledge from theft from within the organization.
PP4	Has processes to protect knowledge from theft from outside the organization.
PP5	Has incentives that encourage the protection of knowledge.
PP6	Has technology that restricts access to some sources of knowledge.
PP7	Has extensive policies and procedures for protecting trade secrets.
PP8	Values and protects knowledge embedded in individuals.
PP9	Knowledge that is restricted is clearly identified.
PP10	Clearly communicates the importance of protecting knowledge.

Table 11

Item Measures of Team Protection Processes

Variable name	Item
	My organization…
PP1	Has processes to protect knowledge from inappropriate use inside the organization.
PP2	Has processes to protect knowledge from inappropriate use outside the organization.
PP3	Has processes to protect knowledge from theft from within the organization.
PP4	Has processes to protect knowledge from theft from outside the organization.
PP5	Has incentives that encourage the protection of knowledge.
PP6	Has technology that restricts access to some sources of knowledge.
PP7	Has extensive policies and procedures for protecting trade secrets.
PP8	Values and protects knowledge embedded in individuals.
PP9	Knowledge that is restricted is clearly identified.
PP10	Clearly communicates the importance of protecting knowledge.

Organizational Effectiveness Item Measures

Organizational effectiveness is the outcome of the combined effectiveness of infrastructure capability and process capability (Gold et al., 2001). Three aspects can be

used to measure organizational effectiveness: innovativeness, adaptability, and efficiency (Gold et al., 2001; C-P. Lee et al., 2007; J. N. Lee, 2001). The indicators of these are improved ability to innovate, improved ability to anticipate surprises, improved coordination of efforts, quicker commercialization of new products and services, quicker response to market change, and reduced redundancy of information and knowledge (Gold et al.). Organizational effectiveness was measured with a Likert-type scale ranging from 1 = strongly disagree to 7 = strongly agree. When financial data are not available to assess organizational performance, a performance indicator or subject approach is most appropriate (Powell, 1992) (see Table 12).

Table 12

Item Measures of Organizational Effectiveness

Variable name	Item
	Over the past 2 years, my organization has improved its ability to…
EI1	Innovate new products/services.
EI2	Identify new business opportunities.
EI3	Coordinate the development efforts of different units.
EI4	Anticipate potential market opportunities for new products/services.
EI5	Rapidly commercialize new innovations.
EI6	Adapt quickly to unanticipated changes.
EI7	Anticipate surprises and crises.
EI8	Quickly adapt its goals and objectives to industry/market changes.
EI19	Decrease market response times.
EI10	React to new information about the industry or market.
EI11	Be responsive to new market demands.
EI12	Avoid overlapping development of corporate initiatives.
EI13	Streamline its internal processes.
EI14	Reduce redundancy of information and knowledge.

Research Hypotheses

Based on the research questions and literature review discussion, the following hypotheses were tested (see Figure 11). The alignment of the research questions, hypotheses, and dependent and independent variables are shown in Table 13.

Hypothesis 1

$H_0$1: Infrastructure capability is positively related to Organizational Effectiveness.

Ha1: Infrastructure capability is not positively related to Organizational Effectiveness.

Hypothesis 2

$H_0$2: Organization Process Capability is positively related to Organizational Effectiveness.

Ha2: Organization Process Capability is not positively related to Organizational Effectiveness.

Hypothesis 3

H03: Culture is a significant component of Infrastructure Capability.

Ha3: Culture is not a significant component of Infrastructure Capability.

Hypothesis 4

H04: Structure is a significant component of Infrastructure Capability.

Ha4: Structure is not a significant component of Infrastructure Capability.

Hypothesis 5

H05: Technology is a significant component of Infrastructure Capability.

Ha5: Technology is not a significant component of Infrastructure Capability.

Hypothesis 6

H06: Knowledge Acquisition process is a significant component of Organization Process Capability.

Ha6: Knowledge Acquisition process is not a significant component of Organization Process Capability.

Hypothesis 7

H07: Knowledge Conversion process is a significant component of Organization Process Capability.

Ha7: Knowledge Conversion process is a significant component of Organization Process Capability.

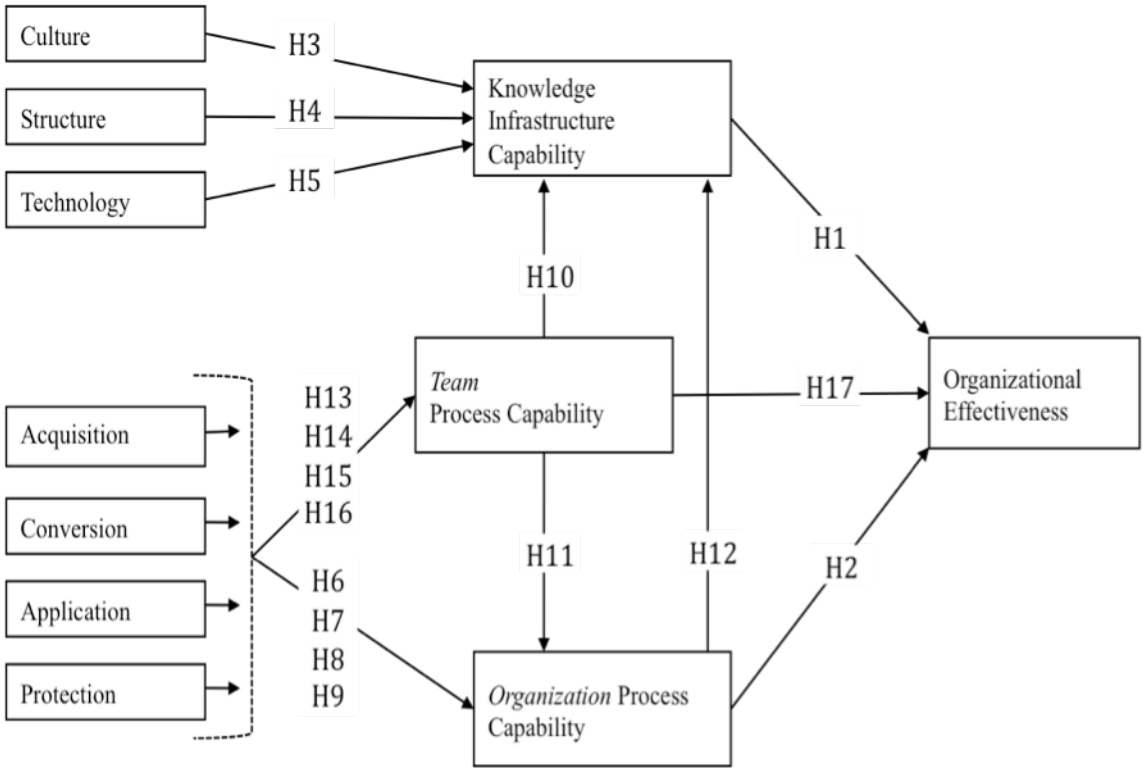

Figure 11. Research Model: Constructs & Hypotheses.

Hypothesis 8

H08: Knowledge Application process is a significant component of Organization Process Capability.

Ha8: Knowledge Application process is not a significant component of Organization Process Capability.

Hypothesis 9

H09: Knowledge Protection process is a significant component of Organization Process Capability.

Ha9: Knowledge Protection process is not a significant component of Organization Process Capability.

Hypothesis 10

H010: Team Process Capability is positively related to Infrastructure Capability.

Ha10: Team Process Capability is not positively related to Infrastructure Capability.

Hypothesis 11

H011: Team Process Capability is a significant component of Organization Process Capability.

Ha11: Team Process Capability is not a significant component of Organization Process Capability.

Hypothesis 12

H012: Organization Process Capability is positively related to Infrastructure Capability.

Ha12: Organization Process Capability is not positively related to Infrastructure Capability.

Hypothesis 13

H013: Knowledge Acquisition is a significant component of Team Process Capability.

Ha13: Knowledge Acquisition is not a significant component of Team Process Capability.

Hypothesis 14

H014: Knowledge Conversion is a significant component of Team Process Capability.

Ha14: Knowledge Conversion is not a significant component of Team Process Capability.

Hypothesis 15

H015: Knowledge Application is a significant component of Team Process Capability.

Ha15: Knowledge Application is not a significant component of Team Process Capability.

Hypothesis 16

H016: Knowledge Protection is a significant component of Team Process Capability.

Ha16: Knowledge Protection is not a significant component of Team Process Capability.

Hypothesis 17

H017: Team Process Capability is positively related to Organizational Effectiveness.

Ha17: Team Process Capability is not positively related to Organizational Effectiveness.

Table 13

Alignment of Research Questions, Hypotheses, and Variables

Research Question		Hypothesis	Independent Variables	Dependent Variables
1. To what extent can organizational effectiveness be predicted by assessing knowledge infrastructure capability and knowledge process capability?	H1	Infrastructure capability is positively related to organizational effectiveness.	Organizational Effectiveness	Infrastructure Capability
	H2	Organization process capability is positively related to organizational effectiveness.	Organizational Effectiveness	Organization-Process Capability
	H3	Culture is a significant component of infrastructure capability.	Infrastructure Capability	Culture
	H4	Structure is a significant component of infrastructure capability.	Infrastructure Capability	Structure
	H5	Technology is a significant component of infrastructure capability.	Infrastructure Capability	Technology
	H6	Knowledge acquisition is a significant component of organization-process capability.	Organization-Process Capability	Knowledge Acquisition
	H7	Knowledge conversion is a significant component of organization-process capability	Organization-Process Capability	Knowledge Conversion
	H8	Knowledge application is a significant component of organization-process capability	Organization-Process Capability	Knowledge Application
	H9	Knowledge protection is a significant component of organization-process capability	Organization-Process Capability	Knowledge Protection

Research Question		Hypothesis	Independent Variables	Dependent Variables
2. What is the relationship between knowledge-infrastructure capability and knowledge-process capability?	H10	Team-process capability is positively related to infrastructure capability.	Infrastructure Capability	Team-Process Capability
	H11	Team-process capability is positively related to organization-process capability.	Team-Process Capability	Organization-Process Capability
	H12	Organization-process capability is positively related to infrastructure capability.	Infrastructure Capability	Organization-Process Capability
3. To what extent does team knowledge management process capability influence the organization?	H13	Knowledge acquisition is a significant component of team-process capability.	Team-Process Capability	Knowledge Acquisition
	H14	Knowledge conversion is a significant component of team-process capability.	Team-Process Capability	Knowledge Conversion
	H15	Knowledge application is a significant component of team-process capability.	Team-Process Capability	Knowledge Application
	H16	Knowledge protection is a significant component of team-process capability.	Team-Process Capability	Knowledge Protection
	H17	Team-process capability is positively related to organizational effectiveness.	Organizational Effectiveness	Team-Process Capability

Data Analysis

To statistically assess the hypothesized relationships, this research utilized the structural-equation-modeling (SEM) approach (Anderson & Gerbing, 1988). SEM is better suited to explain the complex relationships in this research model whereby a variable is independent in one relationship, but dependent in another relationship, as demonstrated in Table 13. SEM explains the different patterns and significance of the relationships among the variables (Diamantopoulos, 1994), because it allows multiple relationships to be analyzed simultaneously (Kline, 1998). Tabachnick & Fidell (2001) suggest between 150 and 200 responses are needed when using SEM to analyze models,

such as those in this study. Researchers have suggested a dual process for applying SEM (Hair, Anderson, Tatham, & Black, 1995; Joreskog & Sorbom, 1996; Kline; Maruyama, 1998), whereby the confirmatory-factor models (measurement models) are tested before conducting SEM on the structural model.

The measurement model includes 136 items describing 12 constructs. Kline (1998) recommends assessing the variables through multiple data screening methods to identify data-related problems in the study through inspecting for completeness, normality, and outliers. Confirmatory factor analysis technique was used to examine the measurement model to remove non-representative items, assess the reliability of the constructs, and assess the correlation relationships among the constructs (Kline). The structural models identify the causal relationships among latent variables and, therefore, were used to identify and describe the causal effects and the degree of unexplained variance (Anderson & Gerbing, 1988).

Summary

This study incorporated measurements adopted from previously validated instruments to form a survey instrument. A survey was conducted on members of a professional organization. After securing approval from the IRB at Nova Southeastern University, a web-based survey was administered. SEM was utilized to analyze the data collected and the results of the analysis are discussed in Chapter IV.

Chapter IV

Analysis and Presentation of Findings

The purpose of this study is to identify and assess the relationships between organizational effectiveness, infrastructure capability, and process capability. The unit of analysis is both the team and the organization. The purpose is also to provide empirical validation of the Gold et al. (2001) theory that organizational effectiveness is the combined measure of knowledge infrastructure capability and knowledge process capability. The research model uses measures of three sub-dimensions for infrastructure capability (cultural, structural, and technological), four sub-dimensions for knowledge process capability (knowledge acquisition, conversion, application, and protection), and a single dimension for organizational effectiveness. These were analyzed in a disaggregated manner to achieve greater detail.

To test the identified hypothesized relationships and to answer the Research Questions, structural models were developed. The models were tested using structural equation modeling (SEM), which suggests casual and correlation relationships. The descriptive analysis was performed using SPSS to summarize the demographic information. Preceding the model testing, the data was checked for missing values, outliers, data entry accuracy, and variable distribution (see for example Tabachnick & Fidell, 2001). The results of the statistical analyses are presented in this chapter including characteristics of the sample, descriptive analysis, instrumentation reliability and validity analysis, and the results from the structural models.

Characteristics of the Sample

The respondents participated through a web-based survey. A total of 276 members were contacted and 244 responses were received, representing a response rate of 88.4%. The sample consisted of a total of 244 participants, with 154 participants from the Fortune 100 private firm, and 90 participants from its outsourced customer support team in India (referred to as "Out-Taskers"). The Researcher's point of contact in the Fortune 100 firm identified the Out-Taskers as being integral to the firm's knowledge management and communication systems. Because the Out-Tasker sample consists of one team, the item measures for knowledge processes at both the team and organization levels would be redundant. For that reason, team data is not available for the Out-Tasker sample and, thus, the two samples were analyzed separately.

The profiles of the participants were outlined by the components of job rank, length of service, and theater (geographical location). The individual component demographics are presented in Appendix A and are shown in a cross-comparison in Tables 14 through 17. The modal Fortune 100 respondent was an individual contributor in the U.S./Canada Theater employed between 5 and 8 years. The modal Out-Tasker respondent was an individual contributor in India employed between 2 and 5 years.

Table 14

Theater by Rank: Fortune 100 Sample (N=154)

		Rank				
Theater	Rate	Consultant/ Contractor	Individual Contributor	Manager	Director	Total
APAC	Frequency	7	14	4	2	27
	Percent	4.55%	9.09%	2.60%	1.30%	17.53%
EEME	Frequency	1	16	8	1	26
	Percent	0.65%	10.39%	5.19%	0.65%	16.88%
US/Canada	Frequency	6	80	14	1	101
	Percent	3.90%	51.95%	9.09%	0.65%	65.58%
Total by Frequency		14	110	26	4	154
Total by Percent			71.43%	16.88%	2.60%	100.00%

Table 15

Years of Service by Rank: Fortune 100 Sample (N=154)

		Years of Service					
Rank	Rate	< 2 years	2 to 5 years	5 to 8 years	8 to 11 years	>11 years	Total
Consultant/ Contractor	Frequency	7	4	3	-	-	14
	Percent	4.55%	2.60%	1.95%	-	-	9.09%
Individual Contributor	Frequency	33	15	27	29	6	110
	Percent	21.43%	9.74%	17.53%	18.83%	3.90%	71.43%
Manager	Frequency	3	2	13	5	3	26
	Percent	1.95%	1.30%	8.44%	3.25%	1.95%	16.88%
Director	Frequency	-	1	1	2	-	4
	Percent	-	0.65%	0.65%	1.30%	-	2.60%
Total by Frequency		43	22	44	36	9	154
Total by Percent		27.92%	14.29%	28.57%	23.38%	5.84%	100.00%

Table 16

Years of Service by Theater: Fortune 100 Sample (N=154)

		Years of Service					
Theater	Rate	< 2 years	2 to 5 years	5 to 8 years	8 to 11 years	>11 years	Total
APAC	Frequency	6	9	6	4	2	27
	Percent	3.90%	5.84%	3.90%	2.60%	1.30%	17.53%
EEME	Frequency	1	3	15	6	1	26
	Percent	0.65%	1.95%	9.74%	3.90%	0.65%	16.88%
US/Canada	Frequency	36	10	23	26	6	101
	Percent	23.38%	6.49%	14.94%	16.88%	3.90%	65.58%
Total by Frequency		43	22	44	36	9	154
Total by Percent		27.92%	14.29%	28.57%	23.38%	5.84%	100.00%

Table 17

Years of Service by Rank: Out-Tasker Respondent data (N=90)

		Years of Service					
Rank	Rate	< 2 years	2 to 5 years	5 to 8 years	8 to 11 years	>11 years	Total
Contractor/ Consultant	Frequency	-	-	-	-	-	-
	Percent	-	-	-	-	-	-
Individual Contributor	Frequency	39	38	4	-	-	81
	Percent	43.33%	42.22%	4.44%	-	-	90.00%
Manager	Frequency	-	3	2	-	-	5
	Percent	-	3.33%	2.22%	-	-	5.56%
Director	Frequency	1	2	1	-	-	4
	Percent	1.11%	2.22%	1.11%	-	-	4.44%
Total by Frequency		40	43	7	-	-	90
Total by Percent		44.44%	47.78%	7.78%	-	-	100.00%

Measurement Reliability and Validity of Major Constructs

Reliability refers to the accuracy of a measurement scale, and validity refers to the extent to which the scale measures the theoretical construct. In this study, construct validity was established through an extensive review of the literature, which is a common practice in quantitative research (Wainer & Braun, 1998). Cronbach's Coefficient alpha (symbolized as α) is commonly used to test for reliability of multi-item scales as it refers to whether items are sufficiently interrelated and estimates the reliability of internal scale consistency (Cooper & Emory, 1995, p. 153). For the alpha values to be acceptable as indicators of internal consistency, they must meet the threshold of 0.70, as suggested in the literature (e.g., Gefen, Straub, & Boudreau, 2000; Hair et al., 1995).

This research examined three major latent constructs identified as knowledge infrastructure capability, knowledge process capability, and organizational effectiveness. Knowledge infrastructure capability is defined by three latent sub-constructs of culture, structure, and technology. The item measures were adopted from Gold et al. (2001), and while the reliabilities were not mentioned in the Gold et al. study, the knowledge infrastructure capability measurement demonstrated high construct validity with factor loadings above 0.70. Knowledge process capability is defined by four latent sub-constructs of knowledge acquisition, conversion, application, and protection. This measure displayed high construct validity with factor loadings above 0.75. Gold et al.'s final measurement model displayed adequate model fit as indicated by a non-normed fit index (NNFI) of 0.90 and comparative fit index (CFI) of 0.91 (Bentler, 1990).

The Cronbach alpha values for each of the multi-item constructs were calculated. The reliabilities and percentage variance extracted for each scale for the Fortune 100

respondent data are presented in Table 18. All of the constructs, with the exception of culture, had a Cronbach alpha in excess of 0.70 and, thus, can be considered reliable. Established measures can be expected to meet the 0.70 alpha threshold (Hair et al., 1995), so since these sub-constructs have been tested before (e.g., Gold, et al. 2001) and are considered established measures, they can be expected to meet the 0.70 alpha threshold.

The variables for each scale (culture for example) were factor analyzed to determine their factor structure to assess construct validity. Factor analysis specifies the relationships of observed measures with latent constructs (Anderson & Gerbing, 1988). In this study, all cases yielded one significant factor that extracted at least 60% of the variance in the constituent variables. The variables in each scale were used to create a factor score that captured the common variance, thereby reducing measurement error. Coefficient estimates and their statistical significance can differ when analyzing constructs in an aggregated versus less aggregated fashion (Garrett, 2002). In view of that, and to achieve greater detail, the constructs knowledge infrastructure capability, knowledge process capability, and organizational effectiveness were analyzed in a disaggregated manner. For the purposes of this analysis, a Likert-type scale was used to capture the respondents' level of agreement ranging from 1 = strongly disagree to 7 = strongly agree.

Table 18

Reliabilities and Percentage Variance Extracted: Fortune 100 Sample

Scale	# Items	α	% Variance Extracted
Knowledge Infrastructure Capability			
Cultural	3	0.66	0.60
Structural	5	0.88	0.63
Technological	4	0.87	0.73
Team Knowledge Process Capability			
Acquisition	3	0.74	0.64
Protection	3	0.81	0.72
Application	3	0.88	0.80
Conversion	3	0.87	0.79
Organization Knowledge Process Capability			
Acquisition	4	0.83	0.67
Protection	4	0.89	0.76
Application	4	0.89	0.75
Conversion	5	0.87	0.66
Organizational Effectiveness	4	0.82	0.65

Results of Structural Equation Modeling

Structural Equation Modeling (SEM) was employed to test the hypotheses. The final SEM models are shown in Figure 12 for the Fortune 100 respondent data, and Figure 13 for the Out-Tasker respondent data. SEM analysis was used in preference to multiple regression analysis for three main reasons (Baines & Langfield-Smith, 2003; Dion, 2008; P. Dion, personal communication, December 27, 2008):

1. SEM estimates all coefficients in the model simultaneously. Therefore, the significance and strength of a particular relationship can be assessed in the context of the complete model.
2. In many models, an independent variable in one relationship becomes a dependent variable in other relationships, such as in this study. Regression

cannot manage this type of relationship among variables and requires the use of hierarchical regression.

3. The issue of multicolinearity is a problem in multiple regression. Multicolinearity is seen when there is a high degree of correlation between two or more independent variables. In SEM, multicolinearity can be modeled, and thereby assessed, because the relationships between predictor variables can be modeled. This means that the coefficients between the predictor variables and the dependent variables are partial derivatives. As a result, the influence of one predictor on another is held constant when estimating the predictor-dependent relationship. This yields a more valid predictor-dependent coefficient. The accounted for variance in the dependent variable may improve because indirect predictor-dependent relationships would be captured.

SEM consists of two parts: (a) factor analysis—assessing confirmatory measurement models and, (b) path analysis—assessing confirmatory structural models (Anderson & Gerbing, 1988). In this study, factor scores were developed for the indicators of the major latent constructs identified as knowledge infrastructure capability, knowledge process capability, and organizational effectiveness. Knowledge infrastructure capability is defined by three latent sub-constructs of culture, structure, and technology. Knowledge process capability is defined by four latent sub-constructs of knowledge acquisition, conversion, application, and protection.

Analysis of Fortune 100 Sample

Structural Equation Model: Fortune 100 Data

The final model for the Fortune 100 respondent data, presented in Figure 1, fit the sample data quite well with a chi sq/df ratio of 1.23, where 2 is a good fit, a probability of 0.143 which fails to reject the null hypothesis that the sample co-variance matrix is equal to the model co-variance matrix, and the fit indices GFI, AGFI and NFI all above the standard of 0.90. The model accounted for 79% of the variance in organizational effectiveness (OE). In Figure 12, the numbers on the arrows depict the standardized path coefficients, and the numbers above the upper right corner of the variables in the boxes depict the percentage variance in that variable accounted for by all the predictor variables.

The SEM model fit well and captured many relationships between the components of knowledge infrastructure capability and the knowledge processes at both the team and organization levels. These relationships would have been lost had simple regression been used. Organization knowledge-acquisition process and structural infrastructure had a direct influence on organizational effectiveness. The overall path of influence appears to be infrastructure (specifically culture and technology) influencing organization-level processes, which in turn influence team–level processes. This pattern should be of interest to management. Overall, the findings conform to the literature and the model explains a high degree of variance and, thus, gives credence to the Gold et al. (2001) model. The findings are discussed in more detail in the evaluation of the hypotheses.

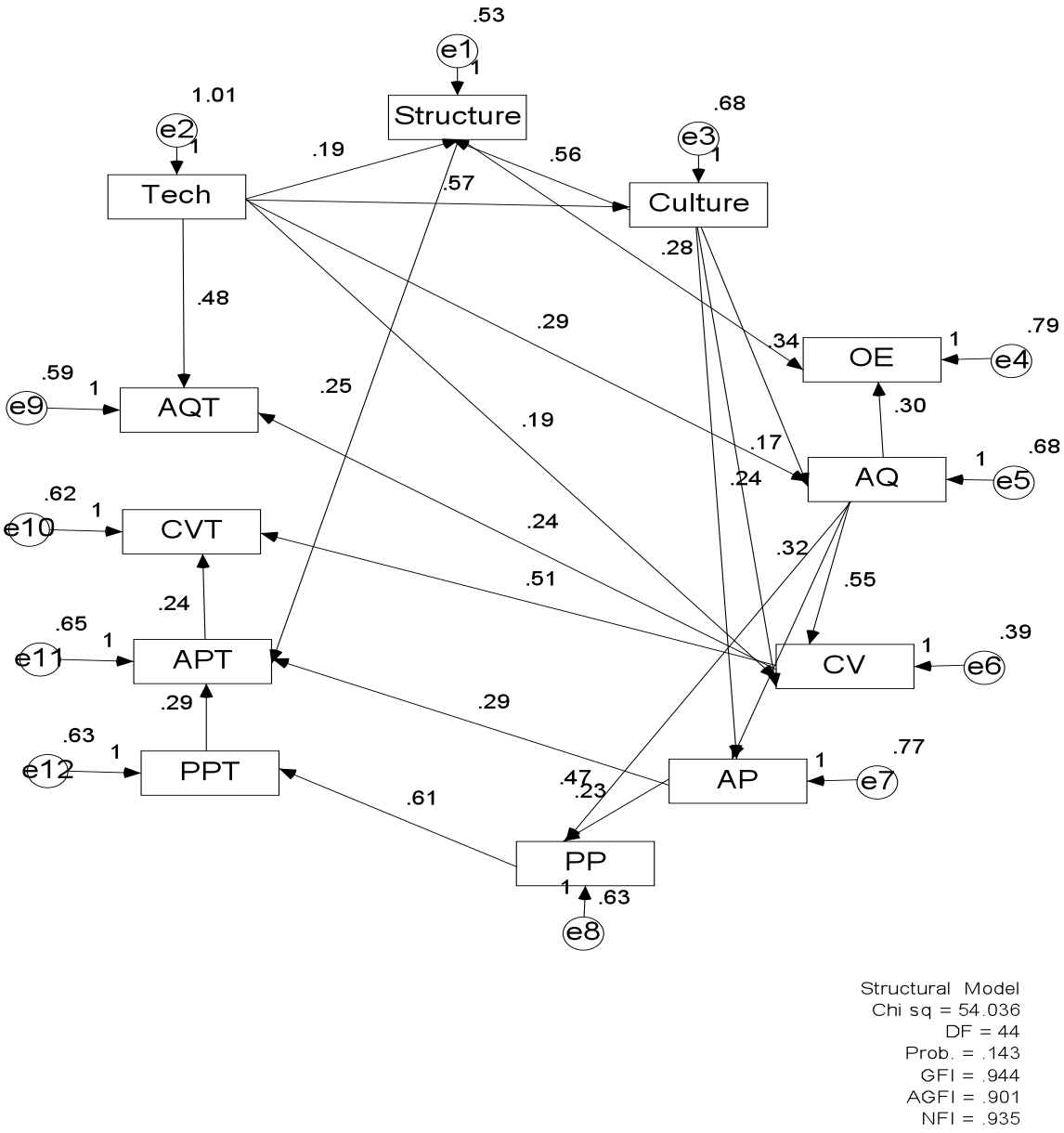

Figure 12: SEM Model of Fortune 100 data.

Results of Hypotheses Tests: Fortune 100 Sample

The Research Questions and related hypotheses were examined by assessing the path coefficients in the SEM structural models. For each path, the critical ratio of the unstandardized path coefficient to its standard error is used to compute the critical ratio (CR), which is interpreted as a *t* value with a probability level.

The first column of Table 19 lists the hypotheses, which are in relation to the major constructs. Multidimensionality was evident when the factor structure of the major constructs was assessed. Subsequently, the constituent subdimensions of the major constructs were used to test the hypotheses, which are listed in the second column. This allowed more detailed level of analysis and displays the possible links between the subdimensions of the major constructs and, thus, offers a more detailed view from which to assess the hypotheses. With each of these possible links, the critical ratio (CR), probability (*p*), and the standardized path coefficients (co-eff) were calculated as shown in the last three columns, respectively.

Table 19

Results of Hypothesis Tests[1]: Fortune 100 Sample

Hypothesis	Path Analysis of Subdimensions	CR	*p*	co-eff
H1 Infrastructure Capability is positively related to organizational effectiveness.	Culture → Org Effectiveness	NS*		
	Structure → Org Effectiveness	3.53	0.00	0.27
	Technology → Org Effectiveness	NS*		
H2 Organization Process Capability is positively related to organizational effectiveness.	Org Acquisition → Org Effectiveness	3.83	0.00	0.30
	Org Conversion → Org Effectiveness	NS*		
	Org Application → Org Effectiveness	NS*		
	Org Protection → Org Effectiveness	NS*		
H3 Culture is a significant component of Infrastructure Capability	Cultural → Structure	7.70	0.000	0.56
	Culture → Technology	NS*		
H4 Structure is a significant component of Infrastructure Capability.	Structure → Culture	NS*		
	Structure → Technology	NS*		
H5 Technology is a significant component of Infrastructure Capability.	Technology → Culture	8.50	0.000	0.57
	Technological → Structure	2.67	0.008	0.19
H6 Acquisition process is a significant component of Organization Process Capability.	Org Acquisition → Org Conversion	8.98	0.000	0.55
	Org Acquisition → Org Application	3.90	0.000	0.32
	Org Acquisition → Org Protection	6.52	0.000	0.47
H7 Conversion process is a significant component of Organization Process Capability.	Org Conversion → Org Acquisition	NS*		
	Org Conversion → Org Application	NS*		
	Org Conversion → Org Protection	NS*		
H8 Application process is a significant component of Organization Process Capability.	Org Application → Org Acquisition	NS*		
	Org Application → Org Conversion	NS*		
	Org Application → Org Protection	3.11	0.002	0.23
H9 Protection process is a significant component of Organization Process Capability.	Org Protection → Org Acquisition	NS*		
	Org Protection → Org Conversion	NS*		
	Org Protection → Org Application	NS*		
H10 Team Process Capability is positively related to Infrastructure Capability.	Team Acquisition → Culture	NS*		
	Team Conversion → Culture	NS*		
	Team Application → Culture	NS*		
	Team Protection → Culture	NS*		

Hypothesis	Path Analysis of Subdimensions	CR	*p*	co-eff
	Team Acquisition → Structure	NS*		
	Team Conversion → Structure	NS*		
	Team Application → Structure	NS*		
	Team Protection → Structure	NS*		
	Team Acquisition → Technology	NS*		
	Team Conversion → Technology	NS*		
	Team Application → Technology	NS*		
	Team Protection → Technology	NS*		
H11 Team Process Capability is positively related to Organization Process Capability	Team Acquisition → Org Acquisition	NS*		
	Team Acquisition → Org Conversion	NS*		
	Team Acquisition → Org Application	NS*		
	Team Acquisition → Org Protection	NS*		
	Team Conversion → Org Acquisition	NS*		
	Team Conversion → Org Conversion	NS*		
	Team Conversion → Org Application	NS*		
	Team Conversion → Org Protection	NS*		
	Team Application → Org Acquisition	NS*		
	Team Application → Org Conversion	NS*		
	Team Application → Org Application	NS*		
	Team Application → Org Protection	NS*		
	Team Protection → Org Acquisition	NS*		
	Team Protection → Org Conversion	NS*		
	Team Protection → Org Application	NS*		
	Team Protection → Org Protection	NS*		
H12 Organization Process Capability is positively related to Infrastructure Capability.	Org Acquisition → Culture	NS*		
	Org Conversion → Culture	NS*		
	Org Application → Culture	NS*		
	Org Protection → Culture	NS*		
	Org Acquisition → Structure	NS*		
	Org Conversion → Structure	NS*		
	Org Application → Structure	NS*		
	Org Protection → Structure	NS*		
	Org Acquisition → Technology	NS*		
	Org Conversion → Technology	NS*		
	Org Application → Technology	NS*		
	Org Protection → Technology	NS*		

Hypothesis	Path Analysis of Subdimensions	CR	*p*	co-eff
H13 Acquisition process is a significant component of Team Process Capability	Team Acquisition → Team Conversion	NS*		
	Team Acquisition → Team Application	NS*		
	Team Acquisition → Team Protection	NS*		
H14 Conversion process is a significant component of Team Process Capability	Team Conversion → Team Acquisition	NS*		
	Team Conversion → Team Application	NS*		
	Team Conversion → Team Protection	NS*		
H15 Application process is a significant component of Team Process Capability	Team Application → Team Acquisition	NS*		
	Team Application → Team Conversion	3.50	0.000	0.23
	Team Application → Team Protection	NS*		
H16 Protection process is a significant component of Team Process Capability	Team Protection → Team Acquisition	NS*		
	Team Protection → Team Conversion	NS*		
	Team Protection → Team Application	4.24	0.000	0.29
H17 Team Process Capability is positively related to organizational effectiveness.	Team Acquisition → Org Effectiveness	NS*		
	Team Conversion → Org Effectiveness	NS*		
	Team Application → Org Effectiveness	NS*		
	Team Protection → Org Effectiveness	NS*		

1All estimates based on the final model.
*Not significant at the 0.05 level.

Discussion of Hypotheses: Fortune 100 Sample

The organizational knowledge capabilities (knowledge infrastructure and knowledge processes) are considered summary variables. The constituent subdimensions of these summary variables relate to organizational effectiveness either directly or indirectly with the Fortune 100 sample, thus providing partial support for Hypotheses 1 and 2. Structure has a significant association to organizational effectiveness. However, unlike culture and technology, structure was not found to be a significant component of infrastructure capability; therefore, Hypothesis 4 is not confirmed with the Fortune 100 sample. While culture showed a significant association to structure providing partial

support for Hypothesis 3, technology has the most significant association to infrastructure capability and, thus, Hypothesis 5 is supported.

With regards to organization-level process capabilities, knowledge acquisition is likely to drive the knowledge processes, thus supporting Hypothesis 6. The Fortune 100 sample results show partial support of Hypothesis 8 regarding the knowledge application process as a significant component of organization process capability. However, the findings did not confirm that knowledge conversion and knowledge protection are significant components of organization process capability; therefore, Hypothesis 7 (organization-level knowledge conversion) and Hypothesis 9 (organization-level knowledge protection) are not supported. Knowledge processes at both organization and team levels do not indicate a significant influence on infrastructure capability and, therefore, Hypotheses 10 and 12 are not supported. However, the converse was found with infrastructure driving the processes at both the team and the organization levels, which is shown in the other findings in Table 20.

The organization-level knowledge processes drive the team-level knowledge process and, therefore, Hypothesis 11 is not supported. This could be due to organizational norms dominating the team-level knowledge processes through company norms and policies. Knowledge acquisition and knowledge conversion processes at the team level did not indicate a significant link to the other team-level process capability components and, thus, Hypotheses 13 and 14 are not supported. However, the team level processes of application and protection indicated a link to the other team level processes, thus providing partial support for Hypotheses 15 and 16. In addition, a statistical relationship was not found between knowledge processes at the team level and

organizational effectiveness; therefore, Hypothesis 17 is not confirmed with the Fortune 100 sample.

Other findings. Other relationships emerged from the SEM analysis of the Fortune 100 sample that were not hypothesized in this study. They are depicted in the structural model in Figure 12 and listed in Table 20. For example, the process of protecting knowledge drives the process of applying knowledge, which in turn drives the process of converting knowledge. Although this is in a reverse order of what is suggested in the literature, it makes practical sense, particularly when a firm highly values its knowledge and emphasizes the importance of knowledge protection. In addition, knowledge infrastructure was found to drive the processes at both the team and organization levels. This indicates that a firm's development of its knowledge infrastructure would effect its knowledge processes, which is consistent with the literature.

Table 20

Other Findings: Fortune 100 Sample

Major Constructs	Links Between Subdimensions	CR	*p*	co-eff
Org Process → Team Process	Org Conversion → Team Acquisition	3.13	0.002	0.24
	Org Conversion → Team Conversion	7.52	0.000	0.51
	Org Application → Team Application	4.11	0.000	0.29
	Org Protection → Team Protection	9.34	0.000	0.61
Infrastructure → Team Process	Technology → Team Acquisition	6.37	0.000	0.48
	Structure → Team Application	3.69	0.000	0.26
Infrastructure → Org Process	Culture → Org Acquisition	4.12	0.000	0.34
	Culture → Org Conversion	2.63	0.009	0.17
	Culture → Org Application	2.85	0.004	0.24
	Technology → Org Acquisition	3.55	0.000	0.29
	Technology → Org Conversion	2.95	0.003	0.19

Analysis of Out-Tasker Sample

The Out-Tasker data was checked for reliability and validity in the same manner as the Fortune 100 data. The results are presented in Table 21. All reliabilities are above 0.70, and each factor extracts at least 60% of the variance in the items. The data reliabilities and percentage variance extracted for both samples together are shown in Appendix B.

Table 21

Out-Tasker Data Reliabilities and Percentage Variance Extracted

Scale	# Items	α	% Variance Extracted
Knowledge Infrastructure Capability:			
Cultural	4	0.77	0.60
Structural	5	0.89	0.69
Technological	4	0.84	0.67
Organization Knowledge Process Capability:			
Acquisition	5	0.85	0.63
Protection	3	0.72	0.64
Application	3	0.75	0.67
Conversion	5	0.87	0.67
Organizational effectiveness	4	0.84	0.67

Structural Equation Model: Out-Tasker Sample

The SEM model fit well with a Chi sq to degrees of freedom ratio of 1.17. The null hypothesis that there was no difference between the sample and model covariance matrices was not rejected at the 0.296 level. The fit indices, with the exception of the AGFI, are all above the recommended 0.90. The low AGFI index suggests some slight over-fitting. However, counteracting this conclusion is the fact that all of the linkages shown in the SEM model in Figure 13 are significant. As such, 45% of the variance for organizational effectiveness is accounted for and, thus, the model is useful to managers.

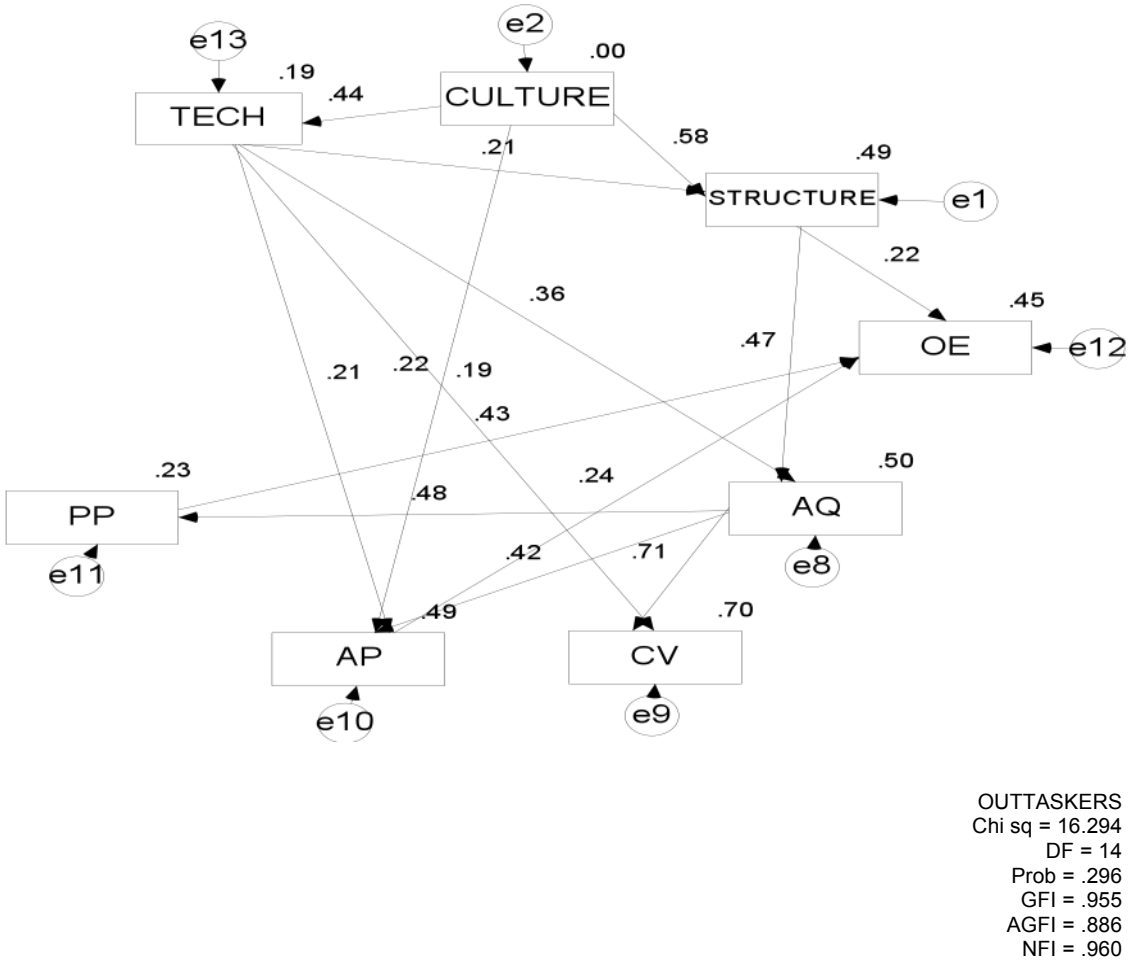

Figure 13. SEM model of Out-Tasker data.

Results of Hypotheses Tests: Out-Tasker Sample

Testing the hypothesis for the Out-Tasker data was performed in the same manner as for the Fortune 100 data. The results are presented in Tables 22 and 23. In the Out-Tasker sample, the key managerial variables appear to be technology and the process of knowledge acquisition. Overall, the model development explains a high degree of variance and, thus, gives credence to the Gold et al. (2001) model.

Table 22

Results of Out-Tasker Data SEM Hypothesis Tests[1]

Hypothesis	Path Analysis of Subdimensions	CR	*p*	co-eff
H1 Infrastructure Capability is positively related to organizational effectiveness.	Culture → Org Effectiveness	NS*		
	Structure → Org Effectiveness	2.34	0.019	0.22
	Technology → Org Effectiveness	NS*		
H2 Organization Process Capability is positively related to organizational effectiveness.	Org Acquisition → Org Effectiveness	NS*		
	Org Conversion → Org Effectiveness	NS*		
	Org Application → Org Effectiveness	2.54	0.011	0.24
	Org Protection → Org Effectiveness	5.092	0.000	0.43
H3 Culture is a significant component of Infrastructure Capability	Cultural → Structure	6.91	0.000	0.58
	Culture → Technology	4.602	0.000	0.44
H4 Structure is a significant component of Infrastructure Capability.	Structure → Culture	NS*		
	Structure → Technology	NS*		
H5 Technology is a significant component of Infrastructure Capability.	Technology → Culture	NS*		
	Technological → Structure	2.45	0.014	0.21
H6 Acquisition process is a significant component of Organization Process Capability.	Org Acquisition → Org Conversion	10.08	0.000	0.71
	Org Acquisition → Org Application	4.33	0.000	0.42
	Org Acquisition → Org Protection	5.10	0.000	0.48
H7 Conversion process is a significant component of Organization Process Capability.	Org Conversion → Org Acquisition	NS*		
	Org Conversion → Org Application	NS*		
	Org Conversion → Org Protection	NS*		
H8 Application process is a significant component of Organization Process Capability.	Org Application → Org Acquisition	NS*		
	Org Application → Org Conversion	NS*		
	Org Application → Org Protection	NS*		
H9 Protection process is a significant component of Organization Process Capability.	Org Protection → Org Acquisition	NS*		
	Org Protection → Org Conversion	NS*		
	Org Protection → Org Application	NS*		
H10 Team Process Capability is positively related to Infrastructure Capability.	N/A			
H11 Team Process Capability is	N/A			

Hypothesis	Path Analysis of Subdimensions	CR	*p*	co-eff
positively related to Organization Process Capability				
H12 Organization Process Capability is positively related to Infrastructure Capability.	Org Acquisition → Culture	NS*		
	Org Conversion → Culture	NS*		
	Org Application → Culture	NS*		
	Org Protection → Culture	NS*		
	Org Acquisition → Structure	NS*		
	Org Conversion → Structure	NS*		
	Org Application → Structure	NS*		
	Org Protection → Structure	NS*		
	Org Acquisition → Technology	NS*		
	Org Conversion → Technology	NS*		
	Org Application → Technology	NS*		
	Org Protection → Technology	NS*		
H13 Acquisition process is a significant component of Team Process Capability	N/A			
H14 Conversion process is a significant component of Team Process Capability	N/A			
H15 Application process is a significant component of Team Process Capability	N/A			
H16 Protection process is a significant component of Team Process Capability	N/A			
H17 Team-Process Capability is positively related to organizational effectiveness.	N/A			

[1]All estimates based on final model
*Not significant at the 0.05 level. (CR = Critical Ratio)

Table 23

Other Findings: Out-Tasker Sample

Major Constructs	Links Between Subdimensions	CR	*p*	co-eff
Infrastructure → Org Process	Culture → Org Application	2.54	0.011	0.22
	Structure → Org Acquisition	5.52	0.000	0.47
	Technology → Org Acquisition	4.21	0.000	0.36
	Technology → Org Conversion	.254	0.008	0.19
	Technology → Org Application	2.18	0.029	0.21

Discussion of Hypothesis: Out-Tasker Findings

The SEM model for the Out-Tasker sample shows partial support for Hypotheses 1 and 2 with structure and knowledge acquisition process having a direct influence on organizational effectiveness. Within the infrastructure capabilities, the findings indicate that culture drives both structure and technology, thus providing support for Hypothesis 3. Structure was found to not have a direct link to culture and technology, but rather the converse was seen and, therefore, Hypothesis 4 is partially supported. Technology was found to be a significant component of infrastructure capability providing support for Hypothesis 5.

Of the four subdimensions of process capability, both knowledge application and knowledge protection have a direct influence on organizational effectiveness, and along with structure, account for 45% of its variance. The process of knowledge acquisition strongly influences the other knowledge processes, which is in line with the literature whereby acquiring knowledge is critical to organizational effectiveness. Therefore, Hypothesis 6 is supported. However, the processes of knowledge conversion, application, and protection did not appear to be significant components of process capability; therefore, Hypotheses 7, 8 and 9 are not confirmed. As hypothesized, the processes did

not influence the infrastructure, thus Hypothesis 11 is not supported. The Out-Tasker data did not include item measures for team process capability and, therefore, Hypotheses 10, 11, 13, 14, 15, 16, and 17 are not applicable.

Discussion of Hypotheses: Aggregate Findings

This is in contrast to the Out-Tasker sample whereby structure and the processes of knowledge protection and application directly influence organizational effectiveness. The reason for knowledge protection directly influencing organizational effectiveness in the Out-Tasker data and not in the Fortune 100 data may be due to the increased role of knowledge security when corporate knowledge is in the hands of an outsource agent. The reason for the knowledge application process having a direct influence on organizational effectiveness in the Out-Tasker data and not in the Fortune 100 data may be due to outsourcers being more likely to focus on specific tasks rather than broader corporate goals (e.g., more focused on applying knowledge than acquiring knowledge). In both samples, an established knowledge structure and the ability to acquire knowledge appear to be key drivers of infrastructure and process capability and, therefore, important managerial considerations.

With regard to other findings, it appears that of the three infrastructure subdimensions, technology has the strongest influence on knowledge processes providing support. This can be explained by the importance of technology as an enabler (enablement tool) of knowledge management. As found in the literature, technology facilitates the processes of acquiring, converting, and applying knowledge and information. Overall, the findings conform to the literature and lend credibility to Gold et

al.'s (2001) theory of effective knowledge management from the perspective of knowledge infrastructure and knowledge process capabilities.

Hypotheses Results

Structural Equation Modeling was used to examine the hypotheses. The sample was split into two groups: Fortune 100 respondents and Out-Tasker respondents. The results for both samples are considered in this discussion of the overall hypotheses results.

Null Hypothesis 1: Infrastructure capability is positively related to organizational effectiveness.

In both of the samples, structure directly influenced organizational effectiveness, but culture and technology did not. Based on these findings, the null is partially supported.

Null Hypothesis 2: Organization process capability is positively related to organizational effectiveness.

In the Fortune 100 sample, the organization process of knowledge acquisition strongly influences organizational effectiveness. In the Out-Tasker sample, the organization processes of knowledge conversion and knowledge protection directly influence organizational effectiveness. With regards to the four organizational process capability components, all but the knowledge conversion process showed a significant link to organizational effectiveness, thus the null hypothesis is partially supported.

Null Hypothesis 3: Culture is a significant component of infrastructure capability.

Significant associations were found between culture and the other two components of infrastructure capability. In both samples, culture showed a strong

influence on structure. In the Out-Tasker sample, culture also had a significant influence on technology. Based on these findings, the null hypothesis is supported.

Null Hypothesis 4: Structure is a significant component of infrastructure capability.

Significant associations were found between structure and the other two components of infrastructure capability. In the Fortune 100 sample, structure was influenced by, rather than having an influence on, the other components of infrastructure capability, technology and culture. In the Out-Tasker sample, structure is linked to culture and influenced by technology. Based on these findings, the null hypothesis is supported.

Null Hypothesis 5: Technology is a significant component of infrastructure capability.

Significant associations were found between technology and the other two components of infrastructure capability. In both samples, technology showed a strong influence on structure. In the Fortune 100 sample, technology also had a significant influence on culture, and in the Out-Tasker sample was influenced by culture. Based on these findings, the null hypothesis is supported.

Null Hypothesis 6: Knowledge acquisition process is a significant component of organization process capability.

In both samples, significant associations were found between organization level knowledge acquisition and the other organization level components of organization process capability. Therefore, the null hypothesis is supported.

Null Hypothesis 7: Knowledge conversion process is a significant component of organization process capability.

In both samples, organization level knowledge conversion did not influence any of the other organization level components of organization process capability. Therefore, the null hypothesis is rejected.

Null Hypothesis 8: Knowledge application process is a significant component of organization process capability.

In the Fortune 100 sample, organization level knowledge application directly influences organization level knowledge protection, but in the Out-Tasker sample it did not show significant influence on the other organization level components of knowledge process capability. Based on these findings, the null hypothesis is partially supported.

Null Hypothesis 9: Knowledge protection process is a significant component of organization process capability.

In both samples, organization level knowledge protection did not show significant influence on the other components of organization-level knowledge process capability. Therefore, the null hypothesis is rejected.

Null Hypothesis 10: Team process capability is positively related to infrastructure capability.

None of the team process capability components were linked to the components of infrastructure capability. Therefore, the null hypothesis is rejected.

Null Hypothesis 11: Team process capability is a significant component of organization process capability.

Organization-level knowledge processes drive the team-level knowledge process. Therefore, the null hypothesis is rejected.

Null Hypothesis 12: Organization process capability is positively related to infrastructure capability.

In both samples, organization level knowledge processes do not indicate a significant influence on infrastructure capability. Therefore, the null hypothesis is rejected.

Null Hypothesis 13: Knowledge acquisition is a significant component of team process capability.

Knowledge acquisition at the team level did not indicate a significant link to the other team-level process capability components. Therefore, the null hypothesis is rejected.

Null Hypothesis 14: Knowledge conversion is a significant component of team process capability.

Knowledge conversion at the team level did not indicate a significant link to the other team-level process capability components. Therefore, the null hypothesis is rejected.

Null Hypothesis 15: Knowledge application is a significant component of team process capability.

Knowledge conversion at the team level did not show a significant link to other team-level knowledge processes with the exception of knowledge conversion. Therefore, the null is partially supported.

Null Hypothesis 16: Knowledge protection is a significant component of team process capability.

Knowledge protection at the team level did not show a significant link to other team-level knowledge processes with the exception of knowledge application. Therefore, the null is partially supported.

Null Hypothesis 17: Team process capability is positively related to organizational effectiveness.

None of the processes at the team level indicated a significant link to organizational effectiveness. Therefore, the null hypothesis is rejected.

Summary

The analysis of both the Fortune 100 and Out-Tasker data yielded well fitting and similar models. In both cases, structural infrastructure was a determinant of organizational effectiveness, and the organization-level knowledge acquisition process influenced organizational effectiveness directly in the Fortune 100 data and indirectly in the Out-Tasker data. In the Fortune 100 data, organization-level processes dominated team-level processes, whereas in the Out-Tasker data the team-level processes were not a factor. In both samples, the organization-level process of knowledge acquisition dominated the other knowledge processes and, therefore, should be treated as a key managerial variable. Reasons for the differences were explored in this chapter. The summary of the findings, conclusions, recommendations for further research, and managerial implications are discussed in Chapter V.

Chapter V

Discussion and Conclusions

Although approximately 81% of the largest U.S. and European companies use some form of knowledge management, it has been difficult for firms to implement and maintain effective knowledge management programs. There is great interest in explaining this phenomenon so that firms can realize the value that knowledge management promises while sidestepping the pitfalls. The problem of ineffective knowledge management, as argued by Gold et al., stems from organizations not considering their capabilities before implementing a knowledge management program. The development of effective knowledge management is discussed in the literature, and prescribed by vendors, often from the perspective of the organization as a whole without consideration for the organization's size or structure. Using only the organization as the unit of analysis provides little guidance for business leaders in how they can influence the success of their knowledge management programs. No known studies exist that examine knowledge management process capability where the team, as well as the organization, are the units of analysis. Consequently, there is little guidance for practitioners on implementing effective knowledge management programs. The purpose of this study is to identify and assess the relationships between knowledge management effectiveness, infrastructure capability, and process capability from both the team and the organization perspectives, thereby contributing to the body of knowledge. It is also to provide empirical validation of the Gold et al. (2001) theory that organizational effectiveness is the combined measure of knowledge infrastructure capability and knowledge process capability.

To test the identified hypothesized relationships and to answer the Research Questions, structural models were developed using measures adopted from Gold et al. (2001): three sub-dimensions for infrastructure capability (cultural, structural, and technological), four sub-dimensions for knowledge process capability (knowledge acquisition, conversion, application, and protection), and a single dimension for organizational effectiveness. The summary variables were analyzed in a disaggregated manner (analyzed the constituent sub-dimensions) to achieve greater detail. The model was validated, as discussed in Chapter 4, by assessing data from several business units of a large Fortune 100 company, and the company's outsourced customer support team in India called Out-Taskers.

Conclusions

This research has shown that knowledge management capabilities are a contributing factor of organizational effectiveness. From this research, it can be concluded that firms with superior absorptive capacity and knowledge integration processes will improve their knowledge management capability. Overall, the findings conform to the literature and lend credibility to Gold et al.'s (2001) theory that effective knowledge management, as measured by its impact on organizational performance, is dependent on the firm's knowledge infrastructure capability and knowledge process capability.

Infrastructure Capability

The three sub-dimensions of infrastructure—culture, structure, and technology—were found to be significant components of infrastructure capability. They were also found to influence knowledge process capability.

Research has suggested that an organization's culture is one of the most significant components of effective knowledge management, and also one of the most difficult hurdles to overcome due to its complex nature. Gold et al. (2001) found that when culture is operationalized around the themes of corporate vision, corporate values, and innovation, it is a significant factor of an organization's infrastructure capability. In turn, Gold et al. found that infrastructure capability is a significant predictor of organizational effectiveness. In this study, although culture was not directly linked to organizational effectiveness, it was found to have significant influence on the other infrastructure capability components, technology and structure, and is thereby indirectly associated.

Structure was found to have the most significant influence on organizational effectiveness of the three infrastructure capability components. A knowledge friendly structure, as noted in the literature, will influence organizational effectiveness by improving an organization's ability to innovate, adapt quickly to unanticipated changes, and coordinate the development efforts between business units. These are critical elements of organizational effectiveness (Gold et al., 2001) and included as item measures in this study.

Technology was found to be a significant component of knowledge infrastructure capability due to its influence on structure and culture. This is consistent with the research of Gold et al. (2001). The results also suggest that technology plays a considerable role in knowledge management effectiveness due to its direct influence on the knowledge management processes. These findings are consistent with the literature.

For example, Lee & Choi (2003) operationalized technological capability around information storage, retrieval, and collaboration capabilities, similar to this study.

Process Capability

With regard to the four components of process capability, the knowledge acquisition process was found to be the most significant and will likely be the key driver of process capability. In addition, it has a direct influence on organizational effectiveness, which supports the literature. For example, knowledge acquisition requires an absorptive capacity to recognize, understand, and capture knowledge from a variety of sources. It also requires knowledge-integration, the ability to effectively apply it. Absorptive capacity and knowledge-integration are significant components of organizational effectiveness. From this, and the findings of this study, it can be concluded that knowledge acquisition is a significant component of organizational effectiveness. This study also revealed strong support for the role of absorptive capacity and knowledge integration as requisitions of knowledge acquisition, which is consistent with the literature and the research of Gold et al. (2001).

The process of converting knowledge did not appear to be a significant factor of knowledge process capability, which is inconsistent with the literature and the research of Gold et al. (2001). It can be concluded that difference are due to technology. In this study, technology was found to have a considerable influence on the knowledge conversion process. In addition, the firm chosen for this study is heavily dependent on technology in all aspects of its business. Evidence to support the conclusion that technology influences the knowledge conversion process can be found in the literature. For example, with regarding to the role of technology in knowledge management,

Davenport & Prusak (1998) argue that knowledge conversion is dependent on the firm's ability to organize, integrate, combine, structure, coordinate, or distribute knowledge. Taking it step further, Alavi & Leidner (2001) argue that this depends on the firm's ability to store and structure information so that it can be effectively searched, retrieved, and shared, to ultimately be converted to knowledge.

Knowledge application was found to directly influence organizational effectiveness, and found to be a significant component of knowledge process capability. This is consistent with Gold et al.'s (2001) research as well as the literature. It supports the generally accepted idea that the application of knowledge is critical for problem solving and achieving organizational effectiveness (Hinds & Aronson, 2002; C-P. Lee et al., 2007; Zack, 1999b)

Knowledge protection directly influenced organizational effectiveness, which is consistent with the limited amount of research in the field. However, inconsistent with Gold et al.'s (2001) research, knowledge protection did not appear to be a significant component of knowledge process capability. While conducting this empirical study, it became evident that knowledge security is considered an important and integral part of knowledge management. Protecting knowledge is generally regarded as axiomatic of successful knowledge management programs, which explains the direct influence of knowledge protection on organizational effectiveness. Interestingly, however, knowledge protection was treated as a corporate responsibility rather than an individual or team responsibility. This might explain its lack of influence on the other knowledge processes. Overall, this finding is in harmony with the limited research in the field regarding the significance of knowledge security (e.g., Bock et al. (2005) empirically found that the

only time knowledge sharing is intentionally limited is when industrial espionage is a concern, which is handled at the corporate level).

Infrastructure Drives Processes

Knowledge processes at both the organization and team levels do not have a significant influence on infrastructure capability. Rather, the converse was found with infrastructure driving the processes at both the team and the organization levels. The relationship between infrastructure and process was not explored by Gold, et al. (2001) and no known research exists that examines the intersection of these themes. However, because of the practical implications it is important to explore. Of the three infrastructure capability components, technology has the strongest influence on the knowledge processes. This can be explained by the importance of technology as an enabler of effective knowledge management, particularly as a vehicle for managing knowledge processes. As noted in the literature, technology facilitates the processes of acquiring, converting, and applying knowledge and information, (e.g., Alavi & Leidner, 2001; Davenport & Prusak, 1998; Leonard, 1995; Leonard & Sensiper, 1998; Teece, 1998).

The Influence of Teams

Most knowledge management research is performed at the organizational level, while most knowledge management implementation is performed at the team level. Yet, until this study, the knowledge management effectiveness had not been examined from the team perspective in contrast to the organization perspective. In this study, teams rated themselves higher in knowledge management process capability than they rated the company, with the exception of knowledge protection. Put another way, each team felt its processes for acquiring, converting, and applying knowledge were better than those of the

organization. Interestingly though, instead of the team's knowledge processes driving the organization's knowledge processes, the opposite was found. This could be due to organizational norms dominating the knowledge processes through company policies, and shared company values and vision. In addition, team-level knowledge processes do not influence organizational performance (no statistical relationship was found between organizational effectiveness and any of the team-level knowledge processes). This could be explained by the ad-hoc processes of teams, whereby knowledge management was seen as being more effective *within* teams than *across* teams.

Implications

Research Implications

Future research should continue to examine organizational capabilities from the perspective of teams (or business units) in contrast to the organization, and then aim to ground this research into business management literature. It is possible that achieving knowledge management effectiveness depends not only on the level in the organization (e.g., team or company-wide) that knowledge management is implemented, but also what level it is maintained. Such possibilities warrant further research. In addition, despite strong arguments in the literature, this study did not provide empirical evidence that strengthening knowledge management process capability at the team level will result in more effective knowledge management for the whole organization. This could be due to this study's limitations, thus, a retesting of this research is suggested.

A focused approach examining capabilities from the perspective of teams in contrast to the organization should include public firms, and expanded to include the manufacturing and services sectors of private firms, so that relationships can be

delineated by firm type. Such research would require a more generalized measure of organizational effectiveness to balance the measure across public and private firms.

To provide guidance for business leaders in how they can influence the success of their knowledge management programs, further research is needed that examines the relationship between knowledge infrastructure capability and knowledge process capability. This would help managers understand whether to focus on developing knowledge management processes that cultivate the development of a supportive infrastructure, or whether to focus on developing a supportive infrastructure that will promote desirable knowledge management processes.

Managerial Implications

The implications for managers begin with the understanding that a team's knowledge management processes may not be entirely under their direct control. Although a specific process may be outside of the manager's responsibilities, it is important to maintain cohesiveness with other business units in the firm. Otherwise, the result is knowledge management effectiveness in isolation within teams, but not wholly across the organization. Managers should be aware that the development of ad-hoc knowledge management processes could inhibit the performance of the firm since it inhibits knowledge management effectiveness.

At the organization level, managers should focus on the process of acquiring knowledge, as it appeared to be the impetus for developing organizational knowledge management process capability. Focusing on knowledge acquisition will not only have a direct impact on organizational performance, but also an indirect impact through its influence on the other process capability components. Thus, the most effective path

toward developing a strong knowledge process capability is through knowledge acquisition. This study also finds strong support for the role of absorptive capacity and knowledge integration as inherent requisitions of knowledge acquisition. Therefore, a firm should be able to replicate this study to gauge its degree of absorptive capability and knowledge integration abilities by measuring its degree of knowledge acquisition capability. Such a study would be informative to the firm, rather than prescriptive.

Improvements in the technological infrastructure will result in improvements to the firm's structural and cultural infrastructures, as well as the firm's knowledge processes. In turn, this will have a positive influence on the firm's effectiveness. This implies that firms should focus resources on improving the technological infrastructure, particularly with regard to information management and a robust communication system. However, while technological infrastructure indirectly influences organizational effectiveness, structural infrastructure directly influences it. This implies that to improve the ability to innovate, identify new business opportunities, and coordinate the development efforts of different business units, *inter alia*, business leaders should focus efforts on improving the structural infrastructure as well. What business leaders need to understand is that the components of infrastructure capability are not mutually exclusive. Efforts to improve one component in isolation would be ineffectual. Isolated improvement efforts may contribute to the problem of knowledge management failure.

Managers are using correlations and regression and tend toward the use of averages, which produce isolated answers. In trying to solve complex business problems, such as determining why knowledge management programs fail to meet expectations, a firm needs more than the narrow view offered by averages. In situations where managers

are seeking to understand complex relationships, such as the relationship between organizational capabilities and knowledge management effectiveness, it is critical that they apply the right analytics. Instead of using averages, managers should utilize SEM. The risk of looking at variable pairs in isolation is that critical nuances in the data could be missed. The value of SEM is that it not only looks at pairs of variables, it looks at all measures simultaneously providing a broader view of the observations that would have been otherwise lost.

Limitations

A limiting factor in this study may be sample size. While it was adequate to detect a hypothesized effect, it may not have been adequate to detect the influence of teams in the knowledge management process. A larger sample size would offer more statistical power to detect relationships. Although the study was conducted among multiple business units in a single large company, it is important to recognize the potential limitation on external validity. Therefore, prudence is suggested with regards to generalizing the results.

This study was conducted with one firm and its outsourced agent. Due to the nature of the relationship between the firm and the outsourced agent, the outsourced agent could not be treated as a separate company or as a business unit (team). This served as a limitation of this research. Generalizations taken from this study should be limited to similar groups.

This study was partially a retesting of the Gold et al. (2001) model and, thus, the inherent weaknesses of that model are reflected in this study. A major limitation was discovered during the data analysis phase of this study that concerned the overlapping

definitions of major constructs, specifically infrastructure capability and process capability. The factor analysis produced groupings that were inconsistent with the original model making the use of confirmatory factory analysis impractical. To work around this limitation while maintaining integrity of the research, the constructs of infrastructure capability and process capability were treated as summary variables. Although a statistical summary of the summary variables was not produced as in the original Gold et al. study, the approach of disaggregating the constructs to examine all possible relationships produced results from which sound conclusions could be drawn about the summary variables. For example, analyzing the relationships between the infrastructure capability components (culture, structure, and technology) and organizational effectiveness allowed for conclusions to be drawn about the relationship between infrastructure capability (the summary variable) and organizational effectiveness.

Summary

Knowledge management has become one of the most important trends in business, yet many knowledge management initiatives fail. To understand the success and failure of knowledge management, firms must identify and assess the organizational capabilities required for the effort to prosper, which is the focus of this study. Literature has offered important theoretical grounding for this study with regard to organizational capability as a predictor of knowledge management effectiveness, but empirical examination is lacking. The organizational capabilities have been identified as knowledge infrastructure capability (consisting of cultural, structural, and technological) and knowledge process capability (consisting of knowledge acquisition, conversion,

application, and protection). The research model was adopted from Gold, Malhotra, and Segars (2001). This research broke new ground in the field of knowledge management by examining the relationships between knowledge infrastructure capability, knowledge process capability, and organizational effectiveness from the dual perspective of the team (within business units) in contrast to the organization (across business units).

Organizations develop knowledge infrastructure to drive desired behaviors, yet knowledge workers develop processes to circumvent the organization's infrastructure (cultural and structural barriers). This may contribute to the problem of knowledge management failure. However, the relationships between knowledge infrastructure and knowledge processes have not been empirically examined, until this study.

In addition, most knowledge management research is conducted at the organization level, yet most knowledge management implementation occurs at the team level (project teams, business units, social groups). To help bridge the gaps between theory and practice, this study aligned the unit of analysis more closely with the practitioners' level of implementation. Using only the organization as the unit of analysis would provide little guidance for business leaders in how they can influence the success of knowledge management programs, and it would present an incomplete picture when assessing the relationships between organizational capabilities and knowledge management effectiveness. The organization perspective helps with generalizability of this study, while the team perspective leads to results of a more informative and prescriptive nature for practitioners. Because the field of knowledge management is driven by practical need, this study offers many important managerial implications.

Data was collected from several business units of a Fortune 100 multinational firm and assessed using Structural Equation Modeling. The structural models were developed to test the hypothesized relationships and answer the research questions. As a result, this research provides empirical evidence that knowledge management capabilities are a contributing factor of organizational effectiveness. In addition, it can be concluded that firms with superior absorptive capacity and knowledge integration processes will improve their knowledge management capability.

The results of this study include the findings that knowledge infrastructure drives knowledge processes, that organization-level knowledge processes drive team-level knowledge processes, and that knowledge protection is seen as a corporate responsibility rather than a team or individual responsibility. Overall, the findings conform to the literature and lend credibility to Gold et al.'s (2001) theory that effective knowledge management, as measured by its impact on organizational performance, is dependent on the firm's knowledge infrastructure capability and knowledge process capability.

Appendix A

Demographics

Table A.1

Rank: Fortune 100 Sample (N=154)

Rank	Frequency	Percent	Valid Percent	Cumulative Percent
Consultant	13	8.6	8.6	8.6
Independent Contractor	108	71.5	71.5	80.1
Manager	26	17.2	17.2	97.4
Director	4	2.6	2.6	100.0
Total	154	100.0	100.0	100.0

Table A.2

Theater: Fortune 100 Sample (N=154)

Theater	Frequency	Percent	Valid Percent	Cumulative Percent
US/Canada	101	66.2	66.2	66.2
Europe	26	17.2	17.2	83.4
Asia	27	16.6	16.6	100.0
Total	154	100.0	100.0	

Table A.3

Years of Service: Fortune 100 Sample (N=154)

No. of Years	Frequency	Percent	Valid Percent	Cumulative Percent
< 2 years	43	27.9	27.9	27.9
2 to 5	22	14.3	14.3	42.2
5 to 8	44	28.6	28.6	70.8
8 to 11	36	23.4	23.4	94.2
11 to 15	9	5.8	5.8	100.0
Total	154	100.0	100.0	100.0

Table A.4

Rank: Out-Tasker Sample (N=90)

Rank	Frequency	Percent	Valid Percent	Cumulative Percent
Individual Contributor	81	90.0	90.0	80.1
Manager	5	5.5	5.6	97.4
Director	4	4.4	4.4	100.0
Total	90	100.0	100.0	100.0

Table A.5

Years of Service: Out-Tasker Sample (N=90)

No. of Years	Frequency	Percent	Valid Percent	Cumulative Percent
< 2 years	40	44.4	44.4	44.4
2 to 5	43	47.8	47.8	92.2
> 5 years	7	7.8	7.8	100.0
Total	90	100.0	100.0	100.0

Appendix B

Data Reliabilities and Percentage Variance Extracted of Both Samples

Table B.1

Data Reliabilities and Percentage Variance Extracted of Both Samples

	Fortune 100 (*N*=154)			Out-Taskers (*N*=90)		
Scale	# Items	α	% Variance Extracted	# Items	α	% Variance Extracted
Knowledge Infrastructure Capability						
Cultural	3	0.66	0.60	4	0.77	0.60
Structural	5	0.88	0.63	5	0.89	0.69
Technological	4	0.87	0.73	4	0.84	0.67
Team Knowledge Process Capability						
Acquisition	3	0.74	0.64	-	-	-
Protection	3	0.81	0.72	-	-	-
Application	3	0.88	0.80	-	-	-
Conversion	3	0.87	0.79	-	-	-
Organization Knowledge Process Capability						
Acquisition	4	0.83	0.67	5	0.85	0.63
Protection	4	0.89	0.76	3	0.72	0.64
Application	4	0.89	0.75	3	0.75	0.67
Conversion	5	0.87	0.66	5	0.87	0.67
Organizational Effectiveness	4	0.82	0.65	4	0.84	0.67

Appendix C

Structural Equation Modeling Results

Table C.1

Results of SEM Including Non-Significant Links: Fortune 100 Sample

Correlations			Estimate	S.E.	C.R.	*p*	Label
Culture	←	Tech	.569	.067	8.495	***	par_37
AQ	←	Tech	.289	.082	3.535	***	par_23
AQ	←	Culture	.338	.082	4.116	***	par_24
Structure	←	Tech	.193	.072	2.667	.008	par_38
Structure	←	Culture	.557	.072	7.695	***	par_39
CV	←	AQ	.558	.062	9.062	***	par_22
AP	←	Culture	.178	.091	1.954	.051	par_26
AP	←	Tech	.132	.090	1.470	.142	par_27
CV	←	Structure	.039	.070	.557	.577	par_29
CV	←	Culture	.149	.076	1.957	.050	par_30
CV	←	Tech	.181	.066	2.757	.006	par_31
AP	←	AQ	.289	.086	3.367	***	par_34
PP	←	AP	.214	.091	2.342	.019	par_12
PP	←	CV	.103	.116	.890	.374	par_13
PP	←	AQ	.387	.139	2.792	.005	par_14
PP	←	Structure	-.094	.099	-.945	.345	par_16
PP	←	Culture	.162	.113	1.440	.150	par_17
PP	←	Tech	.104	.097	1.075	.282	par_18
PPT	←	AQ	.042	.154	.271	.787	par_25
APT	←	PPT	.289	.070	4.135	***	par_20
APT	←	Structure	.252	.069	3.648	***	par_28
APT	←	AP	.288	.071	4.036	***	par_32
AQT	←	Tech	.480	.075	6.370	***	par_19
CVT	←	CV	.508	.068	7.423	***	par_21
CVT	←	APT	.237	.068	3.479	***	par_33
AQT	←	CV	.237	.076	3.133	.002	par_35
OE	←	Structure	.190	.099	1.919	.055	par_1
OE	←	Tech	.091	.104	.875	.381	par_2
OE	←	Culture	.042	.108	.389	.697	par_3
OE	←	AQT	.132	.091	1.443	.149	par_4
OE	←	CVT	-.098	.089	-1.098	.272	par_5
OE	←	APT	.116	.090	1.291	.197	par_6

Correlations			Estimate	S.E.	C.R.	*p*	Label
OE	←	PPT	.063	.093	.676	.499	par_7
OE	←	AQ	.294	.113	2.604	.009	par_8
OE	←	CV	-.109	.124	-.877	.380	par_9
OE	←	AP	.023	.086	.269	.788	par_10
OE	←	PP	-.054	.101	-.531	.596	par_11
PP	←	PPT	-.200	.309	-.647	.518	par_15
PPT	←	PP	.698	.246	2.843	.004	par_36

Note: The latent variable approach was abandoned due to cross loading among the variables. The measured variables are the factor scores of the underlying indicator variables. The data in Table A.2 remains after the non-significant links are removed.

Table C.2

Results of SEM, Only Significant Links: Fortune 100 Sample

Correlations			Estimate	S.E.	C.R.	*p*	Label
Culture	←	Tech	.569	.067	8.495	***	par_20
AQ	←	Tech	.289	.082	3.535	***	par_9
AQ	←	Culture	.338	.082	4.116	***	par_10
AP	←	Culture	.236	.083	2.847	.004	par_11
AP	←	AQ	.324	.083	3.901	***	par_17
PP	←	AP	.225	.072	3.114	.002	par_3
PP	←	AQ	.474	.073	6.524	***	par_4
PPT	←	PP	.610	.065	9.399	***	par_19
Structure	←	Tech	.193	.072	2.667	.008	par_21
Structure	←	Culture	.557	.072	7.695	***	par_22
APT	←	PPT	.289	.068	4.242	***	par_6
CV	←	AQ	.553	.062	8.980	***	par_8
APT	←	Structure	.252	.068	3.685	***	par_12
CV	←	Culture	.172	.065	2.630	.009	par_13
CV	←	Tech	.190	.064	2.951	.003	par_14
APT	←	AP	.288	.070	4.105	***	par_15
OE	←	Structure	.276	.078	3.532	***	par_1
OE	←	AQ	.301	.079	3.826	***	par_2
AQT	←	Tech	.480	.075	6.365	***	par_5
CVT	←	CV	.508	.068	7.515	***	par_7
CVT	←	APT	.237	.068	3.491	***	par_16
AQT	←	CV	.237	.076	3.125	.002	par_18

Table C.3

Standardized Regression Weights: Fortune 100 Sample

Correlations			Estimate
Culture	←	Tech	.570
AQ	←	Tech	.291
AQ	←	Culture	.339
AP	←	Culture	.235
AP	←	AQ	.323
PP	←	AP	.225
PP	←	AQ	.472

Correlations			Estimate
PPT	←	PP	.609
Structure	←	Tech	.193
Structure	←	Culture	.557
APT	←	PPT	.292
CV	←	AQ	.553
APT	←	Structure	.255
CV	←	Culture	.173
CV	←	Tech	.191
APT	←	AP	.291
OE	←	Structure	.274
OE	←	AQ	.297
AQT	←	Tech	.480
CVT	←	CV	.505
CVT	←	APT	.235
AQT	←	CV	.236

Table C.4

Results of SEM, Only Significant Links: Out-Tasker Sample

Correlations			Estimate	S.E.	C.R.	*p*	Label
TECH	←	CULTURE	.438	.095	4.602	***	par_7
STRUCTURE	←	CULTURE	.583	.084	6.914	***	par_1
STRUCTURE	←	TECH	.207	.084	2.453	.014	par_9
AQ	←	TECH	.356	.085	4.213	***	par_6
AQ	←	STRUCTURE	.467	.085	5.520	***	par_8
AP	←	CULTURE	.223	.088	2.543	.011	par_3
AP	←	TECH	.206	.095	2.182	.029	par_4
PP	←	AQ	.476	.093	5.104	***	par_11
AP	←	AQ	.417	.096	4.325	***	par_12
OE	←	STRUCTURE	.214	.091	2.343	.019	par_2
CV	←	TECH	.187	.071	2.642	.008	par_5
OE	←	PP	.420	.083	5.092	***	par_10
CV	←	AQ	.715	.071	10.078	***	par_13
OE	←	AP	.233	.092	2.542	.011	par_14

Table C.5

Standardized Regression Weights: Out-Tasker Sample

Correlations			Estimate
TECH	←	CULTURE	.438
STRUCTURE	←	CULTURE	.583
STRUCTURE	←	TECH	.207
AQ	←	TECH	.356
AQ	←	STRUCTURE	.467
AP	←	CULTURE	.224
AP	←	TECH	.206
PP	←	AQ	.476
AP	←	AQ	.417
OE	←	STRUCTURE	.217
CV	←	TECH	.187
OE	←	PP	.426
CV	←	AQ	.715
OE	←	AP	.236

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