

Knowledge Sharing Among a Community of Project Managers:
A Descriptive Case Study Examining the Relationship Between Social Structures and
Knowledge Sharing Among Project Managers in a Global Engineering Firm

By Tiffani Worthy

B.S. in French, May 2000, United States Military Academy
M.A. in Human Resources Management, May 2005, Webster University

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Margaret Delaney Gorman
Assistant Professor of Human and Organizational Learning

The Graduate School of Education and Human Development of the George Washington University certifies that Tiffani Worthy has passed the final examination for the degree of Doctor of Education as of October 13, 2011. This is the final and approved form of the dissertation.

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Tiffani Worthy

Dissertation Research Committee:

Margaret Delaney Gorman, Assistant Professor of Human and Organizational Learning, Dissertation Chair

Chris Johnson, Vice President Operational Integration, URS, Committee Member

Harry Jones, Assistant Professor of Electrical Engineering, Minnesota State University, Committee Member

DEDICATION

This dissertation is dedicated to my family. To my late grandparents, Marjorie Deloris and O.G. Smith Jr., the first generation of college graduates in my family in the early 1950s, who set the standards high and provided a model of what success could look like despite any odds and adversities.

A special thank you goes to my daughter, Chloe Simone, for her inspiration to make me want to be the very best, and to my husband, Carlos, for his belief in me, relentless support, and reminding me of my *warrior spirit*.

Acknowledgments

I came home from preschool and my mother asked me, “Did you get an *education* at school today?” and I responded, “They didn’t give me anything at school.” From that point forward, my mother helped me to understand that if you want to learn, you can learn anywhere. My journey from primary school through doctoral studies has been filled with learning opportunities and a zeal for finding what I could learn in different situations through various challenges and adversities; I fell in love with learning and thinking. Now I can respond to my mom’s question, “Yes—I got my education. I created the space and freedom to learn throughout my life’s journey, wherever I was.” This journey was greatly impacted and enhanced during my matriculation through The George Washington University Executive Leadership Doctoral Program.

I am humbled by the learning opportunities I have been afforded throughout my life. My grandparents, Marjorie Deloris and O.G. Smith Jr., began my family’s journey into higher education. My grandmother earned a Bachelor of Science degree and graduated from the University of Arkansas at Pine Bluff. Later she earned a master’s of library science degree at the University of Maryland College Park. My grandfather earned his Bachelor of Science degree from Fisk University and later earned his master’s degree in mathematics at Grambling University. Working as a mathematics professor at Howard University, my grandfather nearly finished his dissertation to earn his PhD in mathematics from Howard University before he passed away in 1967.

I am happy to keep the torch lit that my mother and father passed to me upon their graduation from Adelphi University. I am proudly continuing the journey to freedom through lifelong learning and formal education.

This journey would not have been possible without many instrumental people. A warm thanks goes to my mother, Carol Denise, for her creativity; my biological father, George, for helping me find my voice and sense of self; my late *daddy*, André, for convincing me that I really could do anything and become whatever I wanted; my daughter, Chloe Simone, for her inspiration. I would like to acknowledge my dissertation committee, Dr. Margaret Delaney Gorman, my chair; Dr. Chris Johnson; and Dr. Harry Jones for their guidance and support.

Lastly, I would like to acknowledge my husband, Carlos, because without him and his support, completing this program and these studies would have been nearly impossible. I am grateful for his prayers through the stressful nights and for listening to hours of one-sided conversations and theoretical explanations of concepts I was trying to learn. Most of all, I want to thank him for sacrificing his own dreams so I could pursue mine.

Abstract of the Dissertation

Knowledge Sharing Among a Community of Project Managers: A Descriptive Case Study Examining the Relationship Between Social Structures and Knowledge Sharing Among Project Managers in a Global Engineering Firm

The purpose of this study was to gain insight into the extent to which communities of project managers in a global firm shared or did not share knowledge. Specifically the study (1) examined project managers' perceptions of organizations' actions that impact knowledge sharing; (2) examined project managers' perceptions about who, where, what, when, why, and how they shared knowledge and the role they saw formal and informal social structures play in that exchange; and (3) gained insights into the nature of communities of project managers relative to knowledge sharing.

The findings revealed three insights into the nature of three constructs: knowledge sharing, social structures, and communities of practice. First, the organization does not have an established way to share new processes and procedures to everyone. Second, the organization does not scan the environment to understand what its competitors are doing. Lastly, the organization does not have established work groups or communities of practice to help the organization adapt and change. This research provides an introduction to an integrated approach using the three aforementioned constructs to help organizations share knowledge.

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CHAPTER 1: INTRODUCTION

Much has been written about today's global knowledge society and the added complexity of coordinating multifaceted matrix projects. Global competitiveness, tight market forces, and economic constraints have enhanced organizations' sense of urgency to get smart and more efficient about creating, moving, sharing, and distributing goods, services, and knowledge. Project management has served as a format for many global companies seeking to operate effectively in dispersed locations. Benchmarking, capturing best practices, and creating communities of practice are among the strategies global firms use to enhance their sustainability. Yet little is known about the specifics of these micro-interactions among project managers in a community of practice and what role their organizations' formal and/or informal structures play in sharing knowledge among the project managers' community of practice.

In today's changing business environment, companies experience tighter budgets, diminishing resources, more time constraints, and increased competition as they conduct business (Ebersole, 2010; Dyer, 2001). Project management has become one strategy to “focus on priorities, track and measure performance, overcome challenges and problems, become flexible enough to adapt to change and achieve higher performance and a higher probability of success in each project,” which is why the discipline of project management is increasingly more important (Ebersole, 2010, n.p.). Thus, it is important for organizations across various sectors of business to study how they exchange the useful knowledge, skills, and techniques to execute projects effectively and efficiently with cost consciousness (Project Management Institute [PMI], 2008). Today's global firm

recognizes the criticality of knowledge sharing, both in terms of enhancing efficiencies through the sharing of best practices and in terms of transferring and dispersing expert knowledge.

Despite the billions of dollars spent annually in project management, “the bulk of project failures continue to be a result of poor communication” (Biggs, 2000, p. 70).

There are other reasons projects are unsuccessful, including poorly defined goals, lack of resources, inadequate planning, ill-trained or inexperienced project managers, lack of follow-up, cost overruns, unclear directions, and missed deadlines (Ebersole, 2010; Rosenau, 1998). Despite the advanced technology to facilitate increased communication and knowledge sharing, “technology won’t end project failures; communication is key” (Biggs, 2000, p. 70). Without sufficient communication and knowledge sharing during a project, the outcome will probably fail to meet customers’ expectations.

Though most project failures are related to poor communication, the problem can be overcome (Biggs, 2000). Researchers recognize the direct relationship between effective communications and knowledge sharing and project success (Thamhain & Wilemon, 1986). Thomas, Tucker and Kelly (1999) identified communicating effectively among teams as a significant factor contributing to project success in their studies of project management in organizations.

Poor communication continues to be a concern in organizations across levels, functions, and teams. Clarity is needed around how team members interact, how communication flows, how coordination occurs, and how knowledge is shared. Each of these things is enabled or inhibited by an organization’s social structures (Giddens, 1984). Social structures are “sets of rules and resources that individual actors draw upon”

(Giddens, 1981, p. 172) that impact the organization as a social system. Researchers have recognized the challenges associated with knowledge sharing and how poor communication impedes successful exchanges (Badir, Founou, Stricker, & Bourquin, 2003); in turn, Giddens (1984) acknowledged the relationship between social structure and the human actions relative to the reciprocal role in these exchanges. In this context, the action is knowledge sharing, which is central for any project success. Although there is debate as to what defines a successful project (Chiocchio, 2007; Shenhar, 1998, 2001; Shenhar, Levy, & Dvir, 1997; Shenhar, Levy, Dvir, & Maltz, 2001; Wateridge, 1998), few disagree that communication is an essential element of effective project management (Haywood, 1998), and social structures can serve as a constraint or facilitator of action (Giddens, 1984).

The primary focus of this study was to understand the interplay between social structures and knowledge sharing in the context of communities of project managers in a global engineering firm. This study explored how social structures in organizations affect knowledge sharing as perceived by a community of project managers. This dissertation studied a community of project managers within a global engineering firm and sought to examine their perceptions of organizational actions as they relate to knowledge sharing and social structures.

Problem Statement

Organizations spend billions of dollars annually designing policies and procedures and establishing ways of doing things (Dyer, 2001)—in other words, creating social structures—to enable knowledge sharing, yet projects and other efforts are still failing because of poor communication (Rosenau, 1998; Biggs, 2000) and the lack of

knowledge sharing. The noted challenges with knowledge sharing and the lack of a jointed theory to address the direct relationship between social structures and knowledge sharing reveal the applicability of this research and its necessity for practitioners—particularly in project management. Project communication, referring to “the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval, and ultimate disposition of project information” (PMI, 2008, p. 243; Biggs, 2000), is the most cited problem in failed projects. Knowledge sharing is described similarly to communication as the dissemination and diffusion of knowledge through a system (Schwandt, 2010). Thamhain and Wilemon (1986) identified “communicating effectively among task groups as the third most significant factor contributing to project success” (p. 15), further validating the necessity of this study.

While theories exist about social structures (Katz & Kahn, 1966; Giddens, 1984; Stones, 2005) and about knowledge sharing (Schwandt, 2010; Davenport & Prusak, 2000; Nonaka, 1994), there is limited theory that explains how perceptions of social structures impact the extent to which communities of project managers share or do not share relevant and useful knowledge. Additionally, while structuration theory (Giddens, 1998) offers insights into the reciprocal relationships between structure and agency, there is little theoretical work that links this theory to knowledge sharing among a community of project managers.

Schwandt’s (2010) collective learning system model (CLSM) offers a platform to examine the relationship between knowledge and action through interactive subsystems of action. Grounded in Parsonian theory (1951), the CLSM offers a framework for examining project managers’ perceptions of organizational actions associated with the

interactions of meaning-making and remembering, interactions of structuring, interactions of interacting with the environment, and interactions of reflecting. The Schwandt (2010) CLSM allowed this study to leverage the organizational actions' subsystems and modify them to relate to knowledge sharing and social structures, relabeling the subsystems as knowledge valuing, knowledge sharing, knowledge acquisition, and knowledge creation, respectively. The CLSM also allowed the researcher to examine the orientation of knowledge sharing in terms of exploration and exploitation, previously examined in the context of learning and performance.

While studies have examined communications in various contexts, including project management teams (PMI, 2008; Rosenau, 1998; Thamhain & Wilemon, 1986; Thomas, Tucker, & Kelly, 1999), this research has been more focused on the types of knowledge and/or the platform of exchange (face-to-face, meetings, email). Watland, Hallenbeck, and Kresse (2008) noted that communities of practice “serve as effective vehicles to share information, especially across organizational divisions and boundaries” (p. 169). However, most community of practice research has not looked at project managers (Seely-Brown & Duguid, 1991). What has been missing in the research is a study theoretically grounded on a social action theory approach that examines how social structures affect knowledge sharing as perceived by a community of project managers. Thus, the following definitions frame the study: social structures as a set of rules individuals reference in their daily practices (Giddens, 1995); knowledge sharing as dissemination and diffusion of useful knowledge throughout a system (Schwandt, 2010); communities of practice as an informal group of people with shared expertise, knowledge, values, attitudes, and identity who drive strategy, generate new lines of

business, and solve problems (Wenger & Snyder, 2000; Hislop, 2005); and community of project managers as an informal group of project managers within the same organization (PMI, 2008; Wenger & Snyder, 2000). Additional definitions are provided in Appendix A, and summaries of keys theories and constructs are provided in Appendix B.

Research has shown that it is important for organizations to integrate technology or other structures, including standard operating procedures and organizational hierarchy (Trist & Bamforth, 1951;Dulaimi, 2007), regardless of the industry. More than processes, technology and systems are required to achieve project success. Collaborating with stakeholders, sharing knowledge, and communicating strategic goals and objectives are important to develop organizational process capability and project success (Jeong, Kagioglou, Haigh, Amaratunga, & Siriwardena, 2006). This research integrates social structures, knowledge sharing, and community of practice into one study to inform how social structures enable or inhibit knowledge sharing as perceived by a community of project managers.

Research Questions

This research sought to understand the relationship between knowledge and action by examining a community of project managers in a global firm. The overarching research question guiding this study was as follows: How do the social structures of an organization enable or inhibit knowledge sharing as perceived by a community of project managers?

Two secondary questions were used to guide the investigation:

1. What are project managers' perceptions of organizational actions in relation to knowledge sharing?

2. What is the nature of communities of practice among project managers relative to social structures and knowledge sharing?

Purpose and Overview of Methodology

The purpose of this study was to examine project managers' perceptions of organizational actions relative to knowledge sharing and their perceptions about who, where, what, when, why, and how they shared knowledge and the role they saw formal and informal social structures play in that exchange.

To operationalize the study, the researcher identified a global firm that used project managers as a basis for achieving its work. The study was grounded in a descriptive case study methodology with mixed methods that included a document review of the stated policies and procedures about how knowledge sharing occurred; administration of the Schwandt Organizational Action Survey to gain broader perspectives of project managers and organizational actions relative to knowledge sharing as well as identify the orientation of knowledge sharing, exploration or exploitation; and in-depth interviews with project managers to gain their perceptions of formal and informal social structures.

Statement of Potential Significance

This study contributed to theory and practice in the social science discipline. From a theoretical perspective, the study advanced the understanding of knowledge sharing and social structures in the context of project management. Further, because this research treated project managers as members of a community of practice, the research contributed to an understanding of communities of practice as a social structure that may

enable or inhibit knowledge sharing in the context of project management. Further theoretical insights were given into the Schwandt (2010) CLSM—specifically, how policies, procedures, and norms impact the dissemination and diffusion of useful knowledge. From the practitioner’s perspective, the study sought to enhance understanding about the nature of these communities of project managers and their stories and perceptions about when, why, and how useful knowledge was shared among themselves or not. The results of this research can be applied to project managers from other types of industries to possibly include cross-functional teams.

Knowledge is a priority for managers within organizations and is regarded as a requirement for sustained competitive advantage (Argote, McEvily, & Reagans, 2003; Weick & Quinn, 1999; Zack, 1999; Davenport & Prusak, 1998; Inkpen & Dinur, 1998; Spender & Grant, 1996; Prahalad & Hamel, 1994). The opportunity for knowledge sharing to occur resides within the structure that enables or impairs the movement of knowledge (Schwandt, 1997).

In a 2007 study about knowledge within a project-based organization, the findings indicated that “the process of knowledge capture, transfer and learning in project settings rely very heavily upon social patterns, practices and processes” (Bresnen, Edelman, Newell, Scarbrough, & Swan, 2003). A review of the knowledge management literature in construction showed that within the engineering industry, limited efforts were applied to examine knowledge sharing from the social and behavioral perspectives; the focus, instead, was more on project management processes and theories (Dulaimi, 2007). These two previous studies help to validate the importance of the current study, since it focused on the social structures, rather than the technological infrastructure, and how the social

structures enabled or inhibited knowledge sharing. Further, existing literature supports that knowledge sharing is a critical component for an organization to grow and develop and is increasingly recognized as a competitive advantage for organizations (Dulaimi, 2007; Alavi & Leidner, 2001; Nahapiet & Ghoshal, 1998; Nonaka, 1994). Wenger and Synder (2000) explained how organizations are leveraging the influence of knowledge particularly in communities of practice to promote knowledge sharing. The primary focus of this study was to understand the interplay between social structures and knowledge sharing in the context of communities of project managers in a global engineering firm.

Conceptual Framework

Berger and Luckmann (1966) argued that how knowledge is created, shared, and maintained in social situations is more critical than the validity of the knowledge content itself. The theoretical lens guiding this study was social action theory (Parsons, 1951). Specifically, the two theoretical constructs that framed this research study were knowledge sharing (Schwandt, 2010) and social structures (Giddens, 1984), as shown in Figure 1.1.

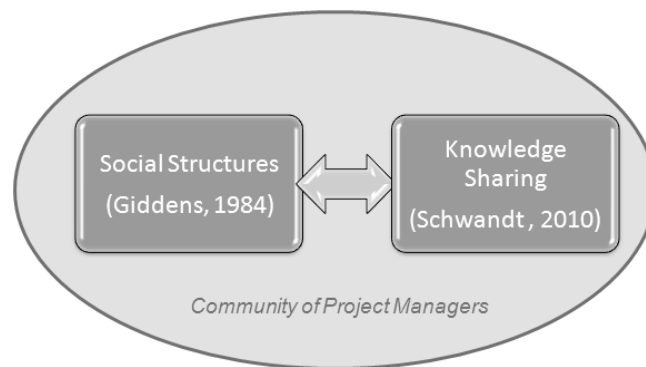


Figure 1.1. Conceptual framework of social interactions and knowledge sharing.

This study focused on knowledge sharing by examining the relationship between social structures (Giddens, 1984) and knowledge sharing (Schwandt, 2010) from a social constructionist perspective. More specifically, the study focused on how social structures enable or inhibit knowledge sharing (Parsons & Shils, 1951; Schwandt, 1997; Schwandt, 2010; Silverman, 1970) among a community of project managers. An action theory perspective was appropriate for this study because of its emphasis on understanding action. Many scholars have employed an action theory approach (Berger & Luckmann, 1966; Cicourel, 1964; Cohen, 1989; Goffman, 1959, 1966; Parsons & Shils, 1951; Schutz, 1964; Schwandt, 1997; Silverman, 1970; Weber, 1947). Additionally, this research incorporated a community of practice (Wenger & Snyder, 2000) as a way to examine a group of project managers within a global engineering firm.

Social Action Theory

This dissertation is grounded in Parsons' action theory. Parsons' framework is based on the relationship between the *actions* of the agents in a social system and their collective ability to adapt to their environments—internally and externally (Parsons, 1951). Parsons (1951) listed four functional prerequisites of a social system of action: adaptation, goal attainment, integration, and latent pattern maintenance. Parsons' (1964) theory “includes an active concern with mastery, or the ability to change the environment to meet the needs of the system, as well as an ability to survive in the face of its unalterable features” (p. 341). Further, Parsons' theory stated that it is imperative for the collective to adapt to its environment (Parsons, 1951). For a complete discussion of the model, see chapter 2.

Knowledge Sharing

Schwandt built upon Parsons' theory by developing four interacting subsystems and four interchange media. Schwandt's (2010) CLSM labeled them as follows: interactions of interfacing with environments (information); interactions of reflecting (goal-referenced knowledge); interactions of meaning making and remembering (sensemaking); and interactions of structuring (structuring) (Schwandt, 2010). Each learning subsystem is imperative to the learning system's capacity to create and share knowledge (Schwandt, 2010). Figure 1.2 depicts the CLSM (Schwandt, 2010).

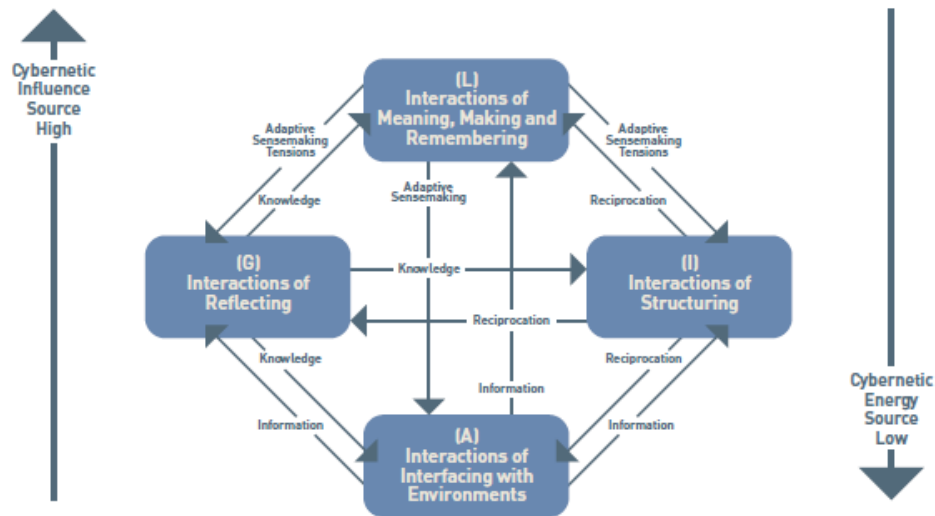


Figure 1.2. The collective learning system model (Schwandt, 2010, p. 126).

The concept of structuration facilitates knowledge sharing and fundamentally is the “recursive character of social life,” which “expresses the mutual dependence of structure and agency” (Giddens, 1993, p. 69). The structure of the social system and the activities engaged in by the individual actors both influence each other and facilitate knowledge sharing (Giddens, 1993). It is the “duality of structure” (Giddens, 1993, p. 128), where “social structure is both constituted by human agency and yet is at the same time the very medium of this construction” (Giddens, 1993, pp. 128-129). Given the

importance of understanding the relationship between social structures and knowledge sharing, Parsons' social action theory was employed, where it offered a framework to understand how social structures enable or inhibit knowledge sharing. A dynamic social action theory was leveraged to further understand this exchange.

Schwandt's CLSM focuses on patterns that occur within and between four interactive subsystems of action. Each subsystem of action corresponds to Parsons' functional prerequisites and contains a set of activities required by the organization to share knowledge. This study used Schwandt's CLSM to describe knowledge sharing. The four subsystems identified by Parsons' general theory of action and reclassified by Schwandt's CLSM were relabeled in this study as knowledge acquisition (new information), knowledge creation (referenced knowledge), knowledge valuing (knowledge adaptation), and knowledge sharing (knowledge dissemination and diffusion) to allow the researcher to examine knowledge sharing, organizational actions, and social structures in a community of project managers.

Further, the CLSM delineates both learning and performing actions. Throughout the dissertation, the researcher referred to learning and performing in the context of knowledge and addressed the orientation as exploration and exploitation, respectively. The document review, Organizational Action Survey responses, and in-depth interviews were the sources of data relative to exploring (learning) and exploiting (performing) actions within the organization. As discussed by March (1991), exploration focuses more on variation, risk taking, and experimentation, while exploitation focuses on efficiency, implementation, and refinement. An overemphasis on either can result in either costly mistakes in undeveloped concepts or in a trapped stale state where new ideas are not

developed and implemented. Maintaining a balance between the two “is a primary factor in system survival and prosperity” (March, 1991, p. 71). For a complete discussion of the CLSM, see chapter 2.

Overall the researcher used Schwandt’s Collective Learning System Model for the conceptualization of the dissertation, which represents Schwandt’s current thoughts as related to knowledge sharing. However, the data collection via the Organizational Action Survey, created as the corresponding tool to assess perceptions of an organization’s actions as related to knowledge sharing and social structures, was based in Schwandt’s original model Organizational Learning Systems Model (OLSM). Although the researcher is using Schwandt’s more current model as the foundation of the study, both models and the survey were grounded in Parson’s Theory of Action, the OLSM, CLSM, and OAS. The core ideas of social interaction and subsystems of action are based on a cognition and action framework consistent with the survey and the researcher’s interpretations of the findings. The researcher used Parson’s Theory of Action as the foundation for the study; therefore, Schwandt’s models and survey are consistent with the researcher’s approach and conceptual framework to respond to the research question.

Relationship Between Knowledge Sharing and Social Structures

The relationship between knowledge sharing and social structures became clear in the work of Giddens (1984) and Schwandt (2010), where there were close ties even at a high-level overview of the discussions and definitions. Giddens (1984) spoke of rules, resources, and practices that facilitate social systems. Schwandt (2010) discussed the flow of information and knowledge within an organization, including communication, coordination, roles, and norms.

Social structures are essential to knowledge sharing; Schwandt (1997, 2010) used the terms structuring, disseminating, diffusion, and coordination to refer to the development and communication of rules, norms, and roles within the system. The aforementioned is closely tied to Giddens' explanation of social structures. Giddens (1993) discussed how "social structure is both constituted by human agency and yet is at the same time the very medium of this construction" (p. 128-129) and how people produce part of their environment and in turn the environment influences the person's meaning making and actions (Giddens, 1979). In 1984, Giddens explained social structures as traditions and as a way of doing things.

Knowledge sharing requires formal and informal communications, which will occur only if the appropriate social structures that facilitate the exchange are in place. Schwandt (2010) indicated that dissemination and diffusion of knowledge throughout a system travel via the structuring medium; therefore, the social structures within an organization enable or inhibit knowledge sharing. The structuring medium is important because it facilitates knowledge sharing into multiple subsystems, and without social structures the knowledge will not be shared and will remain in the interactions of structuring, or knowledge sharing, subsystem. Communities of practice can serve as a social structure within an organization, and in the context of this research the project managers were members of a community of practice as defined by Wenger (1997). Leveraging communities of project managers may enable or inhibit knowledge sharing within the organization.

Assumptions

The researcher made several assumptions to establish the context for this study.

1. Organizations are social systems (Katz & Kahn, 1966; Parsons, 1951; Schwandt, 2010).
2. Knowledge sharing is inherent in all organizations as social systems.
3. Reality is subjective and has multiple interpretations among the participants of this study.
4. Projects enter various states of capability and maturity that require certain levels of norms, behaviors, and tools as measured by professional organizations (PMI, 2008).
5. Project managers are members of the same community of practice within the organization studied.

Limitations of the Study

There are various limitations associated with this study, both in terms of scope and process for inquiry. The scope of the study was a global engineering firm, here called “EngCo.” The study focused only on those divisions within EngCo that had employees classified as project managers. Project managers were the only employees within the organization who participated in the study. The organization allowed research to be conducted over a 3-month period.

The processes for inquiry, survey, and interview also had limitations. Although all project managers were invited to take the survey, not all of them participated. In addition, the self-reported information was not always verifiable with artifacts. It is possible that participants did not objectively report data, which would threaten the validity of the results (Frankel & Wallen, 2000). In addition, the researcher’s presence may have impacted how the participants responded to interview questions. The researcher is

employed by EngCo; thus, familiarity with the organization and its members may have impacted the data received and/or the data analysis.

This research focused only on the role of the project managers and their perceptions of how social structures enabled or inhibited knowledge sharing; the perspectives of others in different roles within the organization were not obtained. Also, the sample of project managers the researcher surveyed and interviewed may have unique single-site characteristics, thus creating self-defined boundaries that may not reflect the entire population of project managers. Such a situation would limit the generalizability of the study.

Delimitations of the Study

The researcher chose to bound the study to enhance robustness and perspective by focusing on a single firm, including from that firm only divisions with project managers, and focusing only on the level of project managers in order to gain a deeper understanding of the nature and communities of project managers. The study was bound by the phenomenon being researched and the selected methodology to answer the research questions. With a focus on the process of useful knowledge exchange among project managers versus the entire spectrum of knowledge exchange possibilities, the researcher chose to gather perceptions of actions via survey and validate the perceptions through interviews of specific project managers in lieu of interviewing all project managers.

Summary

This concludes the introduction, which has discussed the research questions, the assumptions about what was being studied, the significance of the research, and the

general plan for how the research was operationalized. Chapter 2 provides an overview of the literature reviewed for this dissertation and includes synthesis and critiques about the literature on approaches to knowledge, knowledge sharing, Giddens' structuration theory, Schwandt's and Parsons' frameworks for examining social structures and knowledge sharing, and approaches to communities of practice.

CHAPTER 2:

LITERATURE REVIEW

This chapter provides the theoretical background and discusses the scholarly literature on the major concepts and constructs of this study. It also serves to bind the research together and explain why this unique set of constructs was included in this research. The literature review is divided into three major sections: (1) historical perspectives of knowledge and knowledge sharing, (2) structuration theory and social structures, and (3) knowledge sharing and social structures in communities of practice.

Historical Perspective of Knowledge

Theorists have researched knowledge and its meaning for several centuries, using very different perspectives (Tsoukas, 1997). Thus, there are a plethora of definitions and interpretations for the term (Tsoukas, 1997). Scholars have written about Plato's description of knowledge as justified true belief (Marr, Gupta, Pike, & Roos, 2003). Aristotle, a student of Plato, defined knowledge as "context-dependent, personalized, time-bound, and infused with values" (Tsoukas, 1997, p. 839). Aristotle believed individuals had an innate desire to want to know and to use their memories to create experiences and learn from such experiences; the more experiences an individual had, the more information he or she could collect and use to build a repertoire to learn more from (O'Dell & Grayson, 1998). Aristotle believed in knowledge stemming from observations (O'Dell & Grayson, 1998). Disagreeing with Plato's concept of knowledge as justified true belief (Marr et al., 2003), Epicurus provided two criteria for knowledge—a clear view and no contradiction—both of which could be obtained only through the five senses

(Cruise, 2004). Further, he believed that individuals must trust their five senses to gain information about the world and that future sensations experienced would validate or nullify previous senses (Cruise, 2004). Kant (1968) was instrumental in the shift from the concept of our experiences and our senses shaping ideas to a concept of an understanding of the experiences and our recollections increasing knowledge (Cruise, 2004). Table 2.1 shows the progression of thought on the concept of knowledge from 469 BC to AD 1800.

Table 2.1
Knowledge Scholars and Their Concept of Knowledge

Scholar	Year	Concept of knowledge
Socrates <i>Rationalist</i>	469 BC– 399 BC	<ul style="list-style-type: none"> • “I only know that I know nothing.” • Dialectic method of inquiry • Works very similar to Plato
Plato <i>Rationalist</i> (Marr, Gupta, Pike & Roos, 2003)	428 BC– 347 BC	<ul style="list-style-type: none"> • “Justified true belief” • Belief to be distinguished from knowledge on account of justification • Knowledge proportionate to its source
Aristotle <i>Rationalist</i> (Tsoukas, 1997)	384 BC –322 BC	<ul style="list-style-type: none"> • Self-knowledge as context dependent • Deductive inference • Formal logic • Student of Plato
Descartes <i>Rationalist</i> (Cruise, 2004)	1596– 1650	<ul style="list-style-type: none"> • Perceptions as unreliable • “I think; therefore, I am.” • Rejection of ideas that can be doubted
Locke <i>Empiricist</i>	1632– 1704	<ul style="list-style-type: none"> • Determined by experiences derived from sensory perceptions • Mind as a blank slate, not filled with innate ideas
Hume <i>Empiricist</i>	1711– 1776	<ul style="list-style-type: none"> • Human behavior governed by belief, not reason • Rejected the view that effect could be deduced from cause
Kant (Kant & Meiklejohn, 1934)	1744– 1800	<ul style="list-style-type: none"> • Synthetic judgment (e.g., cause and effect, geometry, physics, $7+5=12$) • “Using reason without experience leads to illusions.” • Shift from experiences shaping knowledge to understanding experiences to expand knowledge

As scholars used the term *knowledge* more broadly, a typology of knowledge emerged and clusters of literature about knowledge further defined different types of knowledge. Knowledge is a significant organizational resource (Penrose, 1995; Winter, 1987). Unlike other organizational resources, the use of current knowledge yields the possibility to create new knowledge (Leonard-Barton, 1988; Zuboff, 1984). Knowledge is not finite but can be replenished in use (Giddens, 1985; Schon, 1983); it can also be merged and coalesced to generate new knowledge (Garud & Nayyar, 1994; Kogut & Zander, 1992; Okhuyzen & Eisenhardt, 2002). Once knowledge is created, it can be expressed, shared, saved, and presented in different forms to generate alternative uses and adaptations for future use (Sambamurthy et al., 2003).

Polanyi's Tacit and Explicit Knowledge

There are two types of knowledge: tacit and explicit (Polanyi, 1966). Tacit knowledge has both technical and cognitive dimensions (Polanyi, 1966). The technical dimension is often referred to as “know how” and encompasses informal skills or crafts (Polanyi, 1966). The cognitive dimension is in the minds of individuals in organizations and consists of ideals, values, and beliefs deeply ingrained, which impact how individuals perceive the world (Polanyi, 1966). Both dimensions of tacit knowledge are difficult to codify and are typically expressed through conversation (Nonaka, 1994). Explicit knowledge is captured and written to facilitate the dialogue or exchange between individuals; it can be articulated and captured in a formal system (Polanyi, 1962; Nonaka, 1994). Explicit knowledge can be found in words, numbers, scientific formulas, libraries, and the like (Polanyi, 1962). Table 2.2 compares tacit and explicit knowledge in terms of how it can be shared and its advantages and disadvantages.

Table 2.2
Explanation of Tacit and Explicit Knowledge

Type of knowledge	Description	How knowledge is shared	Limitations	Advantages
Tacit	“Know how” (Nonaka, 1994); embedded in work practice, difficult to codify; “indwells” in a comprehensive cognizance of the mind (Polanyi, 1966)	“Requires sharing through socialization, physical proximity, and good relationships” (von Krogh, Ichijo, & Nonaka, 2000, p. 93); rooted in experience and collective sense-making processes (Weick, 2001)	Not easily passed on because it is tied to the senses, personal experiences, and body movement (von Krogh et al., 2000); transfer between people and units is slow, costly, and uncertain (Grant, 1996; Polanyi, 1966); not easily leveraged by an organization	Important or secret information is not as likely to leak to competitors
Explicit	Written down to facilitate the exchange between two people; easy to codify (Nonaka, 1994)	Written communication	Some individuals are unable to clearly articulate their knowledge or actions and cannot codify it; information must be regularly audited for changes; security and privacy concerns heighten when knowledge is codified so that it does not leak	More easily shared and leveraged throughout the organization; easier to discuss, debate, and enhance as needed because it is codified

Additionally, there are several typologies of knowledge. Knowledge scholars Garud, Habermas, and Sackmann are discussed in the next section, as they are most relevant to this research.

Garud’s Knowledge Types and Forms

Garud (1997) reviewed organizational knowledge in his research and discussed *know-what*, *know-why*, *know-where*, and *know-when* as components of knowledge (Garud, 1997; Nicholls-Nixon, 1997). Garud (1997) emphasized that of the components, *know-how* is most widely used. Each component of knowledge is obtained through

different means and, once created, exists in different compartments, e.g., in individuals, in organizational routines, and in organizational practices (Garud, 1997; Nicholls-Nixon, 1997). Garud's knowledge framework is important because it calls for an all-inclusive approach to the study of social interactions and social processes involved in knowledge creation. Garud's work demonstrated the relationship between knowledge creation and knowledge sharing and in turn supports the argument for a comprehensive framework examining how knowledge is shared.

Habermas' Forms of Knowledge

Habermas (1984) contended that knowledge can take on three forms based on communicative action: technical knowledge, practical knowledge, and emancipatory knowledge (Table 2.3). *Technical knowledge* is oriented by a means-ends relationship regulated by a set of rules guided in the direction of cause-effect relationships (Habermas, 1984). Communicative action or human interaction involves *practical knowledge* of society and is developed from understanding and communicating with members of society and understanding associated elements of a society's culture (Habermas, 1984; Schwandt & Marquardt, 2000). *Emancipatory knowledge* is a result of self-reflection and inquiry about beliefs and conjectures regarding how individuals interact and the corresponding themes associated with the sustaining "inhibitions and patterns of interactions" (Mezirow, 1991, p. 87; Habermas, 1984).

Habermas (1971) critiqued Parsons' failure to acknowledge the mutual understanding element in the development of action orientations (Scheuch, 2004). Further, Habermas developed the theory of communicative action, where language is a

mechanism of communication and provides shared comprehension, which fits well with this research and its focus on knowledge sharing (Scheuch, 2004).

Table 2.3
Habermas' Forms of Knowledge

Knowledge form	Purpose
Technical	<ul style="list-style-type: none"> • Enhance prediction and control • Identify and manipulate variables • Remove formal irrationality
Practical	<ul style="list-style-type: none"> • Improve mutual understanding • Interpret symbolic communication • Eliminate or reduce misunderstanding
Emancipatory	<ul style="list-style-type: none"> • Realize enlightenment projected through development of more rational social relations • Expose domination and exploitation • Remove socially unnecessary suffering

Note: Adapted from Alvesson (2002).

Sackmann's Types of Knowledge

Sackmann (1992) described four types of knowledge shared by organizational members: (1) dictionary knowledge, (2) directory knowledge, (3) recipe knowledge, and (4) axiomatic knowledge (Table 2.4). Dictionary knowledge refers to the *what* in situations and describes common descriptions, labels, and definitions used within an organization (Sackmann, 1992). Directory knowledge is “descriptive rather than evaluative or prescriptive”; it describes the *how*, e.g., processes used to solve problems or how individuals get promoted (Sackmann, 1992, p. 142). Recipe knowledge expresses the *shoulds* and suggests specific certain actions regarding how to solve a problem (Sackmann, 1992). Axiomatic knowledge provides the *why* and provides clarification and rationale of the root cause perceived by others regarding an event (Sackmann, 1992).

Axiomatic knowledge “represents premises that are equivalent to axioms in mathematics in that they are set a priori and cannot be further reduced” (Sackmann, 1992, p. 143).

Table 2.4
Sackmann’s Types of Knowledge

Type	Explanation
Dictionary knowledge	Refers to the <i>what</i> in situations; discusses what is considered the problem
Directory knowledge	Refers to the <i>how</i> in situations; describes processes used
Recipe knowledge	Refers to the <i>should</i> in situations; suggests specific actions to resolve problems
Axiomatic knowledge	Refers to the <i>why</i> in situations; provides rationale and clarity

Knowledge Sharing

Over the past decade, scholars from a variety of disciplines have created a substantial amount of literature on knowledge sharing. The term *knowledge sharing* is differentiated from other terms by its generic bidirectional flow. While knowledge sharing involves a flow, it is never depleted because knowledge is a resource that multiplies when shared effectively (Davenport & Prusak, 2000). Although there is a void in the literature and research when looking at knowledge sharing and communities of project managers, research published in issues of the *Strategic Management Journal* (Spender & Grant, 1996) and *Organizational Behavior and Human Decision Processes* (Argote, Ingram, Levine, & Moreland, 2000) has highlighted knowledge sharing in groups and organizations, reflecting various knowledge sharing perspectives.

Knowledge sharing is addressed mainly through the strategic management literature and is discussed as the realization of competitive advantage. According to the resource-based theory of firms, the objective is to create conditions allowing the fruition of sustainable competitive advantage (Dierickx & Cool, 1989; Fiol, 1991; Peteraf, 1993).

Further knowledge is regarded as a strategic asset; thus, the effective sharing of this resource among the organization increases its competitive advantage. Knowledge resides in people, products, and an organization's operating procedures. This knowledge can be imitated, copied, transferred, or shared through communication (Zander & Kogut, 1995).

One the most frequently discussed modes for knowledge sharing is organizational learning. Argyris and Schön (1978) wrote about organizational learning; their work was followed by research by March and Simon (1958) and Cyert and March (1963). Organizational learning is a process by which knowledge held by individuals is amplified, internalized, and externalized as part of the organization's knowledge base (Nonaka, 1994, p. 20). Externalization is closely related to knowledge sharing, as it refers to the conversion of tacit knowledge to explicit knowledge. Leveraging various dialogues, individuals and groups "articulate their own perspectives, and thereby reveal hidden tacit knowledge that is otherwise hard to communicate" (Nonaka, 1994, p. 20); thus, knowledge is shared.

According to an increasing number of scholars and practitioners, knowledge cannot be managed (Streatfield & Wilson, 1999; von Krogh et al., 2000; Cross, Parker, Prusak, & Borgatti, 2001; Darr & Kurtzberg, 2000); however, certain contextual and organizational variables can influence and support knowledge sharing. Gupta and Govindarajan (1991) identified the environment, characteristics of the organizational structure, and organizational cultural norms as significant contextual variables that impact knowledge sharing. Argote and Ingram (2000) indicated that knowledge is contained within various repositories that include members, organizational tasks, and tools, which they referred to as the three basic elements of organizations. For knowledge

sharing to occur, the repositories' elements and networks of elements within the organization must move (Argote & Ingram, 2000). Otherwise, knowledge elements or networks of elements must be transformed through communication and training (Argote & Ingram, 2000).

An additional significant influence on knowledge and knowledge sharing is the ease of sharing the knowledge. This relates to whether the knowledge is tacit or explicit (Zander, 1991). Even sharing explicit knowledge that is clearly defined and written can be difficult due to the recipients' inability to receive the information or due to their lack of absorptive capacity (Szulanski, 1996). The research reveals that although knowledge sharing may be difficult, it is certainly costly if critical knowledge is *not* shared. Hoopes and Postrel (1999) identified errors plausibly made due to a "glitch," which is defined as "a costly error possible only because knowledge was not shared" (p. 838). They reported "glitches" in their research of fourteen product development projects (Hoopes & Postrel, 1999) and offered four contributions related to knowledge sharing:

- (1) It moves beyond the counting of integrating mechanisms to measure directly the impact of shared knowledge as a resource, and clarifies the channel of influence for the benefits of integration.
- (2) It develops a new technique of measurement, based on the analysis of glitches, which is much easier to operationalize than other methods for studying knowledge.
- (3) It confirms that shared knowledge is an important resource underlying product development capability in at least one business.
- (4) It describes, at a clinical level, different syndromes leading to glitches. (pp. 860-861)

Hoopes and Postrel (1999) indicated that the root cause of the lack of shared knowledge was the lack of integrating practices. Further, they recognized that the initially knowing party fails to mention critical knowledge items to the ignorant party because the knowing party takes the knowledge he or she has for granted. Then knowledge not previously shared is identified by an integrating practice, but the initially ignorant party

does not understand it (thus remaining ignorant), while the initially knowing party mistakenly presumes the knowledge was shared and/or transferred.

Szulanski (2000) referred to “one of the most surprising lessons” (p. 10) from the recent academic interest in knowledge sharing as the fact that just because an individual within the organization owns potentially important knowledge, that does not inevitably equate to a situation where somebody else within the same organization will reap the benefits from this knowledge.

Summary of Theories about Organizational Knowledge

In addition to discussing knowledge sharing, clusters of literature about knowledge are found in the areas of knowledge creation, knowledge management, knowledge transfer, and knowledge acquisition. Table 2.5 summarizes some of the different concepts about the nature of knowledge as described by various scholars.

Table 2.5
Nature of Knowledge Perspectives

Term	Definition
Knowledge (Suchman, 1987; Nicolini & Meznar, 1995)	Situated in particular contexts of meaning and practice (Suchman, 1987); it is the “thickness of experience” that makes knowledge sharing more complicated to communicate than what can be found in standard operating procedures, best practices documents, or training sessions (Nicolini & Meznar, 1995, p. 741).
Knowledge creation (Zahra & George, 2002)	The capability to exploit acquired knowledge through discovering new, improved, and refined ways of doing things that create organizational value or increase operational efficiency.
Knowledge management (Davenport & Prusak, 1998; Nonaka & Takeuchi, 1995, p. 63)	An organized and planned approach to gathering, sorting, and distributing knowledge within an organization (Davenport & Prusak, 1998); ignores the human aspect; limited because it can’t provide the “shared experience” (Nonaka & Takeuchi, 1995, p. 63) necessary for relating to another individual’s thinking process.
Knowledge transfer (Davenport, 1995; Watson & Hewett, 2006)	“Successful knowledge transfer involves neither computers nor documents but rather interactions between people” (Davenport, 1995, p. 32); Watson and Hewett (2006) specified that knowledge transfer occurs when valuable experiential information, not just

	data and information, is shared between individuals or groups.
Knowledge sharing (Schwandt, 2010; Cummings, 2004; Pulakos, Dorsey, & Borman, 2003)	Dissemination and diffusion of knowledge throughout a system (Schwandt, 2010); knowledge sharing refers to the provision of task information and know-how to help others and to collaborate with others to solve problems, develop new ideas, or implement policies or procedures (Cummings, 2004; Pulakos et al., 2003). Knowledge sharing can occur via written correspondence or face-to-face communications through networking with other experts, or through documenting, organizing, and capturing knowledge for others (Cummings, 2004; Pulakos et al., 2003; as cited in Wang & Noe, 2010).
Knowledge acquisition (Zahra & George, 2002)	All the activities a firm's employees may engage in to identify and acquire externally generated explicit or tacit knowledge that is critical to a firm's operations (Zahra & George, 2002).

In summary, this study viewed knowledge sharing as a result of a social process or social interaction, and not solely as a result of receiving facts and bits of data (von Krogh et al., 2000). Schwandt explained that “how information is given meaning and becomes useful knowledge, and the social-cultural contexts of learning” are relevant to understanding the knowledge sharing construct and how social structures influence if or how knowledge sharing occurs (2000, p. 178). In addition, this study grounded its concept of knowledge in Sackmann’s four knowledge typologies to analyze the data and answer the research question. These knowledge typologies represent the types of knowledge most frequently discussed in project management—the “what,” “how,” “why,” and “should” (Sackmann, 1992).

Structuration Theory and Social Structures

Structuration theory (Giddens, 1979, 1984) is regarded as the bedrock in addressing the relationship between agents and social structures. The theory takes a different perspective from the macro/micro and subjectivism/determinism issues in social sciences (Baert, 1998). The concept of duality of structures (Durkheim, 1933; Giddens, 1984; Parsons, Bales, & Shils, 1953) is at the core of structuration, and a key contribution

was made by Giddens (Sewell, 1992; Stones, 2005). Duality refers to the self-repeating or recursive relationships between actors' actions that produce and reproduce structures and the influence of structures on these actions as a medium and as an output (Giddens, 1979, 1984; Stones, 2005). The structural properties of social systems do not exist outside of action but are constantly engaged in its production and reproduction (Giddens, 1984, p. 374).

Structures are the sets of social rules and resources within an organization that individual actors rely upon and are recursively implicated in interaction (Giddens, 1979). According to Sewell (1992), "Structure is one of the most important, elusive, and under-theorized concepts of the social sciences" (p. 1), and the concept of structure is central to many schools of study. As early as the 17th and 18th centuries, the concepts of structuralism, poststructuralism, and structural functionalism appeared and were in use. Sewell (1992) highlighted that the term *structure*, by its very nature, can be viewed as problematic because it conjures images of rigidity and lack of change; he proposed that structures are a "profoundly cultural phenomenon" that encompass both schemas and resources and that structures are dynamic, transformable, and continuously reproducing or transforming.

Human social activities stem from norms, rules, and resources that are created simultaneously through social interaction (Giddens, 1984). By rules, Giddens (1984) referred to the "methodical procedures of social interaction" (p. 18) and influences that affect how actors constrain or promote their actions. Giddens (1984) suggested that structures may include traditions, institutions, moral codes, and other sets of expectations—established ways of doing things. From this context, the structure of the

organization reflects those actions, decisions, processes, norms, values, and outcomes accepted and replicated by the organization's members. Such structures are typically stable, although they can be changed, particularly as a result of unintended action, e.g., when people start to ignore the structures or replace them (Giddens, 1985).

Giddens (1984) indicated that a term was needed that incorporated the duality of structure, not the dualism of structure. It is not possible to separate the structure from the agent; the structure defines how its members will act, and the negotiated action between the members sustains the organization (Giddens, 1984). The duality of structures in the theory indicates that although structures can be the outcome of actors' actions, they are also the precondition for their action (Giddens, 1984). As preconditions, external structures are embedded in individuals' internal structures and hence influence individual actions. Agency refers to a "continuous flow of conduct" (Baert, 1998, p. 101) that exists as purposive action based on individuals' ability to act. Social structures are both created by and influenced by human agency, where structures are "sets of rules and resources that individual actors drew upon in the practices that reproduce social systems" (Giddens, 1995, p. 203). Although individuals may act out of certain free will, they are always affected by their circumstances and social structures (Schwandt, Ayvaz, & Gorman, 2006; Stones, 2005). Giddens believed the key to understanding social systems is to recognize what rules, resources, and actions were reproduced over time. Overall, Giddens summarized the concept of structuration and social systems by stating, "Analyzing the structuration of social systems means studying the modes in which such systems, grounded in knowledgeable activities of situated actors who draw upon rules and resources in the diversity of action contexts, are produced and reproduced in interaction"

(Giddens, 1984, p. 25). Some of the terms related to the duality of structure are defined in Table 2.6.

Table 2.6
Duality of Structure

Structure	System	Structuration
Rules and resources, or sets of transformation relations, organized as properties of social systems	Reproduced relations between actors or collectivities, organized as regular social practices	Conditions governing the continuity or transmutation of structure, and therefore the reproduction of social systems

Note: From Giddens, 1985, p. 25.

Giddens presented structuration as an overarching theory in his 1984 book, *The Constitution of Society*, to provide “an approach to social science” and “construct sets of stably established generalizations . . . that can help order and inform processes of inquiry into social life” (Preface). In Giddens’ work, he avoided use of the term *laws* for a critical component of structuration, and used structuration as “only one among various priorities or aims of social theory” (Preface). In other words, the actions and decisions of the organization’s members create the structures of organizations, and those structures are maintained and sustained within the organization by the conformity of the members.

An interpretation of structuration theory that maintains its core concepts and addresses its shortcomings as related to its application for empirical observations is required to make the theory empirically available and useful (Stones, 2005). There have been attempts to provide sequence to the simultaneous nature of the recursive social interactions between structure and agency (Barley & Tolbert, 1997).

Critiques and Application of Structuration Theory

Scholars have been critical of Giddens, minimizing his contribution to structuration because of its lack of specificity for application to empirical studies (Stones, 2005). While Giddens (1989) indicated that structuration is a framework that is “abstract and generalized” (p. 295) and did not directly advance the use of structuration in empirical studies, other scholars have leveraged structuration in their research. As examples, Barley (1986) used structuration to look at the integration of new technology in hospitals, and Morawska (1996) studied a Jewish population to show that, in the absence of direction or formal structure, behaviors would change, roles and norms would be impacted, and the group would experience a change in their social system. Possebon and Pinsonneault (2005) reviewed use of structuration theory in the information technology field, finding that it played a role in the research of 32 empirical studies over a 13-year timeframe. Other studies have leveraged structuration as an approach to examine social processes during organizational changes.

Stones (2005) responded to some of the critiques of Giddens’ work on structuration and offered insights into the shortcomings of structuration for empirical research. He stated that over the years, “at the theoretical level [structuration as presented by Giddens] has been the negative target of sustained and detailed criticisms, whilst at the empirical level its history, at least on the surface, has been one of overwhelming success” (Stones, 2005, p. 2).

Knowledge Sharing as Related to Social Structures: Parsons’ Social Action Theory

Parsons’ theory of action is founded on the basis of social action. “Social action is all human behavior motivated and directed by the meanings which the actor discerns in

the external world, meaning of which he takes account and to which he responds” (Rocher, 1995, p. 28). Parsons’ model is viewed both as an organizational- and individual-level theory, and his theory of action relates to how knowledge is shared through social actions. Explaining roles within a system of actions and explaining a system of actions through social behavior, Parsons’ theory (1951) contends that organizations are collective systems of social actions. He defined subject-actor, a situation, symbols, and rules, norms, and values in his theory and used these elements to explain how social action occurs within a system. Additionally, Parsons (1967) declared that actions exhibit the system’s properties.

Parsons’ theory (1951) provides a framework in which actions are explained by four sets of action as functional prerequisites: adaptation, goal attainment, integration, and latent pattern maintenance. Two subsystems are externally focused: adaptation, those actions associated with how the firm interfaces with its external environment; and goal attainment, those actions associated with developing and managing the firm’s goals. The other two subsystems are internally focused: integration, those actions associated with how a firm coordinates within; and latency, those actions associated with how a firm maintains its cultural assumptions. The social system is dependent upon knowledge and the set of norms and values that guides interpretation and action.

To further explain his general theory of action, Parsons distinguished media of interchange in the inputs and outputs of each subsystem, which allowed exchanges to occur between each subsystem. “The function of this complex of media is to ensure the continual circulation within the action system of what Parsons calls ‘resources’” (Schwandt & Marquardt, 2000, p. 49).

Parsons' theory serves as an underpinning for understanding knowledge sharing in a system. The theory provides context for how knowledge can be shared and illustrates that action is needed within the system to facilitate knowledge sharing. Parsons' work not only is important to the concept of knowledge sharing, but also provides context for the understanding of social action.

Schwandt's Collective Learning System Model

Schwandt (2010) expanded upon Parsons' general theory of action by constructing the collective learning system model (CLSM) that depicts how organizations transform new information into organizational knowledge. The CLSM provides a theoretical lens for exploring the knowledge creation process and can be adapted to provide insights into the knowledge sharing process. The model incorporates a system of actions, actors, symbols, and processes that enable organizations to convert information into knowledge and in turn increase their long-term strategic advantage (Schwandt, 2010).

Schwandt's (2010) subsystems describe actions associated with how an organization interfaces with its external environment, how it reflects and acts on newly acquired information, how it shares knowledge throughout the system, and how its memory and meaning practices influence how information is understood and acted upon to generate new goal-referenced knowledge. Further, knowledge is considered to be socially constructed, which is consistent with Parsons' thoughts. This action-based model examines the social context in which organizations share knowledge. Table 2.7 displays Parsons' (1952) subsystems as described in the general theory of action along with the collective learning subsystems as described by Schwandt (2010).

Table 2.7
Parsons' Subsystems and the Collective Learning Subsystems

		Purpose	
		Means	Ends
Focus	External	Adaptation (Parsons, 1951) Interactions of interfacing with environments (Schwandt, 2010)	Goal attainment (Parsons, 1951) Interactions of reflecting (Schwandt, 2010)
	Internal	Pattern maintenance (Parsons, 1951) Interactions of meaning-making and memory (Schwandt, 2010)	Integration (Parsons, 1951) Interactions of structuring (Schwandt, 2010)

As shown in the table, each subsystem of action corresponds to Parsons' functional prerequisites and contains a set of activities required by the firm to create knowledge and adapt to the changing environment. The connection between these collective learning subsystems and the action patterns is represented by four interchange media: reciprocation, information, adaptive sensemaking, and knowledge (Schwandt, 2010). Adding the interchange media to the subsystems results in outputs and creates concreteness (Figure 2.1). The CLSM is relevant to this study because it addresses the connection between knowledge sharing and social structures.

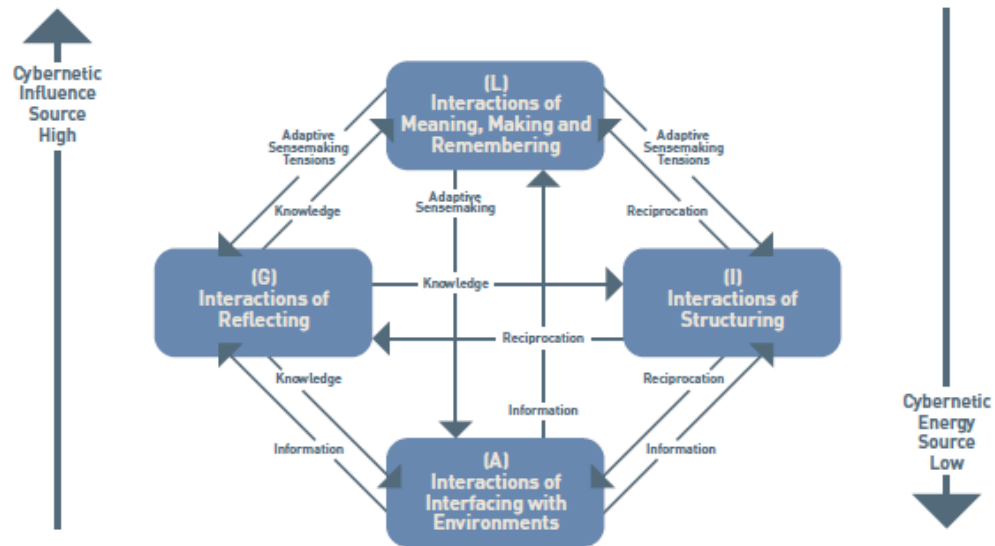


Figure 2.1. The collective learning system model. Reprinted with permission from Schwandt, 2010, p. 126.

Schwandt’s four subsystems. Schwandt (2010) depicted the movement of new information from external sources to the internal organization through the organizational learning subsystems. According to the CLSM, information moves dynamically throughout the organization and is not static in one subsystem of the model.

Interactions of interfacing with environments is the subsystem that serves as a filter that allows or rejects new information attempting to enter the organization. *Information* is the interchange medium output for this subsystem (Schwandt, 2010). This information is “required by all the other learning subsystems for their functioning” (Schwandt, 2010, p. 137). The interactions of interfacing with environments subsystem corresponds with Parsons’ adaptation function.

The *interactions of reflecting* subsystem serves as a critical component for creating knowledge from the information received (Schwandt, 2010). The reflection can range from “rational evaluations” to “value-laden deliberations” (Schwandt, 2010 p. 138)

in response to the *adaptive sensemaking tension* from the interactions of meaning-making and memory subsystem. Reflection is seen as the “how and what and why” of action (Schwandt & Marquardt, 2000, p. 118). Knowledge is created when actors reflect on information and act based on their own interpretation of the information (Schwandt, 2010). The interactions of reflecting subsystem correlates with Parsons’ goal attainment function.

After knowledge is created, it is distributed, disseminated, and shared both internally and externally (Schwandt, 2010). The *interactions of structuring* subsystem is critical to this research because it is how knowledge is shared, whether through formal structures or informal mechanisms (Schwandt, 2010). *Reciprocation* represents the flow of both information and knowledge from the subsystem and correlates to the development of rules, norms, and roles within the system (Schwandt, 2010). The structuring interactions are guided by the norms and values of the collective and respond to the adaptive sensemaking tensions (Schwandt, 2010). The interactions of structuring subsystem parallels Parsons’ integration function.

The fourth subsystem, *interactions of meaning-making and memory*, refers to how agents or the collective receive, store, retrieve, and use knowledge that has been valued through reflection (Schwandt, 2010). “Remembering is the retention and retrieval of knowledge” (Schwandt, 2010, p. 140) and “requires human interactions that manipulate a series of knowledge storage mechanisms, each with its own retrieval schema” (Schwandt, 2010, p. 141). Within the subsystem, the *adaptive sensemaking tensions* are latent; they may go dormant or resurface when the knowledge is produced (Schwandt, 2010).

While the description of the CLSM was described in a linear manner to facilitate a clear and concise overview of the model, these components occur dynamically. Therefore, the interchange between the components more accurately represents the dynamic social process involved in knowledge sharing as depicted in Figure 2.3.

Schwandt's four subsystems as knowledge subsystems. Schwandt's CLSM focuses on patterns that occur within and between four interactive subsystems of action. Each subsystem of action corresponds to one of Parsons' functional prerequisites and contains a set of activities required by the organization to share knowledge. Schwandt's CLSM was used in this study to describe knowledge sharing by reclassifying the subsystems to knowledge subsystems and interchange media: knowledge acquisition (new information), knowledge creation (referenced knowledge), knowledge valuing (knowledge adaptation), and knowledge sharing (knowledge dissemination and diffusion) to allow an examination of knowledge sharing organizational actions and social structures in a community of project managers (Table 2.8).

Further, the CLSM delineates both an external and internal orientation, as described initially by Parsons. The knowledge subsystems refer to this orientation in terms of exploration and exploitation, respectively.

Table 2.8
Schwandt's Subsystems Labeled in the Context of Knowledge with Exploration and Exploitation Orientations

Subsystem (Schwandt, 2010)	Reclassification as a knowledge subsystem	Orientation	Description
Interactions of interfacing with environments	Knowledge acquisition	Exploring	Obtaining information concerning changes external to the organization
		Exploiting	Identifying resources to meet organizational goals
Interactions of reflecting	Knowledge creation	Exploring	Reflecting on organizational experiences to improve the quality of products and services
		Exploiting	Producing products and services of the highest quality
Interactions of structuring	Knowledge sharing	Exploring	Disseminating, diffusing and coordinating information sharing; utilizing knowledge for continuous improvement
		Exploiting	Utilizing structures that support effective products and services
Interactions of meaning-making and memory	Knowledge valuing	Exploring	Reinforcing an open, flexible culture
		Exploiting	Achieving performance standards

Table 2.9 displays the subsystems from each of the models, along with their appropriate orientation. The table shows the researcher's contribution to further understanding knowledge sharing.

Table 2.9

Subsystems from Parsons and Schwandt, with Corresponding Knowledge Subsystems Used in This Study

		Purpose	
		Means	Ends
Focus	External (Exploration)	Adaptation (Parsons, 1951) Interactions of interfacing with environments (Schwandt, 2010) <i>Knowledge acquisition</i>	Goal attainment (Parsons, 1951) Interactions of reflecting (Schwandt, 2010) <i>Knowledge creation</i>
	Internal (Exploitation)	Pattern maintenance (Parsons, 1951) Interactions of meaning making and memory (Schwandt, 2010) <i>Knowledge valuing</i>	Integration (Parsons, 1951) Interactions of structuring (Schwandt, 2010) <i>Knowledge sharing</i>

An Empirical Study of Knowledge Sharing and Organizational Culture

Eskerod and Skriver (2007) conducted a qualitative study linking knowledge sharing and organizational culture. Using a longitudinal case study, they conducted in-depth dialogues with five project managers over a period of 6 months. For each dialogue, which was 60 to 90 minutes long, a semistructured interview guide was used to facilitate the discussions. The company that was studied designs, develops, and produces integrated information, communication, and entertainment systems for trains in the European market (Eskerod & Skriver, 2007).

When talking about sharing information on projects, one of the project managers participating in the survey stated, “We have not been that good at getting hold of the good things we experience in the projects. We are very busy, therefore, experiences tend to be stored with the individuals” (Eskerod & Skriver, 2007, p. 111). Leveraging knowledge transfer and organizational theories to support its research, the study

concluded that although knowledge transfer may be a goal for project managers and senior executives, it may not be easily accomplished. In particular, the study highlighted the constraints of knowledge sharing and concluded that the organization's culture was key. Further, Eskerod and Skriver (2007) indicated that the most effective knowledge sharing occurred when the project managers were in close proximity to one another in a shared office, where they had more room for "interaction" (p. 115) and "in their everyday interactions, they discussed problem solutions and shared experiences" (p. 115). The study supported that socialization in the organization was necessary to facilitate knowledge sharing. The study also highlighted that if an organization focused on knowledge sharing too much, groupthink may ensue, which would be detrimental to the project and the organization (Eskerod & Skriver, 2007).

Relationship Between Knowledge and Action

Given the importance of understanding social structures and knowledge sharing, a dynamic social action theory was leveraged to examine this interaction. A social action theory offers a framework for understanding the social process involved in knowledge sharing. A social constructionist perspective to knowledge sharing (Schwandt, 1997) was used to emphasize the social process of knowledge sharing.

Knowledge Sharing and Social Structures in Communities of Practice

In response to business needs to increase knowledge sharing among professionals in the workplace, Lave and Wenger (1990) responded with their concept of situated learning and a practice-based theory of learning: legitimate peripheral participation (LPP). LPP involves becoming an insider and learning from an insider's perspective in a

communal context to include learning what is explicitly observed and developed and capturing what is not easily observed and developed (Lave & Wenger, 1990). It is where “the visible rests in the invisible” that communities of practice thrive and can capture relevant knowledge to benefit an organization (Wenger, 1990, p. 227). Further, Lave and Wenger (1990) focused on a continuous process where the learner’s context was vital to understanding information presented and comprehended. In fact, Lave and Wenger contended that learning hinges on predecessor activities and lessons learned (Lave & Wenger, 1991).

Learning as an insider yields the formation of “communities of practitioners” and pulls newer practitioners toward interacting in the routines and customs of that community (Lave & Wenger, 1991). Specifically, newer members would learn the vernacular and language of the community and learn to function in that community and use its perspective instead of an outside perspective (Lave & Wenger, 1991). Lave and Wenger (1991) defined communities of practice as

a set of relationships among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice. A community of practice is an intrinsic condition for the existence of knowledge, not least because it provides the interpretive support necessary for making sense of its heritage. Thus, participation in the cultural practice in which any knowledge exists is an epistemological principle of learning. The social structure of this practice, its power relations, and its condition for legitimacy define possibilities for learning (i.e., legitimate peripheral participation). (p. 98)

Lave and Wenger (1991) noted the self-organization aspect of communities of practice as something of significance, as well as their emergence from the needs of the environment. Bishop, Bouchlaghem, Glass, and Matsumoto (2008) argued that during “early stages of CoP [communities of practice] development, leadership is extremely valuable to the CoPs whereas organizational support is less important” (p. 162). Later

scholars argued that communities of practice can be formed by organizations to enhance knowledge management, and they require organizational support in order to survive (Mittendorff, Geijssel, Hoeve, de Laat, & Nieuwenhuis, 2006; Wenger, 2004).

Communities of Practice Versus Groups

Because there are multiple descriptors and nomenclatures for various groups within organizations, Wenger and Snyder (2000) provided an overview to differentiate various groups in organizations from communities of practice. The differences are captured in Table 2.10, defining each group's purpose, membership, bond, and duration.

Table 2.10
Comparison of Communities of Practice with Other Organizational Groups

Group	Purpose	Membership	Bond	Duration
Community of practice	To develop members' capabilities; to build and exchange knowledge	Members who select themselves	Passion, commitment, and identification with the group's expertise	As long as there is interest in maintaining the group
Formal work group	To deliver a product or service	Everyone who reports to the group's manager	Job requirements and common goals	Until the next reorganization
Project team	To accomplish a specified task	Employees assigned by senior management	The project's milestones and goals	Until the project has been completed
Informal network	To collect and pass on business information	Friends and business acquaintances	Mutual needs	As long as people have a reason to connect

Note: Based on Wenger & Snyder, 2000.

Although communities of practice have characteristics that clearly distinguish them from other groups, there is a lack of congruence in the literature around the definition of communities of practice and their purpose and disadvantages, if any, as

shown in Table 2.11. The authors in the table represent only a sampling of the viewpoints. These differing definitions and perspectives are discussed in more detail in the next section.

Table 2.11
Congruence in the Literature Around Communities of Practice

Author	Purpose	Membership	Bond	Disadvantages
Snyder (1997)	Focus on learning, competence, and performance	“People who are informally as well as contextually bound by a shared interest in learning and applying a common practice”	Shared interest	None stated
Wenger (1997)	To codify knowledge (Wenger, 2004)	A group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis	The practice itself; not conventional management because it’s not a formal group (Wenger, McDermott & Snyder, 2002)	Little solid agreement on definition for communities of practice; Hara & Schwen (2006) echo this notion
Wenger & Snyder (2000)	Drive strategy, generate new lines of business, solve problems	Groups of people with shared expertise	Shared expertise and passion	“Vulnerable because they lack the legitimacy—and the budgets—of established departments” (p. 144)
Lesser & Storck (2001)	Transfer knowledge, reduce rework, minimize learning curves	Group with common interests; “a group of people playing in a field defined by the domain of skills and techniques over which the member of the group interact” (p. 831)	Common interests	None stated
Hislop (2005)	Still needs further consideration on how its principles can be applied and merits utilized	People with a common and shared stock of knowledge, values, attitudes, and identity	Shared knowledge, values, attitudes, and identity	Difficulty going across communities; need understanding of intercommunity dynamics; groupthink may set in; not looking at various viable alternatives

Perspectives on the Concept of Communities of Practice

One year before Lave and Wenger (1991) published their book, *Shared Learning: Legitimate, Peripheral Participation*, Orr (1990) published his research in a chapter, “Sharing Knowledge, Celebrating Identity: War Stories and Community Memory in a Service Culture.” Orr (1990) discussed how Xerox technicians created a process of collecting information about the machines they serviced and created a storytelling tradition in order to increase their ability to respond to customers’ needs. Besides increasing their customer service ratings, these actions increased knowledge sharing within their group of technicians. Orr (1990) noted, “This construction of their identity as technicians occurs both in doing the work and in their stories, and their stories of themselves fixing machines show their world in what they consider the appropriate perspective” (p. 187). Orr’s thick description of the technicians’ process and the analysis of the outcomes produced by the technicians gave way for Lave and Wenger’s discussion about legitimate peripheral participation which transitioned smoothly into communities of practice.

Years later, as the discussions about communities of practice continued in organizations and in the literature, other researchers published their working definitions to contribute to the discussion based on their interactions and experiences. The discussions began to clarify the various thoughts about the concept of community of practice and unveiled the conflicting viewpoints. For instance, Stewart (1996) described communities of practice as something that have always existed as long as people have worked together. More specifically, Stewart indicated that “communities of practice . . . evolve, they disperse, according to the timing, the logic, the rhythms, and the social

energy of their learning” (p. 173). Although Snyder acknowledged that communities of practice have been in existence, he also recognized that they allow organizations to create, share, and put into operation the expertise and ability to remain competitive in the environment (Snyder, 1997). Snyder (1997) discussed the informal makeup of a community consisting of a group of people who share a common interest in learning and employing a practice that closes the gap between strategy and organizational learning.

Wenger (1997) relied heavily on his original 1991 work with Lave and more explicitly described a community of practice based upon additional research. Wenger’s (1997) idea of practice is related to conducting activity in the context in which it must be done; “it is doing in a historical and social context that gives structure and meaning to what we do” (p. 38). His focus on “practice,” or doing, includes explicit and tacit learning, as well as adapting to the language used, the procedures followed, and the symbols seen as individuals consider how the work gets done (Wenger, 1997). A community of practice

includes all the implicit relations, the tacit conversations, the subtle cues, the untold rules of thumb, the unrecognizable intuitions, the specific perceptions, the well-tuned sensitivities, the embodied understandings, the underlying assumptions, the shared worldviews, which may never be articulated, though they are unmistakable signs of membership in communities of practice and are crucial to the success of their enterprises. (Wenger, 1997, p. 38)

Stamps (1997) supported Wenger’s summation of communities of practice and emphasized their integral place within organizations; he also supported Stewart’s belief that the concept of communities of practice is not new but commented that the term is new to organizations, which can create confusion. Wenger (1998) acknowledged “little solid agreement on the definition” of communities of practice and admitted that the lack of consistent definitions could negatively impact the progress of research efforts (p. 94).

Wenger (1998) worked to clarify the ambiguity by adding that there are four traits that differentiate communities of practice as the “social fabric of learning”: negotiating meaning, presenting and creating knowledge, spreading information, and being a home for identities. Wenger’s goal in listing these elements was to more clearly define the term and improve the ability to research it.

Hara and Schwen (2006) reinforced Wenger’s contention about the lack of consistency of the concept of communities of practice and commented that “little solid agreement on the definition of CoPs . . . could lead to divergence of the concept” (p. 94). In an effort to add further clarity to the concept, Hara and Schwen (2006) developed five attributes of communities of practice:

- (1) Group of professional practitioners;
- (2) Development of shared meaning;
- (3) Informal social networks;
- (4) A supportive culture (i.e. trust);
- (5) Engagement in knowledge building. (p. 96)

They concluded that communities of practice are “informal social networks that support a group of practitioners to develop a shared meaning and engage in knowledge building among the members” (Hara & Schwen, 2006, p. 100).

Baumard (1999) supported the situational learning theory that Lave and Wenger (1991) promoted in their early discussions about communities of practice. Baumard (1999) indicated that situational learning develops within communities of professionals and results in a community developing “a system of relationships between people, activities and the world” (pp. 209-210). The impacted connections represent individuals who share expertise and zeal in various areas and who regularly meet to discuss their agenda, whether explicit or otherwise, that may span business units (Wenger & Snyder, 2000). Wenger et al. (2002) agreed that communities of practice are groups who meet and

interact on a consistent basis “who share a concern, a set of problems, or a passion about a topic,” and the ongoing interactions increase and mature their understanding and thoughts (p. 4). Hislop (2003) added more emphasis on the social aspects of communities of practice and the intensity developed through “ongoing interaction among individuals working within the same context, or addressing similar issues” (Hislop, 2003, p. 166).

Lesser and Storck (2001) viewed successful communities of practice as a necessary bridge to organizational performance through their efforts to decrease the learning curve for new employees, reduce rework, and avoid reinventing the wheel. Communities of practice can also serve as a platform for organizations to share knowledge through different channels rather than a formal hierarchy. According to Brown and Duguid (2001), the participants have a similar background of knowledge, share points of view, and have a sense of collective/group identity.

Gongla and Rizzuto (2001) highlighted the concerns raised by Wenger (1998) about the varying definitions and references to communities of practice. For instance, communities of practice are written about as “learning communities,” “family groups,” “thematic groups,” and “knowledge networks” (Gongla & Rizzuto, 2001). According to Gongla and Rizzuto (2001), these names evolved from knowledge management. They posited that communities of practice are self-organized groups and “informal networks of professionals managing domains of knowledge” that may necessitate interaction or assistance from management (Gongla & Rizzuto, 2001, p. 842).

Based on their call for involvement of management, perhaps Gongla and Rizzuto (2001) would support Wenger et al.’s (2002) belief that communities of practice are the most appropriate resource to codify knowledge due to their ability to unite tacit and

explicit knowledge. Wenger et al. (2002) posited that, rather than serving only as an internal resource for professionals to exchange ideas, communities of practice should have objectives that strategically align with the organization's goals and objectives; they asserted that communities of practice are a resource that management can use to help achieve goals.

O'Donnell et al. (2003) defined communities of practice as "opportunities to learn, share and critically evaluate what they discover or what may unexpectedly emerge" and characterized them as "bound by a sense of collective identity, founded on interest and intrinsic value expectations" (p. 81). O'Donnell et al. (2003) also explained that the group had a different "logic" than a team: "Such groups share knowledge, learn together, create new knowledge, create common practices, and develop a sense of solidarity and personal responsibility and autonomy" (p. 82). Beers (2003) mentioned that communities of practice "develop their own perspectives about how reality is to be perceived (ontology) and what is worth knowing and how to know it (epistemology) . . . inform what members from these groups do, how they behave, and how they solve problems" (p. 3).

Expounding on his previous research, Wenger (2004) indicated that communities of practice are "social structures" that facilitate the ability of practitioners to organize knowledge and serve as "cornerstones of knowledge management" (p. 2). Wenger (2004) discussed the three elements of communities of practice: domain, community, and practice. He described *domain* as a part of knowledge that bridges the group together, contributes to creating an identity, and articulates the prevailing issues to address. *Community* is described as the members addressed or served by the domain, the social

interactions between and among the members, and the periphery that distinguishes members from nonmembers and keeps them separate. The third element, *practice*, includes “the body of knowledge, methods, tools, stories, cases, documents” that the community creates and matures (p. 3). Although the three elements are defined, Wenger (2004) recognized that “no community can fully manage the learning of another, but no community can fully manage its own learning,” which gives way to later discussions about the disadvantages and concerns surrounding communities of practice in later literature (p. 3). In the same article, Wenger (2004) defended communities of practice and indicated they are a necessity because they “manage their knowledge” (p. 2) and can potentially increase members’ job performance if the information shared and knowledge exchanged is incorporated into their execution of work. However, for communities of practice to succeed within an organization, as proven by increased organizational learning and performance, the communities of practice need support from the organization (Wenger, 2004).

Hislop (2005) continued the discussion about potential disadvantages of communities of practice. He explored the idea that communities of practice may fall into ‘groupthink,’ where they consider minimal options and do not challenge members’ ideas or thoughts (Hislop, 2005). He went on to discuss how the community may make poor choices and irrational decisions, form and support stereotypes, and put forth pressure on newcomers within the community (Hislop, 2005).

Project Managers and Communities of Project Managers

The Project Management Institute (PMI), established in 1969, is a professional organization for project managers to advance the field of project management through

research, education, and credentials (PMI, n.d.). PMI offers various industry certifications for project managers to further professionalize the field and discipline of project management. According to PMI, the project management professional certification is the most important industry-recognized certification for project managers, demanded and recognized both globally and locally (PMI, n.d.). Project managers are responsible for initiating, planning, executing, monitoring, and controlling every project and ensuring that processes are followed within nine knowledge areas: project integration management, project scope management, project time management, project cost management, project quality management, project human resource management, project communications management, project risk management, and project procurement management (PMI, 2008). Project managers work in various industries and are often found in the fields of engineering, construction, computing, architecture, and telecommunications. According to PMI, project managers are “change agents,” “comfortable with change and complexity in dynamic environments,” have a “broad and flexible toolkit of techniques,” are “always improving,” and “are in increasing demand worldwide” (PMI, 2011).

Project managers play a key role on their projects, as they are ultimately responsible for ensuring goals and objectives are set and met. Project managers interact with owners or clients and, based on their needs, manage the entire project, leveraging a strong matrix-structured organization to borrow technical experts, resources, and labor as needed for the duration of the project (PMI, 2008). Project managers in the engineering and construction industry are also tasked with assembling a project team to support their project. The project manager’s ability to form the most effective and optimal project team

directly contributes to the overall success or failure of the project. Project teams often have a matrix configuration, staffed by members from various functional teams within the organization to achieve a specific project goal. When the project manager has a high degree of authority, there is a strong matrix; when functional managers have stronger authority, it is known as a weak matrix (PMI, 2008).

Communities of project managers are cultivated by PMI and also within organizations. PMI hosts over 250 chapters in 70 countries worldwide and encourages its project managers to collaborate to create project management knowledge and to discuss questions, challenges, and interests as well as collaborate through wikis, webinars, discussion forums, and blogs (PMI, 2011). The community of project managers comprises 36 different communities with various areas of interest and focus; they leverage shared documents, surveys, announcements, popular links, and a member directory to facilitate mutual learning (PMI, 2011).

Within organizations, communities of project managers may or may not be as formally structured. Some project managers may use SharePoint to archive their information or meet for breakfast or coffee to discuss project information. Some organizations may facilitate a community of project managers by providing the space and time and setting the expectation that the project managers meet and share knowledge, interests, and concerns. Communities of project managers can be resourceful groups because best practices are shared there and a wealth of information is housed within the members. The community of project managers is differentiated from the general population of the organization because of their common interests, profession, and

experience. If an organization encourages the community of project managers, it can benefit from the knowledge created and/or acquired to improve knowledge sharing.

Summary of Literature

Though not considered a technical skill, communication is highly regarded in project management. According to the Construction Industry Institute (1986), engineers' communication skills are as important to the project as their technical specialty skills or knowledge sharing on projects. Moreover, "the single most important factor that contributes to successful project management is communication," and it continues to be a major obstacle to the success of projects (Construction Industry Institute, 1986, p. 15; Thomas et al., 1999).

As defined by the PMI Body of Knowledge, communication "creates a bridge between diverse stakeholders involved in a project, connecting various cultural and organizational backgrounds, different levels of expertise, and various perspectives and interests in the project execution or outcome" (PMI, 2008, p. 243). PMI (2008) also described the multidirectional exchange of communication and differentiated between push communications (letters, memos, reports, emails, faxes, voicemails, and press releases) and pull communications (intranet sites, e-learning, and knowledge repositories).

There is a link between communications, as described by PMI in the context of project management, and knowledge sharing. Knowledge sharing was described by Schwandt (2010) as disseminating and diffusing knowledge throughout a system. The question becomes, How do social structures inhibit or enable knowledge sharing in communities of project managers?

Practitioners attribute the success of an organization to its ability to share knowledge effectively and efficiently (Abrams, Cross, Lesser, & Levin, 2003, p. 64). A 2000 survey revealed a projected growth in knowledge management technologies from \$2.3 billion to \$12.7 billion between 2000 and 2005, representing a 41% growth in an effort to increase knowledge sharing (Dyer, 2001). The initial approach to knowledge management focused on a database platform, but this had significant inadequacies. The follow-up approach placed more emphasis on integrating social processes and leveraging communities of practice; this approach has been adopted by firms such as Bristol Myers Squibb, the World Bank, and British Petroleum (Wenger & Snyder, 2000; Cross, Nohria, & Parker, 2002; Cross & Prusak, 2002; Abrams et al., 2003). This dissertation posits that organizations should invest their time and money exploring and evaluating their social structures to increase knowledge sharing, rather than investing more into knowledge management technologies, because of the link between knowledge sharing, social structures, and project success.

Social structures are sets of rules and resources that individuals alter and draw upon to reproduce social systems (Giddens, 1984). Social structures include traditions, moral codes, and other established ways of doing things (Giddens, 1984) that will facilitate knowledge sharing. Communities of practice are an example of a social structure an organization could leverage to facilitate knowledge sharing. Communities of practice, as defined by Wenger (1997), codify knowledge and consist of a group of people who share a concern, set of problems, or passion about a topic and deepen their knowledge and expertise in this area by interacting on an ongoing basis.

The next chapter explains the research design and methods used in this study to inform how social structures enable or inhibit knowledge sharing in the context of project management at various stages of project completion, as perceived by a community of project managers.

CHAPTER 3: METHODOLOGY

This chapter explains the research design, site and participant selection procedures, methods for data collection and analysis, method strengths, and protection of human subjects for this descriptive case study. The study was designed to answer the primary research question: How do the social structures of an organization enable or inhibit knowledge sharing as perceived by a community of project managers? There were two related subquestions for this research: (1) What are project managers' perceptions of organizational actions in relation to knowledge sharing? (2) What is the nature of communities of practice among project managers relative to social structures and knowledge sharing?

Research Design

This research used a descriptive case study design (Merriam, 2009; Yin, 2003a, 2003b; Creswell, 2003; Tashakkori & Teddlie, 1998) in a single site. The case was time bound based on what was discovered during the period of data collection. The level of analysis was the individual, the project manager, to help understand how social structures enabled or inhibited knowledge sharing. In discussing case studies, Merriam (2009) indicated that “specificity of focus makes it an especially good design for practical problems—for questions, situations, or puzzling occurrences arising from everyday practice” (p. 43) and to gain a comprehensive understanding of a situation. Further, a descriptive case study provides a holistic understanding of systems of action (Feagin,

Orum, & Sjoberg, 1991). Using a case study to explore this research maximized what could be learned in the bounded system over a discrete period of time (Tellis, 1997).

The nature of the research question—How do the social structures of an organization enable or inhibit knowledge sharing as perceived by a community of project managers?—validated a descriptive case study design because it enabled the researcher to glean insights about the nature of knowledge sharing and social structures. A descriptive case study approach allowed the collection of detailed information (Merriam, 1988; Yin, 1989) and supported the purpose of the study to gather in-depth information about knowledge sharing and social structures.

The study employed both qualitative and quantitative methods of data collection. Qualitative procedures were used to gather data to describe the nature of knowledge as well as the dynamic interplay between knowledge sharing and social structures within an organization as related to project management. According to Eisenhardt (1989), although quantitative evidence can denote relationships that may not be significant to the researcher, qualitative evidence is valuable in understanding the connections revealed in the quantitative data (p. 538). This approach allowed the researcher to gather organization-specific data from the source (document reviews), understand a broader perspective from a community of project managers (surveys), and gain specific detailed insight into the organization's perception of knowledge sharing and the role of social structures (interviews). The use of multiple data-gathering methods not only strengthened the grounding of theory by triangulation of evidence, but also added rigor, breadth, and depth to the evidence (Denzin & Lincoln, 2000; Eisenhardt, 1989).

The methodological approach was informed by an interpretivist paradigm (Burrell & Morgan, 1979) and an epistemology based on knowledge as socially constructed (Schwandt & Marquardt, 2000). These perspectives enabled the researcher to understand and explain the social world primarily from the point of view of the individuals directly involved in the social process (Burrell & Morgan, 1979).

Site and Participant Selection

It was critical to find a site where knowledge sharing occurred because the research sought to gain insight about knowledge sharing among a community of project managers and develop thick, rich descriptions of one such organization. Therefore, the researcher intentionally selected a site where the phenomenon, knowledge sharing, regularly occurred and could be observed (Patton, 1990).

Several additional factors were considered when choosing the organization as a site. First, the organization had to permit the researcher to conduct interviews, conduct a survey, and review documents. Second, the site had to be either a firm or a large business unit within a firm with sufficient data to inform the study and a willingness to provide access to a sample of its members throughout the research. Third, knowledge sharing had to be a critical component for organizational success. Fourth, the site needed to be in close proximity to the researcher. Finally, the organization had to utilize project teams.

Based on these criteria, an engineering and construction company, here called “EngCo” to preserve its anonymity, was selected for this study. EngCo is near a large metropolis on the East Coast. Its subsidiary companies and recent acquisitions have allowed the firm to focus resources and expertise within established lines of business on specific market segments over several geographic areas internationally. EngCo has

offices throughout the United States, Africa, Asia, and Europe. It is a project-based organization with approximately 3000 employees; 108 employees function as project managers. EngCo is over 60 years old and has grown exponentially over the past 5 years, with increased work overseas and with the federal government. The CEO, the third since the company began, has a vision of expanding into additional market segments and countries through aggressive business development, a strong reputation, and an organically grown workforce.

Weiss (1994) suggested that in selecting participants, researchers focus on those who will provide the data required by the study. The sample population for this study included all EngCo employees in all divisions who were classified as project managers. The researcher received a list of EngCo project managers and their divisions from the human resources office. All were invited to participate in the survey. For the interview portion of data collection, three criteria were used to select participants: (1) a willingness to talk freely, (2) confirmation of their current work as a project manager; and (3) completion of at least two projects at EngCo as a project manager.

Before formal fieldwork began, the researcher performed an initial mapping of the research site. During this initial contact, the researcher became more familiar with the physical and social structure of the firm and probed for the feasibility of access to the site. The goal of this process was to ensure that all ethical considerations were met as well as to develop rapport with members at the site, to increase response rate, to introduce the researcher to preliminary contextual elements of the firm as relevant to the research, and also to identify and clarify the sampling strategy.

Data Collection

Three sources of data provided insight as to how social structures enable or inhibit knowledge sharing as perceived by a community of project managers—surveys from a representative sample of project managers, interviews from a representative sample of project managers, and document reviews—to enable the researcher to triangulate the data and increase its trustworthiness. Table 3.1 provides an overview of the data collection methods, including sample population, strategy, and outcome.

Document Review

Document review (Yin, 2009; Miles & Huberman, 1994) was used to familiarize the researcher with the site's organizational structure, projects, and context. Documents related to the context of the study and to the research questions were collected throughout the data collection process. Ten types of documents were reviewed: CEO video announcements, other company announcements, company history, the employee handbook, the learning management system, lists of projects (2008-2010) by type, project organizational charts, the intranet site of the project management office, project meeting process documents, and the public Internet site. Apart from documents obtained through the Internet, the site provided materials.

The document analysis allowed the researcher to gain contextual information to help explain how the social structures enabled or inhibited knowledge sharing and obtain additional evidence relative to the contextual factors that may have impacted the constructs and their relationship within the context of project management.

Table 3.1
Data Collection Overview

Step	Sample population	Strategy	Outcome
<p>Document review: Acquire information on the background of the company and its norms and rules (Giddens, 1985)</p>	Review CEO video announcements, company history, project management office documents, public Internet site, strategic employee communications	Reviewed the following: <ul style="list-style-type: none"> • CEO video announcements • Company announcements • Company history • Employee handbook • Learning management system • List of projects (2008-2010) by type • Organizational charts (projects) • Project management office intranet site • Project meeting process documents • Public Internet site 	Identification of internal and external contextual factors impacting knowledge structure; insight into the firm's stated direction, history, policies, and procedures; understanding of the value the organization placed on social structures and knowledge sharing Provides overall context
<p>Survey: Broader representation of project managers' view of how social structures enable or inhibit knowledge sharing (Schwandt, 2010)</p>	N = 75 project managers (across 8 divisions); representative sample of project managers within EngCo	Organizational Action Survey (Schwandt) with the following types of questions: <ul style="list-style-type: none"> • <i>Likert scale</i> (daily practices) • <i>Forced-choice</i> (current organizational actions and future actions) • <i>Rank order</i> (perceptions of importance to the organization) 	How project managers perceive organizational actions in relation to knowledge sharing; the nature of communities of practice among project managers relative to social structures and knowledge sharing; generalizable responses Informs primary research question and both secondary research questions.
<p>Interviews: Open-ended questions that allow probing and deeper meaning-making; questions aimed at ascertaining perceptions of forms of knowledge and knowledge sharing (Habermas, 1984)</p>	N = 8 project managers (across 4 divisions); criteria: <ul style="list-style-type: none"> • Willing to participate • Working as a project manager • Completed at least two projects at EngCo as a project manager 	60-minute semi-structured interviews with each project manager; asked open-ended questions to gain the project managers' insights as related to the research question; used recordings and field notes	Emergent themes; analysis of participants' responses and theoretical frames/constructs; clarity and more in-depth understanding Informs both secondary research questions.

Survey

The Organizational Action Survey (OAS; Schwandt, 1997) (Appendix F) was used to capture a broader representation of the project managers' perspectives and provide insight to the primary and secondary research questions. Using an online survey tool, the researcher sent the OAS to all 108 EngCo project managers. The participants were asked to complete the OAS voluntarily during the 2-week time period and received a reminder e-mail after the first week if they had not yet submitted it.

The OAS was developed by The George Washington University's Center for the Study of Learning based on Schwandt's dynamic social action learning model. The validity and reliability of the OAS have been tested to solidify the strength of the instrument (Johnson, 2000). The face validity of the survey was tested with an expert panel and participants (Callahan, Mueller, & Fields, 1997).

Using the OAS offered several advantages. The survey is based on a social action systems theory approach that is consistent with the researcher's approach and conceptual framework to respond to the research question. The survey has eight factors, corresponding to the learning (exploring) and performing (exploiting) orientations. Table 3.2 provides a brief overview for each of the eight factors.

Table 3.2
Organizational Action Survey Learning (Exploring) and Performing (Exploiting) Factor Descriptors

Factor	Description
<i>Exploring</i>	
1. Interactions of interfacing with environments <i>Knowledge acquisition: Exploring</i>	Proactively importing and exporting information: Proactively securing, filtering, and rendering information to and from the environment; engaging in purposeful information gathering and receiving random information
3. Interactions of reflecting <i>Knowledge creation: Exploring</i>	Reflective planning: Reflecting on priorities and goal-oriented actions; critically examining criteria for success; focusing on new knowledge and innovation; creating goals for research and development; emphasizing plausible readiness over planned change approach
5. Interactions of structuring <i>Knowledge sharing: Exploring</i>	Network idea sharing: Taking opportunities for developing knowledge, skills, and abilities; sharing new insights; collaborating and networking; using situational approaches to resource allocation and communication
7. Interactions of meaning-making and remembering <i>Knowledge valuing: Exploring</i>	Reinforcing flexibility and growth: Valuing individual and firm development; viewing mistakes as learning opportunities; critically reviewing current standards to meet future needs; recognizing and rewarding intelligent risk taking; creating a climate of trust and elasticity
<i>Exploiting</i>	
2. Interactions of interfacing with environments <i>Knowledge acquisition: Exploiting</i>	Reactively importing and exporting information: Participating in low-intensity and routine day-to-day operations influenced by habit or standard operating procedures or in high-intensity actions perceived as having a significant impact; responding to intense industry competition or technological changes; reacting to governmental agencies or consumer requests; adopting new industry standards; taking a market-driven approach
4. Interactions of reflecting <i>Knowledge creation: Exploiting</i>	Production-focused prioritizing: Establishing clear performance goals; consistently meeting deadlines; maintaining accountability for achieving goals; having an achievable mission; producing well-established products; emphasizing accurate planning to minimize the unexpected
6. Interactions of structuring <i>Knowledge sharing: Exploiting</i>	Communicating and coordinating effective actions: Implementing changes to make people more effective; holding leaders responsible for decision making; ensuring fair and equitable allocation of resources; enforcing a formal/hierarchical communication structure; creating rigorous role responsibilities
8. Interactions of meaning making and remembering <i>Knowledge valuing: Exploiting</i>	Establishing performance standards: Rewarding performance achievement; maintaining established standards; emphasizing systemic equity over flexibility; ensuring consistent values to guide daily activity; minimizing risk taking and norm deviancy; reinforcing rule-bound reward-punishment-based systems

Note: Adapted from Gorman, 2004.

The OAS has three primary sections, each containing a different scale designed to maximize interpretive capability and confidence (Table 3.3). The scales provide different insights into the organization’s learning (exploring) and performing (exploiting) orientation as perceived by the project managers.

Table 3.3
The Three Scales of the Organizational Action Survey

Scale	Items	Focus
Likert	31	Assessment of daily practices and processes: Measures performance and learning actions by subsystem
Forced-choice	8	Placement of performance/learning emphasis in present action of firm: Orientation toward social actions of performance and learning
Rank order	16	Perceived importance to firm’s success: Top three actions relative to the functional prerequisites

The first section of the survey was the Likert-scale portion that evaluated the organization’s daily practices. The section contained items about the current daily practice, procedures, and processes of the organization and asked participants to respond using a five-point Likert scale. The second section of the survey consisted of items relating to the organization’s current and future actions. The respondents had to choose one of two statements that reflected their perception of the organization’s emphasis on current actions relative to learning (exploring) or performing (exploiting) in each of Schwandt’s four subsystems, which were reclassified as knowledge subsystems for this research. The third section of the survey collected the project managers’ perceptions about what was important to the organization by asking them to rank order the organization’s top three actions.

Respondent demographics. Overall, 75 participants completed the OAS, providing a 69% response rate. Five participants responded that they were reclassified by

the human resources department and were no longer working as project managers. One participant was terminated after human resources provided the researcher the list of names, but before the researcher administered the OAS. Twenty-seven project managers did not respond to the survey. The breakdown of respondents by business unit is shown in Table 3.4.

Table 3.4
Survey Participants by EngCo Business Unit

Business unit	Project managers (n)	Participants (n)	Response rate (%)
Corporate	4	4	100%
Engineering	27	25	93%
Facilities management	27	20	74%
Integrated systems	14	11	79%
Security	24	6	25%
Telecommunications	12	9	75%
Total	108	75	69%

All 75 participants were Caucasian men; no women opted to participate. The project managers were predominantly college educated (83%), and 29% had earned their project management professional certification. Participants represented all of the age categories (from 25 to 64 years), with the largest representation (47%) in the 45- to 54-year-old age group. A third (33%) of the project managers had 11 to 15 years of experience as a project manager in the industry. Close to half (43%) of the respondents were from the Mid-Atlantic region, where EngCo's headquarters is located. About a third of the responses (35%) came from the engineering division. The respondents were distributed across EngCo, serving as project managers in different regions and in different divisions. The organizational tenure of the project managers spanned the four

categories: 39% had been with EngCo 0-3 years; 28%, for 4-7 years; 12%, for 8-10 years; and 21%, for 10 or more years.

Sample representation. The sample population used for the data analysis was representative of both EngCo the organization as a whole, as well as engineering and construction organizations in general. The majority of project managers in EngCo's general population was male, in the Engineering Division and had zero to three years tenure at EngCo, which was indicative of the response group. Most of the project managers' at EngCo had six and fifteen years experience as a project manager; this characteristic was also indicative of the sample response group. The characteristics of the survey participants as compared to the entire project manager population at EngCo (Table 3.5).

Table 3.5
Survey Participants Compared to EngCo Project Manager Population

Survey Participants		
	Number of Survey Participants	% of Entire PM Population
Age		
25-34	14	13%
35-44	20	19%
45-54	35	32%
55-64	6	6%
65+	0	69%
Tenure at EngCo		
0-3 years	29	27%
4-7 years	21	19%
8-10 years	9	8%
10+ years	16	15%
Tenure as a PM		
0-5 years	15	14%
6-10 years	19	18%
11-15 years	19	18%
16-20 years	9	8%
20+ years	13	12%
Division		
Corporate	4	4%
Engineering	25	23%
Facilities Management	20	19%
Integrated Systems	11	10%
Security	6	6%
Telecommunications	9	8%

Interviews

The final data collection phase involved interviews of select project managers. The researcher emailed all the project managers who participated in the survey, requesting their participation in an interview. To participate, individuals had to meet three criteria: an expressed interest in participating in the interview, a current position involving work as a project manager, and completion of two project at EngCo. Ethical

considerations were given to the recruitment of participants. The researcher ensured that all participation was voluntary and that no one felt coerced. Each potential participant was sent a cover letter, research information sheet, audio release form, informed consent form, and a copy of the letter from the CEO approving the study.

Ten project managers indicated their interest in being interviewed. One project manager in the telecommunications business unit had a work schedule that precluded scheduling of an interview within the agreed-upon timeline. Another project manager resigned from the organization before the interview was scheduled. For the remaining eight participants, once they provided their informed consent, the researcher set up interviews at mutually agreeable times. Each interview was scheduled for 60 minutes. Data were captured using an audio recorder and field notes, and recordings were later transcribed. Each participant was assigned a unique identifier to ensure confidentiality. A relatively open-ended interview protocol was used (see Appendix C), which allowed for probes to facilitate a deeper meaning-making process for the researcher.

Among the eight interviewees, most represented the engineering business unit, which is the largest revenue-generating business unit within EngCo (Table 3.6). Their tenure at EngCo ranged from 2 to 15 years and their project management experience, from 8 to 27 years. All had attained an undergraduate degree; two also had a master's degree in business administration.

Table 3.6
Interviewee Participants by EngCo Business Unit

Business unit	Survey respondents (n, % of total)	Interview participants (n)	Response rate
Corporate	4 (4%)	1	25%
Engineering	27 (25%)	4	15%
Facilities management	27 (25%)	0	0%
Integrated systems	14 (13%)	1	7%
Security	24 (22%)	2	8%
Telecommunications	12 (11%)	0	0%
Total	108 (100%)	8	7%

Data Analysis

First, the qualitative data from the document review were analyzed; then the quantitative data from the survey were analyzed, preparing descriptive statistics using the SPSS software package for individual items and for item groups across the dimension of the survey; and finally the interviews were conducted, transcribed, and analyzed.

Throughout the data analysis, Giddens (1985) was used to guide the analysis for the document review; Schwandt (2010), to guide the survey analysis; and Habermas (1984), to guide the interview analysis. Data across each collection source were then analyzed using the organizational learning system model (Schwandt, 2010) construct, describing the findings in terms of knowledge. Finally, the results of the data analysis were used to inform the research question.

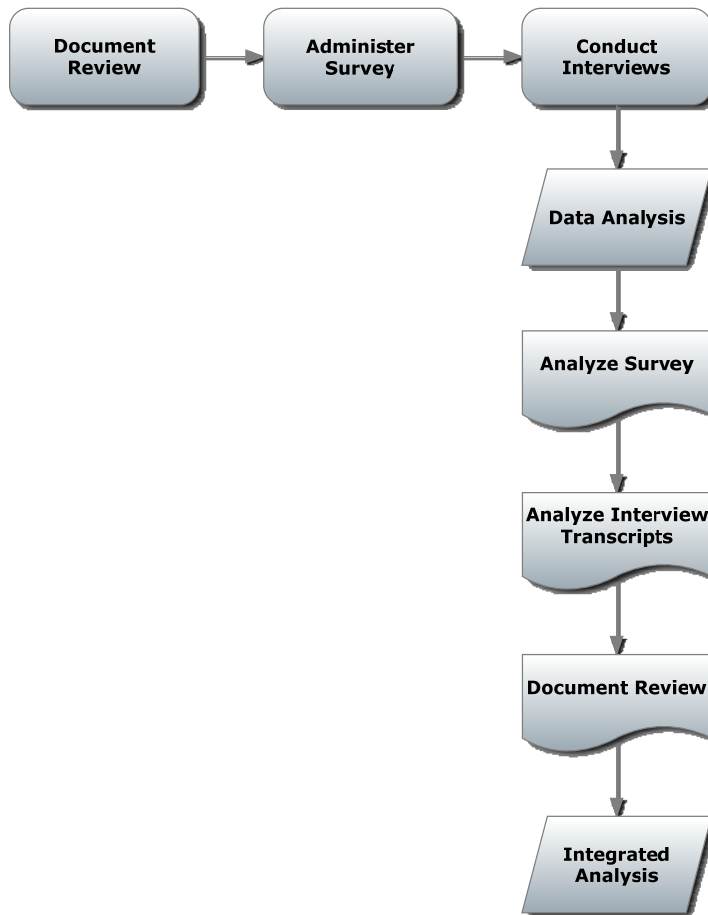


Figure 3.1. Sequence of data collection and analysis.

The interview transcripts and document review were analyzed using Miles and Huberman’s (1994) analysis strategy for qualitative studies. Summary sheets were drafted on field notes for each interview. The data were coded, and the frequency of the codes was determined. The codes led to the identification of patterns and themes. Themes were captured independently and then reviewed at a macro level to determine cross-level themes, if any. Both qualitative and quantitative data were presented using tables and various forms of display. Additionally, relational patterns among the findings were displayed when possible.

Strength of Method

The design of the study attempted to address the trustworthiness, validity, and reliability issues that arise in case studies. For the quantitative survey, reliability and validity were analyzed. For the qualitative methods, the classic tradition of triangulation (Denzin, 1989) was used to enhance reliability and credibility (Patton, 1991) and to serve as a tool to establish trustworthiness (Miles & Huberman, 1994).

Trustworthiness

The trustworthiness of the study was enhanced by its mixed-method design. To ensure trustworthiness and seek corroboration across data sources and methods for this study, Guba and Lincoln's (1985) trustworthiness criteria were considered:

- *Truth value.* Data collection and analysis techniques were designed to help control variance. The data analysis process allowed for analysis within and across the qualitative and quantitative data in a manner that ensured reasonable levels of validity and reliability. The research was designed to “identify recurrent patterns in the form of themes or categories” (Merriam, 1988, p. 12).
- *Applicability.* Although the random sampling within a defined population wasn't maximized, the case selection process enhanced the extent to which the findings may apply in other contexts.
- *Consistency.* The details provided about the methodology aimed to allow for replication of the study, and reliable measures were used.
- *Neutrality.* Member checks were used to obtain validation of the study from the interviewees. The researcher sent each interview participant the transcription from

their interview for their review. Further the researcher compared the interview results with the results from the OAS to validate if the responses to both data collection methods were consistent. The member checks captured the congruency or variation of the project managers' perceptions. Member checks increase the study's credibility and transferability by reducing dependency on sole-source data. In addition, the use of member checks along with multiple data sources was designed to increase the degree to which the findings of the study were conditions of the inquiry rather than the researcher's biases, motivations, or interests.

Validity

Threats to internal and external validity for the qualitative and quantitative data gathered were considered; thus, the design of the study utilized multiple data-gathering strategies to serve as a validation process. Internal validity in qualitative research addresses the question of whether the researcher actually observed what she thinks she observed (McMillan & Schumacher, 1989). The description of time and contextual elements through document review, the survey instrument, and in-depth interviews increased the transferability of the findings to other organizations.

Threats to construct validity were addressed through Cronbach alpha factor analysis. This approach involved verification that the items developed for the OAS within each construct statistically belonged together. Cronbach's alpha was .933 on the 17 Likert-scale items. Additionally, items from the instrument were used as part of the interview guide, providing another check of the face validity of the concepts explored.

Validity in qualitative methods is dependent upon the researcher's competency and the rigor employed (Patton, 1990). In this study, internal validity was increased

through a number of strategies. First, the study employed multiple data collection methods and techniques. This triangulation allowed the research to build on strengths of each data collection strategy while minimizing the weaknesses of any single approach (Patton, 1990). Additionally, triangulation improved the credibility of the phenomena by providing several data points from different sources to help confirm the findings. Finally, the interviews occurred in the firm's natural setting to reflect actual experiences of those participating in the study.

Reliability

Several strategies increased the extent to which the study may be replicated, including the documentation of methodological considerations throughout the research process. Use of appropriate statistical approaches with the quantitative data, use of a significant-sized representative sample, and a well-documented research process enhanced the extent to which the study may be replicated.

Threats to internal reliability for qualitative methods were reduced by using both audio recordings and field notes to allow other researchers to assess the data gathered. The researcher's bias was controlled in the analysis stage by techniques such as coding checks (Miles & Huberman, 1994) to include leveraging two knowledge-sharing researchers who reviewed the coded data to judge the reliability of the researcher's analysis.

Researcher's Role and Bias

There are three forms of bias that this dissertation accounted for: researcher, role, response/non-response. First, to control for researcher bias because the

researcher works in the organization where data was collected, three data collection techniques were used to ensure data was credible and objective. These strategies included document review, survey and interview. Second, to control for role bias because the research focused on project managers who by their very nature have a bias towards a certain view, the researcher also used the organization's documents through a comprehensive document review as an objective lens. And to account for non-response bias, the research made additional efforts to ascertain informal perceptions and to glean insights during meetings attended and documents reviewed.

The law of instrumentation says that what we think exists and that which we believe to really exist are completely determined by the instruments we use to research such beliefs (Miles & Huberman, 1994). The choice of conceptual instruments influences how reality is created. For this study, an action frame of reference based on assumptions of collectives and social construction of reality served as biases. The OAS instrument used was based on these assumptions, as were the questions and analytical frameworks selected to analyze the interview and observational data. The challenge is to be “explicitly mindful of the purposes of study and of the conceptual lenses on it—while allowing oneself to be open and to be reeducated by the things we don't know or expect to find” (Miles & Huberman, 1994, p. 56).

Heightened emphasis on the researcher as the primary instrument for data collection and analysis occurred for the qualitative portion of the study. And, according to Creswell (1994), the role of the researcher is based on merit, time spent in the field, and rapport established with the participants. Lastly, the role of the researcher assumes that his or her experiences are critical to the merit of the study (LeCompte, Preissle, &

Tesch, 1993). Thus, the researcher's experience in organizations as a manager was considered relevant and useful. The researcher captured insights and reflections in field notes throughout the data collection and data analysis phases. These insights were useful during the data analysis and later in the interpretations and recommendation sections.

Human Subjects

The study presented ethical dilemmas typical in organizational research. The purpose of the study, methods employed, confidentiality/anonymity concerns, and the volunteer nature of the study were reviewed with each participant before they provided informed consent. The data collected remain confidential, and results were written in such a way that the firm and participants were not identifiable. Procedures were administered in accordance with human subject guidelines. All procedures required by the Graduate School of Education and Human Development and the Office of Human Research Institutional Review Board were followed.

CHAPTER 4:

RESULTS

This chapter reports and summarizes the results of the data analysis procedures described in chapter 3. The main purpose of this dissertation research was to examine the interplay between knowledge sharing and social structures by examining a community of project managers in a global engineering firm. One overarching research question guided this study: How do the social structures of an organization enable or inhibit knowledge sharing as perceived by a community of project managers? There were two secondary questions:

1. What are project managers' perceptions of organizational actions in relation to knowledge sharing?
2. What is the nature of communities of practice among project managers relative to social structures and knowledge sharing?

The study was conducted in EngCo, a global engineering firm. EngCo has been in business over 60 years, under the leadership of three CEOs, and has multiple divisions, with a strong emphasis on project management. Given the important role of context in the interplay of social interactions (Parsons, 1951; Schwandt, 2010), the context for this descriptive case study was reviewed. Data from all sources revealed four key themes that could impact the study findings: (1) the chief executive officer's (CEO's) tenure and explicit strategic objective to build learning communities among project managers; (2) the nature of these global project management teams, which rotate members and functions and sometimes have cross-functional project teams; (3) the lack of formal

policies about knowledge-sharing protocols, norms, incentives, and training; and (4) the recent growth of the organization despite a national economic recession.

This chapter describes the insights gained from a descriptive and interpretive analysis process. The section is organized in terms of the sequence of the three collection strategies: document review, survey, and interview. The document review was conducted to identify contextual factors. The survey was administered to project managers within the firm to capture their perceptions of organizational actions and to understand the nature of communities of practice within the firm. Among the survey respondents, the researcher interviewed a sample of project managers to facilitate a more in depth discussion about their perceptions of knowledge sharing and social structures as related to the research question. Each section contains a general description and then an analysis of the data via key literature. Documents were analyzed using Giddens' (1985) structuration theory; survey data were analyzed using the collective learning system model (Schwandt, 2010); and interview transcriptions were analyzed using Habermas (1984) as context. The chapter closes with integrated cross-source findings.

Results of Document Review: Contextual Factors

Documents relating to the context of the study were found using internal company sources and included CEO video announcements, company announcements, project organizational charts, project process documents, the project management office intranet site, and the company's public internet site. Ten types of documents were reviewed. Appendix D describes each document, and the table in Appendix E lists all documents, with sample text from each. The process allowed identification of internal contextual factors that impact knowledge sharing and social structures, as well as acquisition of

information about the company's background, norms and rules, history, policies, procedures, and strategic direction.

Within the documents, there was no explicit evidence that employees were sharing knowledge throughout the entire organization. Also, EngCo policies and procedures were void of language encouraging or requiring knowledge sharing among employees. There were no explicit references to the importance of knowledge sharing, ensuring that it happens, or requiring knowledge sharing from project managers or other EngCo employees. There was little information about sharing project-critical knowledge. No documents analyzed stated that employees were required to share their knowledge with others. No documents discussed communities of practice, either encouraging or prohibiting them.

More specifically, seven of the 28 documents reviewed had information about formal policies. However, four of the seven documents were related to administrative functions, such as timesheet procedures and standards of conduct. The other three documents related to managing projects: one provided a human capital plan for engineering projects; the second outlined the processes for project management in the engineering division; and the third explained how to perform tests on equipment. Project management documents were provided only for the engineering division; it was found that project management documents were not shared between the divisions, and each division had its own processes, policies, and forms consistent with the type, scope, and scale of projects it managed.

Included in the document review were company email announcements from the marketing and communications department on subjects such as winning and completing

projects; corporate initiatives, e.g., seeking industry certifications; instructions on how to access and utilize the learning management system, EngCo University; updates on employees who were ill or had passed away; and the CEO video announcements/updates. Although the marketing and communications department sent these announcements, it did not request updates, content, or information from employees for dissemination. No form or information was found on requesting an announcement or providing parameters of what types of information should be shared.

The CEO's video announcements focused on acquiring knowledge and using acquired knowledge in various capacities within EngCo to enhance the organization. The CEO did not explicitly use the term "knowledge sharing" or discuss its benefits, but he encouraged employees to take advantage of every learning opportunity to be more successful in their jobs and to invest the time required to continue to learn and grow so the company could continue to complete complex engineering projects around the world. Although the CEO did not specifically mention knowledge sharing in the video announcements, he modeled knowledge sharing by requiring his speeches to be recorded and disseminated throughout EngCo.

In EngCo, although project-critical knowledge had a structuring medium, the project management intranet site, the intranet content focused on artifacts, not the processes used to complete the projects. No documents were uncovered that contained information about communities of practice, but it could be assumed that some community of project managers was responsible for ensuring the project management intranet site contained relevant information.

The structure of the social system and the activities engaged in by the individual actors both influence each other and facilitate knowledge sharing (Giddens, 1993). In EngCo, the CEO's actions influenced the organization and facilitated knowledge sharing. Because of the importance of understanding the social structures and how collectives share knowledge, a dynamic social action theory was used to further understand this exchange. The process uncovered how the CEO's video messages modeled knowledge sharing actions and how other departments responded by using marketing and communications to share information throughout the organization. Knowledge sharing requires formal and informal communications, which occur only if the appropriate social structures that facilitate the exchange are in place, and the marketing and communications department facilitates these exchanges. Schwandt (1997) indicated that dissemination and diffusion of knowledge throughout a system occur via the structuring medium, and Schwandt (2010) reemphasized that the interactions of structuring are responsible for "distributing, disseminating, and sharing information and knowledge both internally and externally" (p. 138).

In the context of knowledge, the interactions of structuring entail knowledge sharing; the interactions are the way in which structures are used to support knowledge dissemination and to provide effective products and services. Thus, knowledge sharing can be enabled or inhibited depending on the social structures within an organization. In EngCo, the documents reviewed showed that knowledge sharing occurred without any explicit structuring medium to encourage or facilitate knowledge sharing. The structuring medium is important because it is what facilitates knowledge sharing throughout the system. Without the interactions of structuring, knowledge will not be shared and will

remain stagnant. No documents reviewed uncovered any communities of practice within EngCo. Communities of practice can serve as a social structure within an organization, and in the context of this research the project managers would be the members of a community of practice as defined by Wenger (1997).

Results of the Organizational Action Survey

Schwandt's Organizational Action Survey (OAS) was administered to gain insight about the nature of knowledge sharing as perceived by project managers. This section reports on the survey's three dimensions: (1) perceptions about how well the organization was doing relative to knowledge using a five-point Likert scale; (2) perceptions about what the organization tended to revert to when forced to choose, for current actions and projections for future actions; and (3) perceptions about what the organization should be doing, using rank order of perceived importance. Summary results are organized around the action frames of the organizational learning system model: interactions of interfacing with environments, interactions of reflecting, interactions of structuring, and interactions of meaning-making and remembering—which in terms of this study are described as knowledge acquisition, knowledge creation, knowledge sharing, and knowledge valuing. In addition, each performance-learning dimension was converted to exploiting and exploring for each knowledge subsystem. The summary results were drawn from 75 project managers who completed the survey from the 108 who were invited to participate; the response rate was 69%.

Perceptions of Current Actions and Orientations

The survey included 42 Likert-scale items that ascertained perceptions about daily practices. Table 4.1 presents the mean scores for these items in terms of the knowledge actions/subsystems and the exploring and exploiting orientations, where exploring represents what Schwandt (2010) referred to as a learning orientation and exploiting represents a performing orientation.

Table 4.1

OAS: Overview of Mean Scores for Likert-Scale Evaluation of Daily Practices

Knowledge subsystem	Orientation	Description
Knowledge acquisition (<i>Environment</i>)	Exploring (<i>Mean: 3.36</i>)	Obtaining information concerning changes external to the organization
	Exploiting (<i>Mean: 3.49</i>)	Identifying resources to meet organizational goals
Knowledge creation (<i>Reflecting</i>)	Exploring (<i>Mean: 3.22</i>)	Reflecting on organizational experiences to improve the quality of products and services
	Exploiting (<i>Mean: 3.51</i>)	Producing products and services of the highest quality
Knowledge sharing (<i>Structuring</i>)	Exploring (<i>Mean: 3.52</i>)	Disseminating, diffusing, and coordinating information sharing; utilizing knowledge for continuous improvement
	Exploiting (<i>Mean: 3.65</i>)	Utilizing structures that support effective products and services
Knowledge valuing (<i>Memory and Meaning</i>)	Exploring (<i>Mean: 3.65</i>)	Reinforcing an open, flexible culture
	Exploiting (<i>Mean: 3.60</i>)	Achieving performance standards

Results indicate that EngCo project manager respondents evaluating the daily practices of the firm gave more favorable evaluations to organizational actions associated with knowledge valuing, to include actions and knowledge associated with reinforcing an open, flexible culture along with achieving performance standards. Tied for the highest

mean score was knowledge sharing/exploiting; EngCo project managers perceived that the organization utilized structures that supported effective products and services.

Further analysis of items that received the highest mean scores (see Table 4.2) revealed some interesting trends. For example, four of the five highest mean scores were “exploiting” oriented; two of the four were in the knowledge acquisition subsystem, and the other two were in the knowledge valuing subsystem. The one item that was “exploring” oriented was in the knowledge sharing subsystem. These results indicate that respondents perceived relatively more favorable actions associated with identifying resources to meet organizational goals, which is indicative of an “exploiting” orientation in the knowledge acquisition subsystem, where organizations focus on adapting to the environment. This is in contrast to an “exploring” orientation in the same subsystem, which would focus on obtaining information concerning changes external to the organization. The exploring orientation within the knowledge sharing subsystem indicates that EngCo project managers who responded perceived relatively more favorable actions associated with sharing information and knowledge for continuous improvement than for the “exploiting” orientation within the same subsystem, which would utilize structures that support effective products and services. The findings reveal EngCo project managers’ perceptions that their firm was in a competitive industry with frequent policy changes, but that the firm in turn believed it needed to both continuously improve customer service and develop its employees.

Table 4.2

OAS: Highest Mean Scores for Likert-Scale Evaluation of Daily Practices

Item	Mean	SD
There is intense competition among organizations within your industry. <i>(Knowledge acquisition: Exploiting)</i>	4.23	0.879
External forces (e.g., government agencies, professional associations, etc.) frequently develop requirements, regulations and policies that directly affect your organization. <i>(Knowledge acquisition: Exploiting)</i>	4.17	0.724
Your organization provides opportunities for employees to develop their knowledge, skills, and capabilities. <i>(Knowledge sharing: Exploring)</i>	4.09	0.903
Your organization is committed to developing its employees. <i>(Knowledge valuing: Exploiting)</i>	4.09	0.873
Your organization believes it needs to continuously improve customer service. <i>(Knowledge valuing: Exploiting)</i>	4.08	0.867

Respondents’ lowest mean scores were also examined (see Table 4.3). The lowest mean score was in the “knowledge acquisition” subsystem with an exploiting orientation (2.62). This item was the only “exploiting” oriented item in the group of the lowest mean scores. The other four items were related to “exploring” actions. Interestingly, three of the five items had the same mean score, 3.11.

Table 4.3

OAS: Lowest Mean Scores for Likert-Scale Evaluation of Daily Practices

Item	Mean	SD
Frequent technological changes or advances make current products or services, or operations of your organization obsolete. <i>(Knowledge acquisition: Exploiting)</i>	2.62	0.941
Your organization continuously tracks how your competitors improve their products, services and operation. <i>(Knowledge acquisition: Exploring)</i>	2.97	1.09
Members of your organization share external information (information from outside your organization). <i>(Knowledge acquisition: Exploring)</i>	3.11	1.09
Organization has established work groups, network, and other collaborative arrangements to help the organization adapt and change. <i>(Knowledge sharing: Exploring)</i>	3.11	1.06
There are established ways to share new operational processes and procedures throughout the organization. <i>(Knowledge sharing: Exploring)</i>	3.11	1.09

Respondents' evaluations of EngCo's activities associated with making technological changes and tracking competitors were the lowest. In other words, actions associated with external interface learning orientations were perceived to be less frequent than actions associated with internal knowledge sharing and/or the perceived need to change. Additionally, actions associated with exchanging external information, and subsequently the related internal social structures such as work groups, networks, or new operating procedures, received lower ratings than the "knowledge valuing" perception of the need to develop employees and continuously improve.

Appendix G includes the mean scores for each Likert scale item from the OAS.

Forced-Choice Items: Current Actions and Projected Future Actions

Forced-choice items had respondents choose between an exploring or exploiting focus in the dimensions of "current" and "in reaction to change." Overall, the respondents indicated that the organization's current actions were consistent with an exploiting orientation, 52.8%, as compared to an exploring orientation, 48.2%.

As shown in Table 4.4, this exploiting orientation applied to current actions around knowledge acquisition. The project managers perceived that the organization was more likely to use organizational resources to guide change than to use external information to guide change. In addition, they perceived that the organization was more likely to use internal data and procedures to meet customer needs than to use external data to better understand customer needs. The project managers also perceived a stronger emphasis on production of products and services than on production of new knowledge. Similarly, the project managers perceived an emphasis on meeting performance standards and less focus on critically reviewing present standards.

Table 4.4
OAS: Forced-Choice Questions on Present Actions

Knowledge subsystem	Orientation	Percentage agreement	Item
Knowledge acquisition	Exploiting	68.0%	Utilization of organizational resources to guide change
	Exploring	32.0%	Utilization of external information (e.g., customer feedback, government regulations) to guide organizational change
	Exploiting	60.0%	Using internal forecasting data and procedures to meet customer needs
	Exploring	40.0%	Using external data (e.g., political information, government regulations, customer feedback) to better understand customer needs
Knowledge creation	Exploiting	82.7%	Production of valued products and/or services
	Exploring	17.3%	Production of new knowledge relevant to the organization
	Exploiting	52.0%	Production of well-established products and/or delivery of services
	Exploring	48.0%	Innovation of new products and/or services
Knowledge sharing	Exploiting	57.3%	Following established chain of command to successfully manage the situation at hand
	Exploring	42.7%	Using the most effective communication network to successfully deal with the situation at hand
	Exploring	54.7%	Ensuring that the human resources of the organization have the capabilities to effectively perform the work of the future
	Exploiting	45.3%	Fair and equitable allocation of organizational resources to meet future demands
Knowledge valuing	Exploiting	57.3%	Accomplishment of established organizational goals
	Exploring	42.7%	Evaluating information and data to make informed decisions regarding organizational strategy
	Exploiting	68.0%	Meeting present organizational performance standards
	Exploring	32.0%	Critically reviewing present organizational performance standards

However, the project managers had a more balanced perception of the organization's current actions as related to knowledge sharing. For instance, the project managers perceived the organization's current actions relatively balanced in regard to following the chain of command versus using communication networks, and as related to ensuring human resources have the capabilities to do the work versus ensuring equitable allocation of resources. On the whole, the project managers perceived EngCo's current actions as more internally focused and exploitative, with a de-emphasis on exploration and the external environment.

While the project managers' responses were predominantly exploiting oriented for the organization's current actions, there was a shift to a more balanced orientation for the organization's reaction to change, with an overall exploiting orientation of 52.3% and exploring orientation of 47.7%.

As shown in Table 4.5, in support of an exploiting orientation, 74.7% of project managers responded that in reaction to change, the organization could understand the impact of external environmental changes, while 25.3% were uncertain if the organization would know how to deal with changes in the external environment. The project managers' perceptions related to sharing versus protecting new insights and ideas were relatively balanced. There was also a balance in responses that the organization considered the past, present, and future impacts of change versus focusing on the present relevance of change.

In the subsystem of knowledge sharing, most project managers, 70.7%, considered leaders and managers solely responsible for decision making about how to deal with organizational change, while 29.3% expected everyone to participate in the

decision making process on how to deal with organizational change. This perception also uncovered the project managers' perception of vertical authority and not participatory decision making.

Table 4.5
OAS: Forced-Choice Questions on Reaction to Change

Knowledge subsystem	Orientation	Percentage agreement	Item
Knowledge acquisition	Exploiting	74.7%	Is confident in its ability to understand the impact of external environmental changes on the organization.
	Exploring	25.3%	Is uncertain how to deal with changes in the organization's external environment.
	Exploring	69.3%	Allows changes in its external environment to influence how processes and procedures are performed.
	Exploiting	30.7%	Has established processes and procedures to control how changes in its external environment impact its operations.
	Exploring	56.0%	Usually follows the intuition of management.
	Exploiting	44.0%	Usually performs detailed analyses to make informed decisions.
	Exploiting	50.7%	Creates policies to interpret how employees should deal with new situation.
	Exploring	49.3%	Allows employees to interpret and make sense of new situations.
Knowledge creation	Exploring	50.7%	Makes new insights and ideas available to everyone in the organization who wants access to them.
	Exploiting	49.3%	Protects new insights and ideas by sharing them only with certain management levels and functions.
	Exploring	50.7%	Considers the past, present, and future impacts of change.
	Exploiting	49.3%	Focuses on the present relevance of change.
	Exploiting	56.0%	Tries to adapt to changes in its external environment right away.
	Exploring	44.0%	Takes time to clarify and understand changes occurring in the external environment.

Knowledge subsystem	Orientation	Percentage agreement	Item
Knowledge sharing	Exploring	64.0%	Believes that the external environment has significant influences on organizational change.
	Exploring	36.0%	Believes the external environment has only a limited influence on organizational change.
	Exploiting	70.7%	Considers leaders and managers solely responsible for decision making about how to deal with organizational change.
	Exploring	29.3%	Expects everyone to participate in the decision-making process on how to deal with organizational change.
Knowledge valuing	Exploring	68.0%	Is optimistic about new trends and changes in the organization.
	Exploiting	32.0%	Is skeptical about new trends and changes in the organization.
	Exploiting	50.7%	Immediately applies new technology to organizational work procedures.
	Exploring	49.3%	Creates a pilot project to test the new technology's relevance to organizational work procedures.
	Exploiting	68.0%	Strives to obtain additional information so that they can accurately predict the outcomes of their actions with respect to the change.
	Exploring	32.0%	Gathers just enough information to produce a plausible outcome as a result of their actions with respect to the change.

Rank Order: Perceptions of Relative Importance

The third section of the survey asked EngCo project managers to rank order the perceived importance of eight organizational actions relative to achieving success. As shown in Table 4.6, the highest ranked action was in the knowledge valuing subsystem with an exploring orientation: reinforcing an open and flexible organizational culture. The second and third highest choices were both in the knowledge creation subsystem: one in the exploiting orientation, producing products and/or services of the highest quality possible, and the other in the exploring orientation, reflecting on organizational

experience to improve products and/or services. The fourth choice was tied between identifying external resources required to meet organizational goals in the knowledge acquisition subsystem with an exploiting orientation and utilizing organizational structures that support effective production or customer service in the knowledge sharing subsystem with an exploitive orientation.

Table 4.6
OAS: Factors Ranked in Order of Importance

Rank	Item	Weighted score
1	Reinforcing an open and flexible organizational culture (<i>Knowledge valuing: Exploring</i>)	185
2	Producing products and/or services of the highest quality possible (<i>Knowledge creation: Exploiting</i>)	172
3	Reflecting on organizational experiences to improve products and/or services (<i>Knowledge creation: Exploring</i>)	170
4	Identifying external resources required to meet organizational goals (<i>Knowledge acquisition: Exploiting</i>)	150
4	Utilizing organizational structures that support effective production/customer service (<i>Knowledge sharing: Exploiting</i>)	150
6	Achieving performance standards established by the organization (<i>Knowledge valuing: Exploiting</i>)	145
7	Obtaining information concerning the changes in the organization's external environment (<i>Knowledge acquisition: Exploring</i>)	144
8	Sharing of information and knowledge required for continuous organizational improvement (<i>Knowledge sharing: Exploring</i>)	120

Note: Weighted scores were calculated by assigning inverse points for rank selected; e.g., a response of “1” received 8 points; a response of “2” received 7 points.

Summary of OAS Findings

Overall, EngCo’s project managers perceived a flexible culture and quality products and services that they produced and reflected on (improved) as important. Less important was sharing information, despite their evaluation of this being something they did well. Consistent across the three sections was a lower evaluation of external-focused

actions (scanning the environment, sharing external information, and obtaining external information such as competitor data or governmental regulatory changes). These results may be a function of the construction industry, with its high barriers to entry, which mean that while competition is intense in the bidding process, EngCo project managers did not see EngCo tracking competition or valuing it (rank #7). Instead, emphasis was on internal exchange and developing people.

More specifically, an analysis of the factor means from the Likert-scale items that evaluated daily practices revealed a significant difference between exploring and exploiting orientations within three of the four subsystems. The only subsystem with an insignificant difference between the exploring and exploiting orientations was the knowledge valuing subsystem, referred to as the interactions of meaning-making and remembering subsystem. Second, an analysis of the forced-choice responses, which reflected the organization's current actions and projected reactions to change, also revealed a tendency towards an exploiting orientation. The data also uncovered the perception that EngCo valued production of products and/or services and was confident in its ability to understand the impact of the external environmental or acquired knowledge. Third, the analysis of the rank order responses revealed a slight preference for an exploring orientation over an exploiting orientation—by two points.

Results from Interviews:

Role of Social Structures Relative to Knowledge Sharing

To gain insight about the role of formal and informal social structures relative to knowledge sharing as perceived by project managers, in-depth interviews were conducted with eight project managers. For this phase of analysis, all transcripts were reviewed, and

brief vignettes of each participant were prepared. Next, emergent themes, anomalies, and trends were identified among the participants, and evidence was sought to respond to the research question. This section of the chapter discusses results for the last two steps of the process.

Interview Themes

The in-depth interviews, which were consistent with OAS data in describing knowledge sharing, revealed several themes. First, the project managers described not fully understanding how they were interrelated with other disciplines within EngCo. They expressed an interest in knowing who to access for knowledge when they had questions about how other disciplines worked as related to their projects.

Yeah, everybody has to understand who holds the knowledge that you need. And the only way to do that is to understand the project overall.

We understand there's a design group, there's an implementation team, and my job as a project manager is to ensure that I don't have implementation guys doing design's work, or design having to take up on implementation. But at the same time, they each understand that we need to share our knowledge.

The project managers also expressed their thoughts about knowledge sharing across the company, between the divisions, and between project teams. Analysis of transcripts revealed perceptions that there was a variance in how different project management teams were capturing knowledge and the extent to which it was shared. For example:

So I run a project, and this is kind of what [the CEO] was getting at in his [meeting with] operational managers: he's like you guys got it, get in there, work on it, learn what is going on in each and every division. So what facilitates our ability to communicate . . . is that we all, first of all, we all realize that we are all interconnected.

Everybody kind of right now has their own means and methods of how to address [managing projects] and how to share. There's really no written policy. I know we are working on it right now—of better ways to share knowledge between projects and also at each project level with the [project management office] type of set up, where you have a database of knowledge and you can share that and everybody can go to the same site.

Building on the finding around the variance in the knowledge capture process was the “matching issue,” meaning that project managers perceived a gap in where and how people found other people who had done similar work.

Like here we are trying to do a project and the project team is really engaged in the project, but really we missed to identify who else from the company has done that work already so we can actually get the knowledge from that other team.

A key finding across the interviews focused on the perception of the CEO as a unique and solo leader. Evidence showed a strict reliance on his direction setting.

Out of that half an hour, [or] 45 minutes, I can take 5 minutes of pure knowledge, the vision, where [the CEO] wants to take this company, what is so important. . . . Nobody else can do that in the company; nobody else does that.

This “expert” approach was also evident in survey data, where EngCo project managers indicated that “in response to change,” leaders needed to have solo responsibility for their decisions.

Another finding across the interview transcripts was the distinction between “functional boss” and “project manager.” Respondents indicated that they thought people might share knowledge with a functional boss and either hold back or be less inclined or incentivized to share knowledge with their project manager. This was evident in the following statements:

I think a lot of people would tell their functional boss something that they might hold back from the project manager.

For the most part, interdivision [communication is] tough. I think what I find at least is that their project managers don't feel that they report to our project managers. [The org chart is] a graphic depiction of what it [the structure] should be [on the project].

A key insight drawn from the interview transcript analysis was the recognition that project knowledge was not shared across the organization. Interviewees discussed the time and effort expended with a project team to share lessons learned, but such learning may or may not get back to the other areas of EngCo.

I'll read all of our lessons learned in our little [project meeting], but does [another project manager's] team ever get to hear it?

During the in-depth interviews, the project managers shared their desire for team-building opportunities to bring the project managers together to discuss lessons learned and to get to know one another. The project managers expressed an interest in sharing knowledge among themselves and other project team members.

I don't feel like I have a link back into the company, so maybe something that would maybe bring people together, maybe on a monthly basis or something, just so that we could kind of talk through what some of the issues are, you know, like maybe if we had one on scheduling, and we had somebody do a demonstration on scheduling just to see other features of P6 [Oracle's Primavera P6 Enterprise Project Portfolio Management] that I am not using that maybe other projects are using.

We sit down, and sometimes it will take up to 4 hours, and we go through any issues, you know, that one has experienced in a project to ensure that doesn't happen; you know, we can all talk about it. Someone might have a solution to the issue or problem, but at least everybody is also hearing about it . . . and that's a good forum to talk about new processes and procedures and things going on at the corporate level.

The project managers discussed knowledge sharing in the context of structures/infrastructures to support effectively managing EngCo projects.

A finding related to knowledge sharing was the perception that there was no solidified process for running a project, but there were artifacts of past successes and frequent updates/enhancements to forms.

There's no such a thing [as processes on how to run a project]. . . . It's nothing but a bunch of artifacts.

It's hard to keep up with the latest and greatest of everything because it is continually evolving.

Also related to knowledge sharing was the perception that there were different ways to run projects depending on the division to which the project manager was assigned.

Now I am here and in a different division on a different [project] within the same company, and they have their own way of doing things here.

Project managers also evaluated their division's project management process. One project manager perceived his division as efficient while another project manager in a different division expressed concerns that the processes shared via the intranet site were outdated.

You know, that's why we are efficient: it's because we follow a standardized process that we're all familiar with.

It [the intranet] is very useful in getting information. The drawback is if the information is not correct or has not been updated, then now everyone is sharing wrong information.

Another finding was related to the project managers' perception of knowledge being created but not shared.

But this is one of the observations [of the project management software]. It's like, what would it do to you if I give you a Toyota, and then I give you a Mercedes? I don't tell you that in the Mercedes, well, you can speed up to 60 miles in 4½ seconds. Oh, by the way, you have 12 speakers and you are driving your

Mercedes thinking you are driving your Toyota. And you have a GPS and you don't even know where the button for your GPS is.

I'll read all of our lessons learned . . . but does another team ever get to hear it?

During the in-depth interviews, the project managers discussed knowledge sharing in the context of the organizational chart and what it represented. They mentioned that some divisions' organizational charts were fixed, some had functional project teams, some showed what should happen on a project, and some were always changing.

The org chart doesn't necessarily reflect the same way that organizations behave.

Right now, in [my division], the definition of who reports to who is not clear. It is in evolution.

Another finding related to sharing knowledge was the perceived challenge of communicating across the divisions within the organization.

We do have difficulty with communication between our divisions—security, telecom, fire alarm. If you look at them on a project org chart, they are integrated, but functionally they are not integrated to the level that they should be, so there are communication gaps there.

They will hide a lot of stuff inner-divisionally from us. Especially if there are problems they don't want us to know about, they'll hide it.

On the whole, the project managers' interviews provided insights around their perceptions of formal and informal social structures relative to knowledge sharing.

Summary Analysis of Interview Data

This section highlights interview insights around the main research question to understand the role of social structures associated with knowledge sharing. Giddens (1984) suggested that human social activities stem from norms, rules, and resources that

are created simultaneously through social interaction that may include traditions, other sets of expectations, or an established ways of doing things. The project managers indicated that the aforementioned were lacking within EngCo, thus influencing their ability to successfully manage their projects. According to Giddens (1985), the structure of EngCo reflects the actions, decisions, processes, norms, values, and outcomes accepted and replicated by the organization's members, and in the case of EngCo the lack of those things is also replicated. Although structures are typically stable, they can be changed, particularly as a result of unintended action—e.g., when people start to ignore the structures or replace them—but overall the structure defines how its members will act, and the negotiated action between the members sustains the organization (Giddens, 1984).

Analyzing the in-depth interview responses also reveals a call for more interactions of structuring as discussed by Schwandt (2010). The interactions of structuring provide reciprocation; they distribute, disseminate, and share information and knowledge both internally and externally (Schwandt, 2010). The interactions of structuring can “occur in the context of formal structures (e.g., the official chain of command), or they can occur through informal mechanisms (e.g., ‘the grapevine’)” (Schwandt, 2010, p. 137). Currently within EngCo, project managers indicated there was a reliance on informal communications, and they desired a more stable structure through a project management office or chain of command.

Based on the discussions with the project managers, it appeared they were calling for a community of practice or community of project managers. Wenger et al. (2002) suggested that communities of practice are groups who meet and interact on a consistent

basis, “who share a concern, a set of problems, or a passion about a topic,” and the ongoing interactions increase and mature their understanding and thoughts (p. 4). Although these recurring meetings occurred at EngCo, it was with a small group of project managers; the meetings did not involve all the project managers. A community of practice “includes all the implicit relations, the tacit conversations, the subtle cues, the untold rules of thumb, the unrecognizable intuitions, the specific perceptions, the well-tuned sensitivities, the embodied understandings, the underlying assumptions, the shared worldviews, which may never be articulated, though they are unmistakable signs of membership in communities of practice and are crucial to the success of their enterprises” (Wenger, 1997, p. 38), and the reference to monthly meetings made by one project manager along with the suggestion of recurring meetings made by another project manager echo what Wenger defined as communities of practice.

Summary of Integrated Data

The last phase of analysis involved two steps: review of “evidence” across the three methods (see Table 4.7) and review of evidence relative to Schwandt’s (2010) knowledge sharing frame, which was the predominant frame.

Table 4.7
Type of Evidence Provided by Data Source

Evidence	Document review	Survey	Interview
Context	✓	✓+	-
Evidence of social structure’s effect on knowledge sharing	✓	✓	✓
Evidence of communities of practice	✓-	✓	✓+

Overall, the data revealed that EngCo had a strong exploiting orientation across the action frames and had the highest scores in and emphasis on the knowledge acquisition subsystem. There was evidence of knowledge sharing within EngCo; however, because of the high exploitation orientation, knowledge sharing within the organization came in the form of utilizing structures that supported effective product delivery and services. This was very different than if EngCo had an exploration orientation, where knowledge sharing would materialize as sharing information for continuous improvement rather than for high performance or an outcome-driven approach.

Table 4.8 shows the data across each collection method as it pertains to the four action frames: knowledge acquisition, knowledge creation, knowledge sharing, and knowledge valuing. The integrated data across each collection method as related to the four action frames show that in terms of knowledge acquisition, EngCo had a passive orientation to the environment. The CEO videos and EngCo University project management classes, as well as the survey responses and key quotes from the interviews, support this finding. EngCo deemphasized innovation and reflection, as supported by the survey responses and interviews; no documents reviewed related to knowledge creation. EngCo exhibited a strong trait for developing employees and encouraging sharing, as emphasized in process documents reviewed and the project management office intranet site. Further quotes from the project managers' interviews were consistent with an environment where knowledge sharing would be perceived as high.

In addition to EngCo valuing employee development, it had a performance-laden and flexible culture. The documents reviewed about the company's accomplishments

were consistent with a performance-laden culture. The project managers' perceptions captured through the survey and interview responses showed the emphasis on performance within the organization. Overall, project managers perceived EngCo as an organization with a high emphasis on employee development and performance, a low emphasis on innovation and reflection, and a passive orientation to the external environment.

Table 4.8
Integrated Data Results Across Three Collection Methods

	Document review	Survey		Interview	
Knowledge acquisition <i>(Environment)</i> Reactive passive orientation to external environment	CEO video announcements emphasizing taking classes and company reputation; EngCo University classes about project management	Likert 3.49 Exploiting Orientation 3.36 Exploring Orientation		“So what facilitates our ability to communicate . . . is that we all, first of all, we all realize that we are all interconnected.”	
		Evaluation of daily actions (highest mean score)	4.23: There is intense competition among organizations within your industry (Exploiting)		
			4.17: External forces (e.g., government agencies, professional associations, etc.) frequently develop requirements, regulations and policies that directly affect your organization (Exploiting)		
		Forced-choice: Current actions	Exploiting orientation		
		Forced-choice: Reaction to change	Exploiting orientation		
Rank order	Ranked 4th (tie) and 6th				
Knowledge creation <i>(Reflection)</i> Passive de-emphasis of innovation and reflection	NONE	Likert 3.51 Exploiting Orientation 3.22 Exploring Orientation		“Everybody has to understand who holds the knowledge that you need. And the only way to do that is to understand the project overall.”	
		Evaluation of daily actions	Midrange evaluation		
		Forced-choice: Current actions	Exploiting orientation		
		Forced-choice: Reaction to change	Exploring orientation		
		Rank order	Ranked 3rd of 8		

	Document review	Survey		Interview
Knowledge sharing <i>(Structuring)</i> Strong trait for developing employees and encouraging sharing	Robust project process documents; artifact-based project management office intranet site	Likert 3.65 Exploiting Orientation 3.52 Exploring Orientation		“We sit down, and sometimes it will take up to 4 hours, and we go through any issues . . . that one has experienced in a project to ensure that doesn’t happen. . . . Someone might have a solution to the issue or problem, but at least everybody is also hearing about it, . . . and that’s a good forum to talk about new processes and procedures and things going on at the corporate level.”
		Evaluation of daily actions (highest mean score)	4.09: Your organization provides opportunities for employees to develop their knowledge, skills, and capabilities (Exploring)	
		Forced-choice: Current actions	Exploiting orientation	
		Forced-choice: Reaction to change	Exploiting orientation	
		Rank order	Ranked 4th of 8 (tie)	
Knowledge valuing <i>(Memory Making and Meaning)</i> Performance laden; flexible culture	Announcement of industry awards; announcement of projects won	Likert 3.60 Exploiting Orientation 3.65 Exploring Orientation		“So I run a project, and this is kind of what [the CEO] was getting at in his [meeting with] operational managers. He’s like, you guys got it, get in there, work on it, learn what is going on in each and every division.”
		Evaluation of daily actions (highest mean score)	4.09: Your organization provides opportunities for employees to develop their knowledge, skills, and capabilities (Exploring)	
			4.08: Your organization believes it needs to continuously improve customer service (Exploiting)	
		Forced-choice: Current actions	Exploiting orientation	
		Forced-choice: Reaction to change	Exploiting orientation	
Rank order	Ranked 1st and 5th of 8 rankings			

CHAPTER 5:

INTERPRETATIONS, CONCLUSIONS AND RECOMMENDATIONS

This final chapter is designed to integrate data analysis with the scholarly literature and conceptual framework that guided the line of inquiry. This chapter is organized into five sections: (1) integration of the data analysis with the research questions, organized into three findings; (2) discussions of scholarly contributions; (3) recommendations for future research; (4) implications for practice; and (5) summary and concluding remarks.

Integrated Data Analysis

This section was developed from an in-depth review of the data analysis conducted with each of the three methods. Three key findings emerged, which were subsequently linked to each of the research questions along with the scholarly literature that supports it. The three findings were as follows:

1. The organization does not have an established way to share new processes and procedures with everyone.
2. The organization does not scan the environment to understand what its competitors are doing; neither does it share its information external to the organization.
3. The organization does not have established work groups or communities of practice to help the organization adapt and change.

Integrated Data Analysis with Scholarly Frame: Finding 1

The organization does not have an established way to share new processes and procedures with everyone.

Finding 1 responds to the primary research question because it identifies that processes and rules as related to knowledge sharing were not communicated throughout the organization; therefore, project managers and other members of the organization were unable to determine what knowledge to share, how to share it, and whom to share it with. Knowledge sharing within the organization only occurred throughout the organization utilizing structures that supported effective product delivery and services. Knowledge was not shared within EngCo for internal uses such as increasing learning or exploring existing information. If there was no structure in place to facilitate knowledge sharing as related to learning or the exploration of knowledge, then knowledge would not be shared. Within EngCo, knowledge would be shared only if it was directly linked to providing services or delivering a product.

EngCo's challenge to communicating its standards regarding knowledge sharing was related to its high performance or exploitation orientation, with a heavy focus on demonstrating knowledge through delivering projects, providing products, and providing services. EngCo's exploitation orientation allowed the organization to demonstrate or perform using the knowledge it had acquired, created, valued, and shared.

Another challenge with knowledge sharing at EngCo, internally and externally, was related to its fluid organizational structure and organizational charts, as described by the project managers in the interviews. The organizational chart is typically a symbol of how an organization is structured. The structure of the organization reflects those actions,

decisions, processes, norms, values, and outcomes accepted and replicated by the organization's members (Giddens, 1984). However, EngCo's organizational chart did not reflect how the organization was functionally structured. Changing the organizational chart would affect how members behave and share knowledge (Schwandt, Ayvaz, & Gorman, 2006; Stones, 2005). As Giddens (1985) noted, while typically structures are stable, they can be changed, particularly as a result of unintended action, e.g., when people start to ignore the structures or replace them.

Giddens (1984) suggested that structures may include sets of expectations and an established way of doing things. From this context, structures include standards that are maintained and sustained within the organization by the conformity of the members. For the members to conform to a set of expectations, an established way of doing things, or standards, those standards must be communicated to them. Structure informs the members of who needs to know what information; it informs the members how to act. Structure provides the "sets of rules and resources that individual actors draw upon in the practices that reproduce social systems" (Giddens, 1995, p. 203), and without structure and standards the members will not know what to do or how to share knowledge. Thus, the findings of this study are consistent with Giddens' structuration theory and support his position.

Integrated Data Analysis with Scholarly Frame: Finding 2

The organization does not scan the environment to understand what its competitors are doing; neither does it share its information external to the organization.

Finding 2 responds to the secondary research question about perceptions of organizational actions in relation to knowledge sharing. The external interface actions

and structuration actions (networks, groups, procedures) were a weaker trait of EngCo; yet, the perceived need to change and the emphasis on developing employees and providing opportunities were a stronger trait within the organization. EngCo was more confident in its ability to make sense of the environment without bringing new information from the environment into the organization, and it also made decisions about what changes to make based on internal forecasting data. With such a strong internal or exploiting orientation, the organization also did not share its information with others. The lack of sharing knowledge was likely due to the perceived high competition within the industry.

Schwandt's (2010) subsystems describe actions associated with how an organization interfaces with its external environment. It is the organization's interaction with the environment, sending out information and acquiring knowledge, that helps keep the system dynamic so it does not become stagnant. When new knowledge is not received into the system, the entire system is disrupted because "information becomes the exchange medium required by all the other learning subsystems for their functioning" (Schwandt, 2010, p. 137). The lack of new information from the environment will impact the organization and cause it to focus only on its current knowledge, which in turn diminishes its "capacity to regenerate itself through reflective actions" (Schwandt, 2010, p. 137). Thus, EngCo as an organization was unable to evaluate its existing ways of doing business because it neither brought knowledge from the environment into the system or organization, nor shared its information or knowledge with the environment, which creates an imbalance within the organization and ultimately leads to a false sense of confidence and the inability to identify and resolve problems (Schwandt, 2010).

The finding that the organization did not scan the environment to understand what its competitors were doing or share its information externally is significant because it also informs the organization of the interplay between social structures, knowledge sharing, and communities of practice. Each of these constructs is addressed in the collective learning system model (Schwandt, 2010), and not sharing or receiving information with the external environment provides additional insights to the organization and to this study.

Integrated Data Analysis with Scholarly Frame: Finding 3

The organization does not have established work groups or communities of practice to help the organization adapt and change.

Finding 3 supports the secondary research question about the nature of communities of practice among project managers relative to social structures and knowledge sharing. At EngCo, knowledge sharing occurred through informational conversations. Because the primary business of EngCo is engineering and construction, it is reasonable that the company used more of an apprentice model as related to project management, where tacit knowledge is passed through stories, informational conversations, and informal dialogues.

As the organization continues to grow, it is challenged with taking the tacit knowledge and making it explicit in order to effectively facilitate sharing knowledge. As the organization expands and enters different market segments, it is vital that the organization capture its processes, lessons learned, and accomplishments in order to learn from them and share them with a large number of people. As EngCo matures, its infrastructure must also mature for the company to ensure knowledge is shared and is not

lost. After knowledge is created, it is disseminated and diffused throughout the organization (Schwandt & Marquardt, 2000), and EngCo is challenged with ensuring that happens. The output of the knowledge structuring subsystem is “acts of communication, networking, controlling, coordinating and managing”; thus, ‘knowledge carriers’ have the awesome responsibility of transporting knowledge to the various bins (other project managers) within the organization (Schwandt, 2010, p. 176).

The literature described two types of knowledge—tacit and explicit (Polanyi, 1962)—where technical tacit knowledge is often referred to as “know how” and encompasses informal skills or crafts, while cognitive tacit knowledge resides in the minds of individuals in organizations. Cognitive tacit knowledge consists of ideals, values, and beliefs deeply ingrained, which impact how individuals perceive the world (Polanyi, 1962). Both dimensions of tacit knowledge are difficult to codify and are typically expressed through conversation (Nonaka, 1994). Explicit knowledge is captured and written to facilitate the dialogue or exchange between individuals; it can be articulated and captured in a formal system (Polanyi, 1962; Nonaka, 1994). Explicit knowledge can be found in words, numbers, scientific formulas, libraries, and the like (Polanyi, 1962). Table 5.1 illustrates how EngCo shared both tacit and explicit knowledge.

Table 5.1
Tacit and Explicit Knowledge Shared at EngCo

Type of knowledge	How knowledge is shared	How knowledge is shared at EngCo
Tacit knowledge “Know how” (Nonaka, 1994); embedded in work practice, difficult to codify	“Requires sharing through socialization, physical proximity, and good relationships” (von Krogh et al., 2000, p. 93)	<ul style="list-style-type: none"> • “Walking past each other, face to face, yelling across from office to office, job sites” • “[At the] monthly breakfast . . . we go through any issues, you know, that one has experienced in a project. . . . That’s a good forum to talk about new processes and procedures.” • “The more projects that you are on, or the more you work, the more PM’s [project managers] you get to know.”
Explicit knowledge Written down to facilitate the exchange between two people; easy to codify (Nonaka, 1994)	Written communication	<ul style="list-style-type: none"> • Project management intranet site • Classes offered through the learning management system • Formal project update meetings

Further, this study highlighted the components of knowledge as discussed by Garud (1997): *know-what*, *know-why*, *know-where*, and *know-when*. Garud (1997) emphasized that *know-how* is most widely used of the four different components of knowledge. Each component of knowledge is obtained through different means and once created exists in different compartments, e.g., in individuals, embedded in organizational routines, and present in organizational practices (Garud, 1997; Nicholls-Nixon, 1997). Garud’s knowledge framework is relevant because it calls for an all-inclusive approach to the study of the social interactions and social processes involved in knowledge creation. This study focused on knowledge sharing, and Garud’s knowledge framework informed the study, as did Nonaka’s concept of tacit and explicit knowledge (Nonaka, 1994).

Garud's research called for a comprehensive framework examining how knowledge is shared, and this study responded to it.

Further, informational conversations regardless of the *type* of knowledge being shared can leverage a community of practice as a social structure or place to share knowledge. A community of practice was described by Wenger (2004) as "social structures" that facilitate the ability of practitioners to organize knowledge and serve as "cornerstones of knowledge management" (p. 2). Wenger (2004) indicated that communities of practice are a necessity because they "manage their knowledge" (p. 2) and can potentially increase members' job performance if the information shared and knowledge exchanged is incorporated into their work. Yet, communities of practice require support from the organization to succeed (Wenger, 2004). Communities of practice are "informal social networks that support a group of practitioners to develop a shared meaning and engage in knowledge building among the members" (Hara & Schwen, 2006, p. 100). EngCo did not recognize a formal community of practice for its project managers within the organization; however, the project managers responded favorably to the idea of creating and participating in a community of practice at EngCo.

Scholarly Contribution

The findings add to the scholarly conversations on which this study was built: those of Giddens (social structures) and Schwandt (knowledge sharing) in the context of Wenger and Snyder (communities of practice).

Schwandt (2010) was the anchor scholar for this study. Schwandt's collective learning system model focuses on patterns that occur within and between four interactive subsystems of action. Each subsystem of action corresponds to Parsons' functional

prerequisites and contains a set of activities required by the organization to share knowledge. Schwandt's (2010) collective learning system model consists of interactions of meaning-making and remembering; interactions of structuring; interactions of interfacing with environments; and interactions of reflecting. The model represents the interactions and nature of the exchange media involvement in knowledge creation, as comprehensively described in chapter 2.

This study used Schwandt's (2010) collective learning system model to describe knowledge sharing by redesignating the learning subsystems and their interchange media to knowledge subsystems and knowledge interchange media: knowledge acquisition (new knowledge), knowledge creation (referenced knowledge), knowledge valuing (knowledge adaptation), and knowledge sharing (knowledge dissemination and diffusion) to allow the researcher to examine knowledge sharing, organizational actions, and social structures in a community of project managers. Figure 5.1 depicts the redesignation of the collective learning system model. This enhanced representation of Schwandt's (2010) model in terms of knowledge allows future studies to discuss the function of knowledge as subsystems.

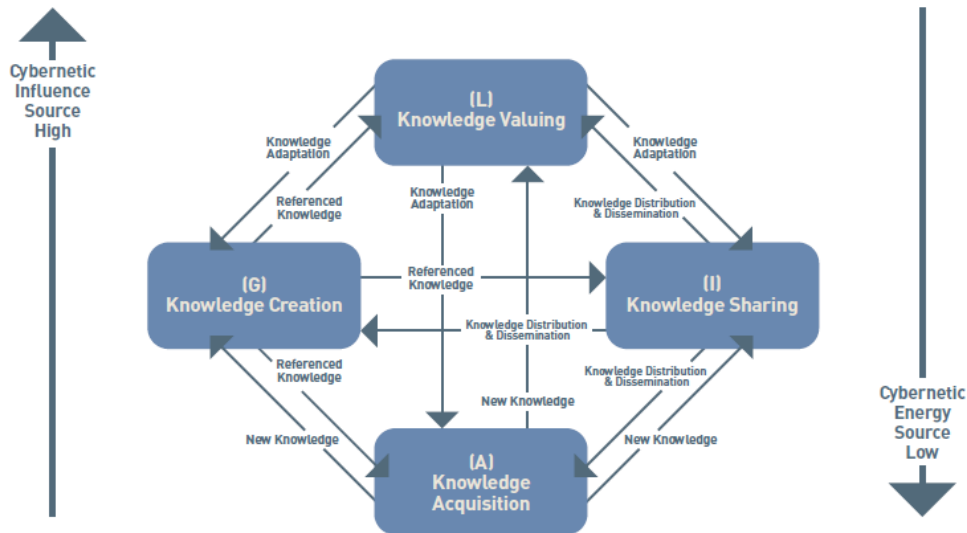


Figure 5.1. Collective knowledge systems model (adapted from Schwandt, 2010).

Giddens' (1976) theory of structuration was a supporting construct for this study. It provided a robust theoretical foundation to describe the relationships between structure and knowledge creation. This study contributes by including knowledge sharing in Giddens' foundation. For knowledge to be shared, it requires a vehicle; structure is the vehicle Giddens offered in his theory of structuration, which this study recognized as an important consideration for effective knowledge sharing to occur.

Wenger & Snyder (2000) community of practice served as the backdrop of this study that evolved more specifically to a discussion of a community of project managers. Wenger & Snyder (2000) described community of practice as an informal group of people with shared expertise, knowledge, values, attitudes, generate new lines of business and solve problems. This study supports their description and adds on that Schwandt's Collective Learning Systems Model informs the Communities of Practice literature because it comprehensively and dynamically addresses social structures and knowledge sharing from the collective perspective. Wenger & Snyder's work on communities of

practice does not address how the community of practice fits into the larger structure; neither does it discuss how the knowledge created and or shared within the community of practice is disseminated to the collective. The CLSM offers a way to share knowledge beyond a community of practice.

Overall, the researcher gained new insights in the understanding of the nature of knowledge sharing, social structures, and communities of practice. While multiple scholars are studying knowledge sharing, structuration theory, and communities of practice, this research began viewing them from an integrated perspective rather than as three separate bodies of literature. This study has provided an introduction to an integrated approach using those three constructs to help organizations share knowledge.

Recommendations for Future Research

This study explored how social structures enable or inhibit knowledge sharing in an engineering company and also focused on the nature of communities of practice relative to social structures and knowledge sharing. Future research should continue with this approach to understanding the phenomenon of knowledge sharing, social structures, and communities of practice but should extend it to include more sites across a range of industries and include multiple sites within a particular industry. Comparative case studies within industries could prove useful, as well as longitudinal studies using mixed methodologies.

More specifically, replicating the study in a different industry and comparing the results to the results of this study would contribute to the knowledge sharing research. Other businesses may include financial services, information technology, or manufacturing in the private sector and/or the federal government. Conducting the

research in other businesses could validate whether the findings are generalizable to other types of business and across sectors, private and public. Further, future research could continue to build on Giddens' structuration theory as well as Wenger and Snyder's research on communities of practice. Future research will provide more empirical research for scholars to reference as they continue researching knowledge sharing in engineering companies and other industries.

Implications for Practice

Implications also exist for practitioners managing knowledge sharing within an organization and/or contributing to the development of an organization's social structures. Three implications relate to how practitioners may be able to gain knowledge from the conclusions of this study to shape and impact organizational processes and practices.

Establish a knowledge-sharing plan to share new processes with everyone in the organization. Organizations have several ways to approach establishing processes and communicating them throughout the organization. This study concluded that the knowledge created is only as valuable as it is effectively shared throughout the organization. Practitioners can use this study to increase their cognizance of the importance and relevance of establishing a knowledge-sharing plan as related to the dissemination and diffusion of new knowledge throughout the organization.

Scan the environment to understand what competitors are doing and share information about the organization externally. For organizations to continue to explore (learn) and exploit (perform), they must acquire new knowledge from the environment and share information from within their organization with the external

environment. This study shared how project managers perceived their organization related to sharing knowledge with the environment. The theoretical model used to describe the impact on the organization and future impact will provide practitioners with insights on the effect of not sharing knowledge; further, practitioners can operationalize the model to understand more specifically what is happening within their organization.

Create work groups or communities of practice to help adapt and manage change. This study provides implications for how practitioners can leverage work groups and communities of practice for knowledge sharing. Because of the informal social structures inherent in organizations, practitioners can use these structures to share knowledge and positively help the organization adapt to various situations and manage change. Creating these social structures within the organization may also lead to cost savings.

Implications for EngCo

Consistent with the implications for practice, implications for EngCo also exist to help practitioners manage knowledge sharing within the organization and/or contribute to the development of an organization's social structures. More specifically, operational implications for EngCo include the following:

1. Provide results of data analysis to the community of project managers and their leadership.
2. Create and manage a community of project managers within EngCo; ensure strategic dissemination of information to the entire community on lessons learned, best practices and industry standards as related to project management.

3. Lead and/or assist with an organizational redesign effort to enhance the focus on social structures. For example:
 - a. Create new infrastructure or communicate existing infrastructure e.g. policies, processes, “the way we do business” to the community project managers.
 - b. Using the results of the data to expand the research model to include additional workgroups (beyond the PMs).
 - c. Using the theory of social structures and models related to knowledge sharing to redesign the human resources/human capital management structure to increase the flow of information and improve service, compliance and productivity.
4. Serve as a member of the senior leadership team in a strategic function as the Chief Learning Officer with the responsibility, authority and resources to oversee and direct the organization’s training and development.

Overall, these operational implications at EngCo will help practitioners manage knowledge sharing and contribute to developing social structures conducive to the organization.

Summary and Concluding Remarks

This study examined the interplay between social structures and knowledge sharing in the context of communities of project managers. The study explored how social structures in organizations affect knowledge sharing as perceived by a community of project managers. Three main findings explained how project managers within EngCo perceived its organization’s actions. First, the organization did not have an established

way to share new processes and procedures with everyone, which led to all project managers not having access to the same knowledge. Second, the organization did not scan the environment to understand what its competitors were doing; neither did it share its information with those external to the organization. Last, the organization did not have established work groups or communities of practice to help it adapt and change.

The conclusions of the study are significant, as they begin to close the gap in literature that explains the interplay between social structures and knowledge sharing in the context of communities of project managers. Understanding this interplay is important because organizations spend billions of dollars annually prescribing policies and procedures, yet projects and other efforts still fail due to nonexistent or ineffective knowledge sharing to communicate these policies and procedures. This study highlighted how social structures facilitate knowledge sharing.

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APPENDIX A:
KEY DEFINITIONS

Communities of practice: An informal group of people with shared expertise, knowledge, values, attitudes, and identity who drive strategy, generate new lines of business, and solve problems (Wenger & Snyder, 2000; Hislop, 2005).

Communities of project managers: Project managers with similar areas of interest and focus; they leverage shared documents, surveys, announcements, popular links, and a member directory to facilitate learning from one another (PMI, 2011).

Interplay: Reciprocal play, free interaction; mutual operation of two things or agents in influencing each other's action or character ("Interplay," 2011).

Knowledge management: An organized and planned approach to gathering, sorting, and distributing knowledge within an organization (Davenport & Prusak, 1998).

Knowledge sharing: Dissemination and diffusion of useful knowledge throughout a system (Schwandt, 2010).

Project manager: A professional in the field of project management with responsibility for planning, executing, and closing any project, typically relating to the construction industry, computer networking, telecommunications, or software development (Project Management Institute, 2008).

Social action theory: A systematic relationship between the "actions" of the agents in a social system and their collective ability to adapt to both their inside and outside environments (Parsons, 1937, 1951).

Social interaction: The basic principles of Parsons' functional theory of social action can be used as a framework for understanding the collective creation of knowledge: a

system of actions, agents, symbols, objects, and processes that enable the collective to transform information into valued knowledge, which in turn increases its long-run adaptive capacity (Schwandt, 1995).

Social structures: “Sets of rules and resources that individual actors draw upon in the practices that reproduce social systems” (Giddens, 1995).

Tacit knowledge: Knowledge embedded in work practice that is difficult to codify, disseminate, coordinate, or change; the assumptions, skills, and capabilities that underlie our ability to act in the world (Polanyi, 1966).

Useful knowledge: Acquaintance or cognizance of something through truth or experience that can be articulated and used by others (March, 1991; Schwandt, 2005).

APPENDIX B:

KEY THEORIES AND CONSTRUCTS

Theory/ construct	Description	Composition	How does it work?
Communities of practice (Wenger, 1997)	Used to codify knowledge	A group of people who share a concern, a set of problems, or a passion about a topic and deepen their knowledge and expertise in this area by interacting on an ongoing basis	Interacting on an ongoing basis to further understand their shared area of expertise
Knowledge (Sackmann, 1992)	Four different types of knowledge shared by organization members: dictionary, directory, recipe, and axiomatic	NA	Dictionary = “what” Directory = “how” Recipe = “should” Axiomatic = “why”
Knowledge sharing (Schwandt, 2010)	Dissemination and diffusion of knowledge throughout a system (Schwandt, 2010)	NA	Through the dissemination and diffusion subsystem via the structuring medium (Schwandt, 2010); can occur via written correspondence or face-to-face communications, through networking with other experts, or through documenting, organizing, and capturing knowledge for others (Cummings, 2004; Pulakos et al., 2003; as cited in Wang & Noe, 2010)
Social action theory (Parsons, 1937, 1951)	Systematic relationship between the “actions” of the agents in a social system and their collective ability to adapt to both their inside and outside environments	Functional prerequisites of a social system of action: adaptation, goal attainment, integration, and latency/pattern maintenance (Parsons, 1951)	“Includes an active concern with mastery, or the ability to change the environment to meet the needs of the system, as well as an ability to survive in the face of its unalterable features” (Parsons, 1964, p. 341)
Social interaction (Schwandt, 1995, 1997, 2000, 2010)	The basic principles of Parsons’ functional theory of social action used as a framework for understanding the	Four interacting subsystems (with interchange media): interactions of interfacing with	Learning at all levels of analysis has no predetermined orientation to success and no particular value; learning

Theory/ construct	Description	Composition	How does it work?
	collective creation of knowledge; collective learning operationally defined as a system of actions, agents, symbols, objects, and processes that enable the collective to transform information into valued knowledge, which in turn increases its long-run adaptive capacity (Schwandt, 1995).	environments (information); interactions of reflecting (knowledge); interactions of memory-making and meaning (adaptive sensemaking tensions); interactions of structuring (reciprocation) (Schwandt, 2010); each learning subsystem is imperative to the learning system's capacity to create knowledge (Schwandt & Marquardt, 2000).	is ongoing and occurs at all levels of significance, at routine levels of day-to-day cognition (e.g., team learning to accomplish a work task), and at levels of high emotional and radical change (e.g., issues of changing cultural patterns, such as schemata and basic assumptions (Schwandt & Marquardt, 2000).
Theory of structuration or duality of structure (Giddens, 1976; 1979)	The concept of structuration, which is fundamentally the "recursive character of social life, and expresses the mutual dependence of structure and agency" (p. 69); in essence, the structure of the social system and the activities (i.e., learning) engaged in by the individual actors influence each other.	"Duality of structure," where "social structure is both constituted by human agency and yet is at the same time the very medium of this construction" (Giddens, 1993, pp. 128-129).	Action is a precondition for sense-making. People often produce part of their environment, and in turn, the environment influences the person's meaning making and actions (Giddens, 1979).

APPENDIX C:
INTERVIEW PROTOCOL

How do social structures enable or inhibit knowledge sharing as perceived by communities of project managers?

Time of interview: _____

Date: _____

Place: _____

Interviewer: _____

Interviewee name and division: _____

Thank you for agreeing to speak with me for the next hour. A pseudonym will be used, and your responses will be kept confidential. With your permission, this interview will be tape recorded for the purposes of transcribing and analyzing the data for use in my dissertation. You can stop the interview at any time for any reason.

To get us started, let me tell you about what I am interested in learning. I'm interested in how social structures enable or inhibit knowledge sharing as perceived by communities of project managers. I'll be asking you a series of questions aimed at gaining this information from you.

Questions for participants:

1. Tell me about your role in the organization. What are your responsibilities?
2. Describe how you share project-critical knowledge with project team members.
3. Describe how you share project-critical knowledge with your supervisors.
4. Describe how the company's policies/standard operating procedures related to running projects enable or inhibit knowledge sharing as it pertains to the project.
5. What form of communication do you use most frequently to share knowledge pertaining to the project with project team members?
6. What is your tenure at this organization?
7. What is your tenure as a project manager?
8. What is your age?
9. What is your educational background?
10. Are you PMP certified?

APPENDIX D:
SUMMARY OF DOCUMENTS REVIEWED

CEO video announcements. The CEO publishes speeches on various topics throughout the year to inform employees about various initiatives or projects or to share his message from speaking engagements. The CEO video announcements were from the 60th anniversary, a rotation engineers' event, a foreman academy graduation, and a training class on preinstallation testing and checkout. The 60th anniversary video discussed the company's capabilities and history. The CEO thanked the employees for their hard work and sacrifices and for the projects the company completed. The video highlighted the employees who work in offices around the world and shared what they do to contribute to EngCo's mission. The rotation engineers' video announcement shared the CEO's vision for the future leaders of EngCo and discussed what they needed to do to continue to advance in their career and grow within EngCo and within the industry. The CEO told the engineers, "Plato established 'The Academy' for philosophers, who were considered radical and brilliant in math and engineering, philosophy and geometry, and we are establishing something similar today; you are encouraged to manage your own careers, and if you decide that you want to move into other disciplines in the organization, you are invited to." The foreman academy graduation video announcement told the foreman and the rest of the company that the three priorities at EngCo were "safety, reputation, and productivity" and the CEO reiterated that safety was the most important of the three. The CEO also stated, "While productivity is essential and making money is a necessity for all of us, building and maintaining a good reputation is crucial for the success of any company." During the video, the CEO announced that the foremen

were the first line of management and they could be whatever they wanted to be within the company and EngCo would invest in them and help them get the training and skills they needed. During the preinstallation testing and checkout video, the CEO challenged everyone to develop an in-depth understanding of complex systems and told the project managers to always test in the lab first before installing in the field. Further, he emphasized that in order for EngCo to increase efficiency, the company had to implement successful methodology, train others how to carry out processes, and optimize all of its available resources.

Company announcements. These communications were sent from the marketing and communications department to all EngCo employees via email and included information about new projects EngCo was awarded, process changes, corporate initiatives, new leaders joining the organization, employees' upcoming training events, and the death of an employee. The new project announcements provided employees insight about the project location, approximate project square footage, and if it was design-build, design, or just build. The process change announcements discussed new corporate initiatives, including achieving ISO 9001 certification and how that would impact employees, EngCo University course registration information, and uploading of credentials and transcripts to the learning management system. As new leaders joined EngCo, an announcement shared where they attended school, information about their previous employer, and their role at EngCo. Training information was listed by discipline and provided employees a synopsis of the training, the cost, and how they could register to participate. In the unfortunate event that an employee passed away and/or an employee or their family member was diagnosed with a severe illness, an announcement was sent

with funeral information or requesting monetary support for the family. EngCo Foundation, the 501c(3) of EngCo, always matched employees' contributions to these causes, as indicated in the announcement as well.

Company history. The company history was presented via a 60-minute video. A brief summary of the company history was provided by marketing and communications and also appeared on the public Internet site. The video described the evolution of EngCo and its growth as a company in the engineering industry and its expansion into other areas of business. The summary on the public Internet site shared general information about the history of the company and its expansion into various market segments over 60 years.

Employee handbook. This 100-page provided information about standards of conduct in the workplace and explained company policies about travel expenses, paid time off, tuition reimbursement for training and continuing education, time and attendance, bonuses, performance evaluations, operational risk management, safety, and the grievance process. The handbook provided employees with a host of information to help them navigate throughout EngCo over the course of their career. The handbook was posted on the company's intranet site, was accessible by EngCo employees, and was given to all new employees during orientation.

Learning management system (EngCo University). EngCo used a learning management system for the registration and administration of its training programs. This system provided information on the types of training offered and their frequency and an opportunity to participate in an eLearning class that was in progress. EngCo University provided online learning opportunities and also stored content for face-to-face classes

that were conducted for the employees. EngCo University allowed employees to upload all of their credentials, licenses, degrees, and transcripts. It also saved each course employees registered for and participated in during their tenure at EngCo.

List of projects by type (2008-2010). This list of EngCo's projects and customers was maintained by the marketing and communications department. Details of many of the projects listed were also available throughout EngCo's corporate headquarters on posters and flyers. Due to the varying security levels of the projects that EngCo has worked on, an entire list of projects and customers was unavailable.

Project organizational charts. The organizational charts reviewed were project specific from the engineering business unit. Some of the projects had employees names, while others were functional organizational charts that listed the types of positions that were required for a project, with no names included. The organizational chart of the entire EngCo structure was neither published nor available for review to the researcher or EngCo employees.

Project management office intranet site. This SharePoint site stored all forms project managers were to use on their jobsite. The engineering business unit and integrated systems business unit both had a site. The structure of the sites and the forms differed. The project management office intranet site had a process document as well as an Excel sheet that indicated which artifacts were required to be submitted for various project meetings. The site did not explain how to create the artifacts—just which artifacts to include in the updates.

Project meeting process documents. These documents informed project managers what documents were to be included in their project updates. There was also a

matrix for project managers indicating which documents were required at the various project meetings throughout the lifecycle of the project.

Public EngCo Internet site. The company's public Internet site had information about the company history, market segments, services provided, career opportunities, and corporate responsibility/community outreach. The Internet site gave the public an overview of the company's capabilities and points of contact to receive additional information.

APPENDIX E:

DOCUMENT REVIEW SAMPLE TEXT

	Artifact	Forms to complete	Software capabilities	Project processes	Formal policies	Career progression	Training opportunities	Types of projects completed	Accomplishments
Strategic Communications									
1	Upcoming learning opportunities: Find the course that is right for you and register today at: http://EngCouniversity.EngCo.com . Have a class in mind but don't see it listed, please email education@EngCo.com and we will be happy to add the class. Interested in having an onsite training at your location, please email education@EngCo.com .	1				1	1		
2	Industry awards earned by EngCo: Each year EngCo continues to rise in key industry rankings. This year was no exception as EngCo received outstanding recognition in 2010. Our awards include...								1
3	New Engineering & Construction Projects: 2010 marked a year of many outstanding projects awarded to the Engineering and Construction division. As the year comes to a close, we want to celebrate those wins and the new projects many employees will and are currently supporting. Additionally, impressive is the geographical diversity of our new projects – from two major hospitals and an airport in Texas to a major hospital and transportation project in Atlanta to a plant in South Carolina and hospital in North Carolina.							1	1
4	EngCo Foundation donation requests; announcements of where donations were given: Interested in helping make a wish come true? Attend the volunteer meeting TONIGHT in the main conference room at the corporate office at 5pm. Maureen, a local teenager, and her family are flying to Santorini, Greece, as part of a wish that is being fulfilled through a partnership between the EngCo Foundation and the Make-A-Wish Foundation. Maureen was diagnosed with bone cancer when she was a freshman in high school and the only thing that kept her spirits up during treatment was watching "Mamma Mia" and dreaming of someday visiting the island of Santorini. She's currently in remission and we are excited to help make her wish become a reality by hosting a Greek send-off party for her and her family on June 30 from 6-8pm.	1							
5	EngCo holidays/days closed				1				
6	Processing timesheets		1		1				
7	Death of an employee								
Videos; Messages from CEO									
8	Preinstallation testing and checkout video: Challenges us to	1		1	1		1		

	Artifact	Forms to complete	Software capabilities	Project processes	Formal policies	Career progression	Training opportunities	Types of projects completed	Accomplishments
	develop an in-depth understanding of complex systems engineer testing; Enables us to create mini-version world class systems; Systems are tested in the lab first before installation in the field; System experts are generated: You design it = You test it = You install it!; In order for EngCo to increase efficiency, we must: Implement successful methodology, Train others how to carry out processes, Utilize all of our available resources								
9	Rotation engineers: Most of the electrical engineering jobs within EngCo are available to an interested skilled engineer or an interested technician who would like to move into that area. EngCo wants to build highly skilled engineers, not just consultants. If you design it, you test it. Engineering is artistic and complicated. Plato established “The Academy” (early philosophers were considered radical and brilliant in math and engineering philosophy and geometry), and we are establishing something similar today. You are encouraged to manage your own careers, and if you decide that you want to move into other disciplines in the organization, you are invited to. EngCo is building a linear career path that goes through all of the primary disciplines of engineering, including accessibility to the best education and great opportunities. In order for anyone to be successful, they need to spend at least two weeks per year, maybe 4-6 years, in very challenging educational programs in a chosen discipline.					1	1	1	
10	Foreman academy graduation: Moving to the frontline of supervision: Managing now and for the future; Foreman level is the first line of management. It is here that you are given the opportunity to become part of management and you begin “managing now and for the future.” You are making a difference now as a leader and a supervisor. You are an “initiator,” “communicator” and a “problem solver” and you deliver “quality input.” You are ensuring EngCo’s future by making sure that as a company, we always deliver the highest level of excellence in the following areas: safety, reputation, productivity. Safety should be your most important focus and “making sure that everybody is going home the way they came. Everybody is going home healthy.” While productivity is essential and making money is a necessity for all of us, building and maintaining a good reputation is crucial for the success of any company. What about your future? For individuals who want to shift careers, you are now in the position to do any job. EngCo will provide you with all of the tools necessary to be successful at any position. However, you must realize that this process is very demanding, requires a high level of commitment and performance as well as choosing success over a long term.					1	1	1	
11	60th anniversary video: Describes the different divisions’							1	1

		Forms to complete	Software capabilities	Project processes	Formal policies	Career progression	Training opportunities	Types of projects completed	Accomplishments
	Artifact								
	capabilities, the history of the third-generation–owned company, thanked employees for their hard work, sacrifices and dedication; showed employees representing the offices around the world								
12	Project Gatecheck intranet site								
13	Project meeting(s) process document	1		1	1				
14	Required artifact spreadsheet for project meetings	1							
15	Project organizational charts				1				
16	HR project plan information	1			1		1		
	Orientation materials								
17	EngCo University video		1				1		
18	Employee handbook	1			1		1		
19	Inprocessing paperwork/forms	1				1			
	Company public website: Information exclusively about EngCo’s body of work and how to come work there								
20	Company history: Established in 1949, EngCo has earned a reputation as an innovator and pioneer. It employs more than 3,500 professionals in offices throughout the Eastern United States, Europe and the Middle East.								
21	EngCo market segments: Government, corporate, special industry, commercial. EngCo harnesses cutting-edge technologies that allow commercial market customers to offer tenants unsurpassed amenities such as fiber to the desk, content delivery networks, comprehensive access control and security monitoring systems, voice over IP, critical and backup power systems, and custom lighting systems. Our experience encompasses new construction, renovations, expansions, and tenant fit outs. The nation’s leading developers and private owners consistently select EngCo to deliver complex systems on time, within budget, and to exacting quality standards.							1	1
22	EngCo Services: DesignBuild, Energy, Communications, Security/Life Safety, Automation							1	1
23	Career Opportunities: Interested in working on exciting, high profile, state-of-the-art projects? Are you looking for a career, not just a job? Look no further. Consider a career with EngCo. We seek dynamic motivated individuals to complement our current team of professionals and continue the company’s unparalleled reputation for technical excellence that it began more than 60 years ago.					1	1		
24	Corporate citizenship and responsibility: EngCo is more than an engineering and technologies company; we are corporate citizens who contribute to the greater good of the nation and the world, not only through our core competencies and service offerings, but also by how we give back to the communities that have supported our ongoing success.								1
	Recruiting materials								

	Artifact	Forms to complete	Software capabilities	Project processes	Formal policies	Career progression	Training opportunities	Types of projects completed	Accomplishments
25	Learning opportunities by career field					1	1		
26	EngCo projects/portfolio of work							1	1
27	EngCo overview/ fact sheet: EngCo is the nation's premier electrical design-build and systems integration firm for complex, mission-critical organizations.							1	1
TOTAL		8	2	2	7	6	9	8	8

Over half, 14 out of 27, of the documents reviewed referenced career progression and training opportunities, while only 2 documents reviewed provided insights into project management processes and two addressed software capabilities. Seven documents discussed formal policies; however, four of the seven were related to administrative functions, e.g., how to process timesheets, and information in the company handbook and inprocessing paperwork discussed during orientation. The other three documents related to formal policies directly related to managing projects. One was a human capital plan for projects, one was the project meeting process document that spelled out the existing processes for project management, and the third discussed how to perform a preinstallation test on equipment.

APPENDIX F:
ORGANIZATIONAL ACTION SURVEY

[Five-point Likert scale] <i>Indication of how much respondents disagree=1 to strongly agree=5 with the following statements To what extent...</i>
1. Do frequent technological changes or advances make current products or services, or operations of your organization obsolete?
2. Is your organization committed to developing its employees?
3. Do members of your organization share external information (information from outside your organization)?
4. Is there intense competition among organizations within your industry?
5. Are people in your organization held responsible for the decisions they make?
6. Does your organization predict the changes occurring in the industry?
7. Does your organization use stories and make references to its history to let people know how they should perform their jobs?
8. Does your organization effectively allocate and distribute organizational resources (e.g., people, materials, money, technology, equipment)?
9. Does your organization continuously track how your competitors improve their products, services and operation?
10. Does your organization hold work groups accountable for achieving established goals?
11. Does your organization implement changes to help the employees to be more effective in doing their jobs?
12. Does your organization deliberately reflect upon and evaluate external information ?
13. Do customers play a significant role in providing information about the quality of products and services in your organization?
14. Does your organization publicly acknowledge employees for outstanding performance (e.g., featuring them in newsletter, plaques, etc.)?
15. Is your organization committed to being as efficient as possible?
16. Does your organization provide opportunities for employees to develop their knowledge, skills, and capabilities?
17. Does your organization influence or control important factors and forces in its external environment (e.g., professional associations, government agencies, technological innovations)?
18. Does your organization believe it needs to continuously improve customer service?
19. Does your organization effectively use organizational resources?
20. Do external forces (e.g., government agencies, professional associations, etc.) frequently develop requirements, regulations and policies that directly affect your organization?
21. Do your organization's leaders support quick and accurate communication among all employees?
22. Does your organization have set goals for researching and developing new products

and/or services?
23. Do members of the organization effectively use organizational structures (e.g., chain of command, personal networks) when sharing ideas and innovations?
24. Are your organization's leaders effective at achieving organizational goals?
25. Does your organization use ideas and suggestions from its employees?
<i>[RANK IMPORTANCE to organizational success]</i>
26. Sharing of information and knowledge required for continuous organizational improvement
27. Identifying external resources required to meet organizational goals
28. Reflecting on organizational experiences to improve products and/or services
29. Utilizing organizational structures that support effective production/customer service
30. Reinforcing an open and flexible organizational culture
31. Producing products and/or services of the highest quality possible
32. Obtaining information concerning the changes in the organization's external environment
33. Achieving performance standards established by the organization
<i>[Five-point Likert scale]</i> <i>Indication of how much respondents disagree=1 to strongly agree=5 with the following statements. In my experience. . .</i>
34. This organization believes that continuous change is necessary.
35. There are established ways to share new operational processes and procedures throughout the organization.
36. This organization has clear performance goals.
37. This organization effectively identifies and acquires external resources required to meet its goals.
38. This organization has a strong culture of shared values that guide the daily work activities.
39. Due dates for deliverables are consistently met in this organization.
40. People in this organization believe that evaluating what customers say is critical to reaching organizational goals.
41. Mistakes are seen as learning opportunities in this organization.
42. This organization has established work groups, network, and other collaborative arrangements to help the organization adapt and change.
43. The managers and leaders of the organization have the skills needed to guide organizational change.
44. This organization has established an achievable organizational mission.
45. The end products of work groups in this organization are of much higher quality than any one of us could have produced alone.
46. The people in this organization learn from one another through informational conversations.
47. It is easy for employees to access expertise in the organization.
48. This organization has a strong culture of shared values that support individual and organizational development.
49. My work group has been able to influence the way changes are introduced in the organization.

50. This organization has clear goals for individual and organizational development.
<i>[Forced-choice]</i>
<i>Which statement best describes the present actions of your organization?</i>
51. [1] Utilization of external information (e.g., customer feedback, government regulations) to guide organizational change
52. [2] Utilization of organizational resources to guide change
53. [1] Production of valued products and/or services
54. [2] Production of new knowledge relevant to the organization
55. [1] Evaluating information and data to make informed decisions regarding organizational strategy
56. [2] Accomplishment of established organizational goals
57. [1] Meeting present organizational performance standards
58. [2] Critically reviewing present organizational performance standards
59. [1] Using the most effective communication network to successfully deal with the situation at hand
60. [2] Following established chain of command to successfully manage the situation at hand
61. [1] Innovation of new products and/or services
62. [2] Production of well-established products and/or delivery of services
63. [1] Ensuring that the human resources of the organization have the capabilities to effectively perform the work of the future
64. [2] Fair and equitable allocation of organizational resources to meet future demands
65. [1] Using external data (e.g., political information, government regulations, customer feedback) to better understand customer needs
66. [2] Using internal forecasting data and procedures to meet customer needs
<i>In case of change, which statement best describes your organization's reaction to change . . .</i>
67. [1] Makes new insights and ideas available to everyone in the organization who wants access to them.
68. [2] Protects new insights and ideas by sharing them only with certain management levels and functions.
69. [1] Is uncertain how to deal with changes in the organization's external environment.
70. [2] Is confident in its ability to understand the impact of external environmental changes on the organization.
71. [1] Has established processes and procedures to control how changes in its external environment impact its operations.
72. [2] Allows changes in its external environment to influence how processes and procedures are performed.
73. [1] Usually performs detailed analyses to make informed decisions.
74. [2] Usually follows the intuition of management.
75. [1] Considers the past, present, and future impacts of change.
76. [2] Focuses on the present relevance of change.
77. [1] Tries to adapt to changes in its external environment right away.
78. [2] Takes time to clarify and understand changes occurring in the external environment.

79. [1] Is skeptical about new trends and changes in the organization.
80. [2] Is optimistic about new trends and changes in the organization.
81. [1] Believes the external environment has only a limited influence on organizational change.
82. [2] Believes that the external environment has significant influences on organizational change.
83. [1] Immediately applies new technology to organizational work procedures.
84. [2] Creates a pilot project to test the new technology's relevance to organizational work procedures.
85. [1] Creates policies to interpret how employees should deal with new situation.
86. [2] Allows employees to interpret and make sense of new situations.
87. [1] Considers leaders and managers solely responsible for decision making about how to deal with organizational change.
88. [2] Expects everyone to participate in the decision-making process on how to deal with organizational change.
89. [1] Strives to obtain additional information so that they can accurately predict the outcomes of their actions with respect to the change.
90. [2] Gathers just enough information to produce a plausible outcome as a result of their actions with respect to the change.
<i>Compared to companies like yours, how would you assess the performance in the following areas?</i>
91. Revenue Growth
92. Quality of Products and Services
93. Process Improvement
94. Management Practices
95. Overall Employee Satisfaction
96. Workforce Development/Training Programs
97. Market Share
[Background Items]
98. What is your age group? <input type="checkbox"/> 25-34 years <input type="checkbox"/> 35-44 years <input type="checkbox"/> 45-54 years <input type="checkbox"/> 55-64 years <input type="checkbox"/> 65+ years
99. How long have you worked for this organization? <input type="checkbox"/> 0-3 years <input type="checkbox"/> 4-7 years <input type="checkbox"/> 8-10 years <input type="checkbox"/> 10+ years
100. How long have you been a project manager in this organization?
101. How many years total have you functioned in a project manager role (in this organization and in other organizations)?
102. How long have you been Project Management Professional (PMP) certified? <input type="checkbox"/> 0-3 years <input type="checkbox"/> 4-7 years <input type="checkbox"/> 8-10 years <input type="checkbox"/> 10+ years <input type="checkbox"/> Not PMP Certified
103. What is the distance between you and your project team? <input type="checkbox"/> All co-located <input type="checkbox"/> In two different locations <input type="checkbox"/> In three different locations
104. In what field is your highest degree? <input type="checkbox"/> Engineering <input type="checkbox"/> Project Management <input type="checkbox"/> Construction Management <input type="checkbox"/> Business Administration <input type="checkbox"/> General Education/Interdisciplinary Studies <input type="checkbox"/> Other, please write in:

105. What location do you work at within this organization?

106. What division do you work for?

- Integrated Systems Engineering (ISE) Security & Electronic Systems (SES)
 Service Engineering & Construction Telecommunications

APPENDIX G:

MEAN SCORES OF LIKERT ITEMS

Subsystem	Orientation	Item	Mean
Knowledge Acquisition	Exploiting	Is there intense competition among organizations within your industry?	4.2267
Knowledge Acquisition	Exploiting	Do external forces (e.g., government agencies, professional associations, etc.) frequently develop requirements, regulations and policies that directly affect your organization?	4.1733
Knowledge Sharing	Exploring	Does your organization provide opportunities for employees to develop their knowledge, skills, and capabilities?	4.0933
Knowledge Valuing	Exploiting	Is your organization committed to developing its employees?	4.0933
Knowledge Valuing	Exploiting	Does your organization believe it needs to continuously improve customer service?	4.0800
Knowledge Sharing	Exploiting	Are people in your organization held responsible for the decisions they make?	4.0800
Knowledge Valuing	Exploring	People in this organization believe that evaluating what customers say is critical to reaching organizational goals.	3.9067
Knowledge Sharing	Exploiting	The end products of work groups in this organization are of much higher quality than any one of us could have produced alone.	3.8800
Knowledge Acquisition	Exploring	Do customers play a significant role in providing information about the quality of products and services in your organization?	3.8400
Knowledge Valuing	Exploring	This organization believes that continuous change is necessary.	3.7067
Knowledge Acquisition	Exploring	Does your organization predict the changes occurring in the industry?	3.6933
Knowledge Creation	Exploiting	Due dates for deliverables are consistently met in this organization.	3.6800
Knowledge Sharing	Exploring	The people in this organization learn from one another through informational conversations.	3.6800
Knowledge Sharing	Exploiting	The managers and leaders of the organization have the skills needed to guide organizational change.	3.6267
Knowledge Sharing	Exploring	It is easy for employees to access expertise in the organization.	3.5733
Knowledge Valuing	Exploring	This organization has a strong culture of shared values that support individual and organizational development.	3.5600
Knowledge Acquisition	Exploiting	This organization effectively identifies and acquires external resources required to meet its goals.	3.5467
Knowledge Creation	Exploiting	This organization has clear performance goals.	3.5333

Subsystem	Orientation	Item	Mean
Knowledge Sharing	Exploring	Do your organization's leaders support quick and accurate communication among all employees?	3.5333
Knowledge Valuing	Exploiting	Is your organization committed to being as efficient as possible?	3.5200
Knowledge Creation	Exploiting	Does your organization hold work groups accountable for achieving established goals?	3.5200