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A Causal Model to Predict Organizational Knowledge Sharing via Information and Communication Technologies

Simon Cleveland
Nova Southeastern University, sc1674@nova.edu

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A Causal Model to Predict Organizational Knowledge Sharing via Information and Communication Technologies

by

Simon Cleveland

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Information Systems

Graduate School of Computer and Information Sciences Nova Southeastern University 2014
We hereby certify that this dissertation, submitted by Simon Cleveland, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

______________________________
Timothy J. Ellis, Ph.D.
Chairperson of Dissertation Committee

______________________________
Vincent Scovetta, Ph.D.
Dissertation Committee Member

______________________________
Maxine S. Cohen, Ph.D.
Dissertation Committee Member

Approved:

______________________________
Eric S. Ackerman, Ph.D.
Dean, Graduate School of Computer and Information Sciences

Graduate School of Computer and Information Sciences
Nova Southeastern University

2014
Knowledge management literature identifies numerous barriers that inhibit employees’ knowledge seeking and knowledge contributing practices via information and communication technologies (ICTs). Presently, there is a significant gap in the literature that explains what factors promote common knowledge sharing barriers. To bridge this gap, this study examined two research questions: 1) What are the potential factors that contribute to the commonly accepted barriers to knowledge sharing?, and 2) How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing? Literature review of 103 knowledge management articles identified three major barriers to knowledge sharing practices (lack of time, poor communication skills, and lack of trust) and three underlying factors that promoted these barriers (role conflict, role ambiguity, and locus of control). A six-stage content analysis study of the 103 knowledge articles identified 199 references to the observed contributors.

To address the second research question, a causal knowledge sharing model was developed and seven hypotheses proposed. A survey consisting of 41 questions was distributed to 1,368 full-time analysts from a variety of industries, and 314 useful responses were analyzed using confirmatory factor analysis and structural equation modeling. The results confirmed that role conflict, role ambiguity, and locus of control predicted knowledge seeking and knowledge contributing behaviors via ICTs. Moreover, type of ICTs used was found to moderate the strength of these predictors.
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Chapter 1

Introduction

Background

Avoiding repetition of mistakes by relying on the use of previously acquired knowledge has been a key knowledge management (KM) goal of organizations (Hanisch, Lindner, Mueller, & Wald, 2009). The existence of organizational procedures to share knowledge does not, however, guarantee knowledge sharing. A survey of 522 professionals indicated that while 62.4% of the organizations have formal procedures for documenting experiential knowledge, 89.3% are not sharing knowledge (Williams, 2008). This lack of adherence to procedures for knowledge documentation and the existence of a variety of other barriers to knowledge contribution inhibit knowledge management practices in organizations. As a result, novices fail to learn from experienced professionals and repeat historical mistakes.

The work force is in the process of significant change; estimates indicate that 3.6 million “baby boomers” will leave by 2020 (Toossi, 2012). With their departure, valuable knowledge accumulated over many years will disappear. This issue is especially critical in the IS area where it is common for organizations to not keep archives of accumulated experience, best practices, and valuable positive or negative work insights. For example, approximately 66% of information technology projects fail as a result of inexperienced staff (StandishGroup, 2011).
Organizations have been taking steps to combat loss of knowledge by investing in technologies that help facilitate knowledge transfer. In 2011, US based businesses invested $289.9 billion on ICTs, a 10.6% increase from 2010 (U.S.Census, 2013). ICTs (combination of email, instant messaging, micro/wiki blogging, online forums, and knowledge repositories) provide employees with the ability to capture and share knowledge in the normal flow of their work (Kankanhalli, Tan, & Wei, 2005; Rojko, Lesjak, & Vehovar, 2011). According to some reports, sales of enterprise social networking ICTs had a 259% increase in the first quarter of 2013 (Perez, 2013), yet in spite of such enterprise investments, organizations still fail to retain knowledge insights at a rate of approximately $32 billion per year in Fortune 500 companies (Yan, Davison, & Mo, 2013).

**Problem Statement**

Effective dissemination of knowledge is a critical component for the achievement and sustainability of competitive advantage for any firm (Buckley & Carter, 2000; Davenport & Prusak, 2000; Davenport, Prusak, & Wilson, 2003; Evermann, 2005; Foss & Pedersen, 2002; Friedman, 2002; Grant, 1996; Hackney, Burn, & Salazar, 2004; Spender & Grant, 1996; Teece, 2000). While successful knowledge transfer is associated with higher levels of productivity and prolonged organizational survival (Darr, Argote, & Epple, 1995; Dyer & Nobeoka, 2000; Galbraith, 1990), literature suggests that this success depends on the knowledge exchange between experts and novices (Cabrera & Cabrera, 2005; Damodaran & Olphert, 2000; Hinds, Patterson, & Pfeffer, 2001; Wang & Noe, 2010).

Presently, there is a gap in the understanding on how to effectively promote knowledge sharing within an organization, because barriers that inhibit knowledge
sharing behaviors and factors that promote these barriers are poorly understood (Bock, Zmud, Kim, & Lee, 2005; Connelly & Kelloway, 2003; Ruggles, 1998). Extant literature has identified a number of knowledge sharing barriers such as lack of time (Kankanahalli et al., 2005; Santos, Soares, & Carvalho, 2012; Williams, 2008), poor communications skills (Lin, Wu, & Yen, 2012; Riege, 2005; Santos et al., 2012), and lack of trust (Abrams, Cross, Lesser, & Levin, 2003; He, Qiao, & Wei, 2009; Jarvenpaa & Majchrzak, 2008; Renzl, 2008; Ridings, Gefen, & Arinze, 2002; Riege, 2005; Rosen, Furst, & Blackburn, 2007; Sun & Scott, 2005); however, information and communication technology (ICT) research has demonstrated that technology alone is not capable of increasing knowledge sharing or eliminating knowledge sharing barriers. While some studies have suggested that electronic knowledge repositories (EKRs) can facilitate the flow of knowledge (Alavi & Leidner, 2001; Ibrahim & Nissen, 2005; Newell, Swan, & Galliers, 2000; von Krogh, 1998), others have shown little evidence of such success (Kelly & Jones, 2001). For example, Gilmour (2003) found US firms spent nearly $4.5 billion on ICTs without realizable benefits to the knowledge sharing processes. In another study among European and U.S. firms, the knowledge transfer success rate was measured at only 13% from a sample of 431 organizations (Ruggles, 1998). It seems the problem is not rooted in the technology, but in the people that use it, specifically their lack of understanding of its benefits, lack of communication, lack of time to use it, its incompatibility with their current jobs, and lack of training on it (Cabrera, Collins, & Salgado, 2006).

To truly understand the problem and add value to the knowledge management literature, it is necessary to examine the organizational and individual characteristics that
influence the aspects of knowledge sharing behavior. For this purpose, knowledge sharing behaviors were deconstructed into its building blocks: knowledge seeking and knowledge contributing practices (Van den Hooff & De Ridder, 2004). Doing so allowed for an adequate exploration of the unique drivers that impact each behavior and determine potential contributors to the lack of knowledge sharing success (Carter & Scarbrough, 2001; Voelpel, Dous, & Davenport, 2005).

**Dissertation Goals**

The goal of this study was to develop an actionable knowledge sharing model to explain contributory factors that impact employees’ use of ICTs to seek and contribute knowledge. The goal was accomplished by conducting causal modeling research. This type of research provides major advantages to assessing and predicting the effects of one set of variables on another set (Bontis & Fitz-Enz, 2002; Bontis & Serenko, 2009). In the knowledge management literature, causal modeling studies have been successfully used (Chiu, Hsu, & Wang, 2006; Ngah & Ibrahim, 2010; Staples & Webster, 2008; Wasko & Faraj, 2005; Zaim, Tatoglu, & Zaim, 2007). For example, He and Wei (2009) used a causal modeling study to demonstrate that employees contributed to knowledge management systems (KMS) as a result of the joy they perceived in helping others, the strength of social relationships, and perceived value of management support. Their model also showed that knowledge seeking was associated with the perceived seeking effort, the social relationships, and the utility of the KMS.

Similarly, Chen and Hung (2010) used causal modeling research to examine the factors associated with increased knowledge transfer and their impact on virtual communities. They studied 323 members of two communities using structural equation
modeling (SEM). The results showed that knowledge sharing in virtual communities was impacted by reciprocity, interpersonal trust, knowledge sharing self-efficacy, and perceived relative advantage, while knowledge utilization was associated with knowledge contributing behaviors.

**Research Questions**

For the current study, the following research questions drove the development of the causal model:

1) What are the potential factors that contribute to the commonly accepted barriers to knowledge sharing?

2) How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing?

**Relevance and Significance**

The alarming rate of baby boomers’ departure from the workforce will increase the drain of organizational knowledge accumulated over the years (Levy, 2011). The challenge will be to capture and transfer their experiential knowledge to the employees who will inherit the vacant roles (Whyte & Classen, 2012). This challenge is even more prevalent in the IS field where the majority of software and systems projects do not keep archives of accumulated experience (Williams, 2008). While extant literature on the use of ICTs for the purpose of knowledge creation is abundant (Cabrera et al., 2006; Hsu, Ju, Yen, & Chang, 2007; Kankanhalli et al., 2005; Tseng & Kuo, 2010; Van den Hooff & De Ridder, 2004; Watson & Hewett, 2006), a review of the literature suggests a gap in research that explores the impact of contributing factors to knowledge sharing barriers on the use of ICTs for knowledge seeking and knowledge contributing. The present study
closed this gap. It contributes to the knowledge management (KM) body of knowledge by providing analysis of the existing literature on the characteristics of knowledge seeking and knowledge contributing behaviors. In doing so, current debates related to the notion of knowledge sharing via ICTs are clarified (Huysman & De Wit, 2002; Roberts, 2000; Zack, 1999). Results from the study emphasize how employees search and share knowledge in organizations, as well as provide broader understanding on the factors that guide these behaviors. Moreover, the study operationalized and validated these factors, therefore offering greater insight into their characteristics.

Another significance of this research was the use of a causal modeling approach. Presently, case-based studies dominate the KM literature (Despres & Chauvel, 1999; Wong & Aspinwall, 2004), and some researchers have proposed that KM is a soft discipline, not particularly useful beyond augmenting the corporate culture (Demarest, 1997). Quantitative-based KM study can serve as a model for future organizational initiatives in the KM discipline (O’Brien, 2013).

The research also has practical implications for organizations. For example, the study adds value to the organizational decision making process by highlighting for management the areas requiring further investments in ICTs to prevent loss of knowledge. The study also clarified the results of existing research on the use of ICTs for the purposes of knowledge seeking or contributing and assists employers with new training programs to improve knowledge sharing practices in organizations. Future research can shift focus toward specific ICT capacities that complement knowledge users’ needs and contribute to the increase in knowledge seeking and knowledge contributing practices.
Barriers and Issues

The goal of this research was to determine the impacts of role conflict, role ambiguity and locus of control (LOC) on employees’ knowledge seeking and knowledge contributing behaviors via ICTs, as well as the moderating effect of ICTs on the relationships of these variables. One barrier for this study was obtaining access to sufficient number of organizational ICT users. Issues that were encountered in this case included: 1) decision on the number of employees required to ensure the presence of sufficient statistical sample for the data analysis; and 2) obtaining the selected sample. To mitigate this barrier, rules of common statistical models (e.g. Structural Equation Modeling) were used to determine the appropriate sample. Additionally, the help of SurveyMonkey Audience online survey company was used to solicit the sample of organizational ICT users for the purposes of the study.

Another barrier concerned the scales used to test each of the constructs of the causal model. For example, lengthy scales were shown to lead to potential non-response issue for the participants (Biner & Kidd, 1994; Galesic & Bosnjak, 2009; Kalantar & Talley, 1999). To address this barrier, an expert panel was used to sort through and remove ambiguous or poorly worded items.

Another potential barrier was the decision on appropriate online software to conduct the survey. Potential issues included lack of accessibility for all available browsers (e.g. Mozilla, Safari, and Internet Explorer), flexible configurability of the questionnaire, and final data output format. To mitigate this barrier, the services of a proven, easily configurable, and broadly accessible online survey company (SurveyMonkey Audience) was used.
Assumptions, Limitations, and Delimitations

Assumptions

1) It was assumed that participants were honest in self-qualifying for the study;

2) It was assumed that the responses of the participants reflected their true beliefs and opinions;

3) It was assumed that the participants of the study either presently used, or have used, ICTs for knowledge sharing purposes at their place of employment;

4) It was also assumed that the participants made a conscientious effort to complete the survey in its entirety.

Limitations

One limitation that may raise potential questions on bias was the method of obtaining participants to the study. An opt-in crowd-sourcing platform was used as medium to solicit the participants - SurveyMonkey Audience, resulting in a voluntary sample that may not have been a representation of the entire population. This limitation was mitigated by the number of prior studies that have confirmed the validity of this platform (Hughes, 2009; Kavanaugh, Bessett, Littman, & Norris, 2013; McAuley, Chen, Elliott, & Shneker, 2009).

Another potential limitation was response rate and its impact on the generalizability of the study. While response rates for mailed surveys are typically higher than web-based surveys (Shih & Fan, 2008), a carefully crafted invitation, and frequent reminders were used to mitigate this limitation (Bosnjak & Tuten, 2001).
Completion rate was also a potential limitation to the study. To address it, an expert panel was used to improve on the survey’s length, ordering, formatting, time-to-complete, and questionnaire clarity (Fan & Yan, 2010).

The inability to determine the beliefs and responses of those who chose not to complete the survey was a fourth limitation of the study. Similarly, the lack of knowledge whether the data was a representative of the sample drawn, let alone of the population was another limitation.

Finally, a limitation was the method used to obtain responses to the survey. The sample for the study was confined to participants selected by the SurveyMonkey Audience site. The survey participants may represent a biased survey-taking population (Ross, Irani, Silberman, Zaldivar, & Tomlinson, 2010) and as a result, the validity of the results may be limited.

**Delimitations**

Delimitations are intentional restrictions placed on the scope of the study in order to make it manageable. Extant literature demonstrates that employees in supervisory roles (e.g. managers or directors) experience higher levels of ambiguity and uncertainty with their job duties than non-supervisory employees (Alexander, 1979; Hannaway, 1985). As a result, a delimitation of the study was to use participants with the job function of analyst from across of variety of industries since it is consistent in terms of its non-supervisory duties across organizations.

A second delimitation of the study was the use of participants who were full-time employees in their organizations. Steffy and Jones (1990) found that part-time employees experience significantly greater role ambiguity than their full-time counter parts due to
perceived job strain as a result of reduced information training, job information, and social support. In order to control for this variable, only full-time employees were invited to take part in the study.

A third delimitation of the study was the selection of participants who used a restricted set of ICT applications in their organizations (email, instant messaging, micro/wiki blogging, online forums and knowledge repositories). Such delimitation ensured that the study covered ICTs that facilitate knowledge seeking and knowledge contributing behaviors in organizations.

Finally, a fourth delimitation of the study was the restricted sample of participants who resided in the United States. This delimitation was imposed by SurveyMonkey Audience and couldn’t be avoided at the time of the survey.

**Definition of Terms**

Definitions of key terms used throughout this document are provided below in order to provide clarification on the constructs and methodology of the study:

*Information and communication technologies* are defined in this study as a combination of email, instant messaging, micro/wiki blogging, online forums, and knowledge repository systems for the purposes of communication among employees (Usman-Hamza, 2012).

*Locus of control* is defined as the extent to which employees believe that themselves or others have control over events in their lives. According to Spector (1988), locus of control is “a generalized expectancy that rewards, reinforcements or outcomes in life are controlled either by one's own actions (internality) or by other forces (externality),” (Spector, 1988, p. 385).
Role ambiguity is defined as “the lack of the necessary information available to a given organizational position,” (Rizzo, House, & Lirtzman, 1970, p. 151).

Role conflict is defined as “the extent to which a person experiences incompatible role pressures within the work domain,” (Aziz et al., 2011). It is characterized as over-demand on employees to complete specific tasks that they perceive as excessive on their time availability.

SurveyMonkey Audience is a crowd-sourcing site with access to millions of respondents in the United States (Hughes, 2009; SurveyMonkey, 2013).

Summary

Competitive advantage in organizations depends on effective knowledge exchange between experts and novices; however barriers that inhibit employees’ knowledge sharing behaviors and factors that promote these behaviors via ICTs are poorly understood. To understand these factors, an actionable knowledge sharing model was developed that explained the contributory factors impacting employees’ use of ICTs to seek and contribute knowledge. To validate the model, a causal-modeling research using a cross-sectional survey for the data collection was used.

The rest of the paper is structured as follows: a detailed literature review is performed to examine the most commonly recognized barriers to knowledge seeking and knowledge contributing; a shared set of potential factors are extracted and addressed; this is followed by a discussion on the study’s methodology; and the paper concludes with results and conclusions.
Chapter 2

Review of the Literature

Overview

The focus of this literature review is to examine the characteristics of knowledge sharing behaviors, common knowledge sharing barriers, and a set of factors that influence these barriers. These topics represent an overall foundation for the conducted study and became part of the critical analysis for the problem statement.

The first component of the review is the act of organizational knowledge sharing, which is deconstructed into knowledge seeking and knowledge contributing behaviors. Results of existing studies associated with each behavior are evaluated, and potential gaps requiring further studies are proposed. Next, barriers to knowledge sharing are addressed in order to explore potential contributors that enhance or inhibit knowledge sharing behaviors. Finally, extant literature on proposed contributors is analyzed to determine their impact on employees’ knowledge sharing behaviors via ICTs.

Knowledge Sharing

McDermott (1999) regarded knowledge sharing as an act where one individual guides another through one’s own thinking, to make another aware of his/her own situation using personal insights. According to Lin (2006) knowledge sharing is the act of capturing, organizing, transferring, and reusing an organization’s experiential knowledge. The sharing process consists of continuous dissemination, absorption, and utilization of information among employees for the purposes of integrated learning (Tiwana, 2002).
Van den Hooff and De Ridder (2004) argued that knowledge sharing is a form of knowledge donation that includes the element of joint explicit and tacit knowledge creation (Fernie, Green, Weller, & Newcombe, 2003; Lee, 2001). The process also involves two or more parties who partake in the roles of knowledge supply (source or carrier) and knowledge demand (seeker or requestor) (Ardichvili, Page, & Wentling, 2003). Wu and Haasis (2013) considered knowledge sharing as not only the contribution of one's own knowledge but also the seeking and receiving of knowledge from others within the system. As a result, the following portion of the literature review examines the characteristics of knowledge seeking and knowledge contributing behaviors.

**Knowledge Seeking Behavior**

Knowledge acquisition, or knowledge seeking, involves behavior associated with active searching of information for the purposes of fulfilling specific information needs (Xu, Tan, & Yang, 2006). Such needs typically stem from the existence of ambiguous problems in need of knowledge on potential courses of action (Pirolli & Card, 1999).

One theory that explains this behavior is the information foraging theory proposed by Pirolli and Card (1999). Pirolli and Card suggested that valuable information is viewed as prey that is often hidden in the environment (e.g. online documentation, books, media, people, etc). Since it may take longer to locate a piece of information from a file drawer than from an online database, information foragers, similar to predators, are forced to make decisions whether to hunt for hard-to-locate prey, or focus on accessing prey that “maximize the rate of gain of information relevant to their task,” (Pirolli & Card, 1999, p. 646). As a result, the foragers consider certain information more valuable when the amount of time and effort taken to locate it is minimal and will not seek additional
information if efficiency has been achieved. “The optimal information forager is one that best solves the problem of maximizing the rate of valuable information gained per unit cost, given the constraints of the task environment,” (Pirolli & Card, 1999, p. 645). The theory also explains that in order to locate the more ‘profitable’ information, foragers “will modify their strategies or the structure of the environment to maximize their rate of gaining valuable information,” (Pirolli & Card, 1999, p. 643).

A number of different knowledge seeking behaviors have been proposed by researchers. Vandenbosch and Huff (1997) argued that these are divided into four categories: 1) undirected– exposure to information without purpose in mind; 2) conditioned – exposure without active search; 3) informal– effort to acquire information without structure; and 4) formal– purposeful effort to uncover specific information. Huber (1991) proposed that knowledge acquisition behavior consists of scanning, focused search, and performance monitoring. Furthermore, Huber argued that focused search “occurs when organizational members or units actively search in a narrow segment of the organization's internal or external environment, often in response to actual or suspected problems or opportunities,” (Huber, 1991, p. 97) and when the benefits and costs for the search have been justified.

Belkin (1980) argued that knowledge seeking behavior consists of: 1) the seeker’s awareness of knowledge disparity; 2) a quest for gathering relevant information, and 3) an awareness of reduced knowledge disparity. Savolainen (2006) proposed a model to explain the knowledge seeking behavior (Figure 1). Savolainen reasoned that information-seeking is initiated by a trigger, such as an ambiguous task or an unclear problem. This is followed by a consideration of useful sources and channels of
information on behalf of the seeker. Next, retrieval of the information and weighing of its relevance occurs. The conclusion includes interpretation of the acquired information and a ruling on the derived benefit whether: a) the information sufficiently satisfies the need, or b) additional information is required. Depending on the conclusion, the behavior may be terminated or repeated.

![Diagram of Knowledge Seeking Process Model](image)

**Figure 1.** Knowledge Seeking Process Model adapted from Savolainen (2006).

Research into the type of information sought by employees identifies several categories of knowledge. For example, Miller and Jablin (1991) developed a theoretical model and series of propositions to explain factors that impacted information-seeking behaviors of newcomers in organizations. They argued for three categories: 1) referent-related to functions of the job, 2) appraisal-related to job performance, and 3) relational-related to acceptability of social behavior at work. Madzar (2001) extended Miller and Jablin’s categories to include a technical type, which addressed information related to: “defining a problem/task; learning techniques applicable to dealing with the
problem/task; finding solutions; or identifying a piece of missing data,” (Madzar, 2001, p. 222).

From their qualitative interview study, among 40 consulting managers from a Big Five accounting firm, Cross and Sproull (2004) distinguished five categories of wanted knowledge: 1) solutions, 2) meta-knowledge, 3) problem reformulation, 4) validation of plans or solutions, and 5) legitimation from contact with a respected person. Xu, Kim, and Kankanhalli (2010) categorized the sought information into task information (associated with specific technical skills, feedback associated with performance, role expectations, goals, and organizational values) and social information (knowledge related to political and social feedback, history, and knowledge of people).

Extant literature identifies a number of factors that impact knowledge seeking behaviors. For example, trust has been found to affect knowledge seeking behaviors. Al-Ani, Wilensky, Redmiles, and Simmons (2011) conducted a study at a large Fortune 500 company in order to determine whether trust impacts knowledge seeking practices in distributed teams. The researchers interviewed 43 participants from nine different countries who were members of distributed teams within the year before the data collection. The results indicated that trust in the knowledge owner and the validity of knowledge impacted knowledge seeking behaviors. He, Fang, and Wei (2009) surveyed 201 knowledge workers at a leading IT corporation in China in order to determine whether trust impacts knowledge seeking behaviors in the context of KMS. They found that trust positively affected employees’ perceived usefulness of knowledge seeking in KMS.
The quality of knowledge and relationship (both personal and supervisory) between seeker and source were also found to impact knowledge seeking frequency in organizations. Xu, Zhang, and Zhang (2010) conducted a study to examine whether formal structures impacted the formation of informal networks and perception of information quality. They surveyed 35 IS/IT professionals from a major Chinese university and found that perceived information quality of the source and the relationship between seeker and source significantly affected knowledge seeking frequency.

A survey, conducted among 154 university professionals from a major university in Southeast Asia, aimed to determine the effect of source quality, understandability, proximity, and social risk on source preference for task-information seekers. The results indicated that source quality was a key driver for seekers of knowledge related to important tasks (Xu et al., 2006).

Another factor that impacts employees’ frequency and intent to seek knowledge is leadership. For example, in a survey among 73 software development employees from various companies in China, Humayun and Gang (2013) examined the relationship between leadership support and KMS success. The results indicated that the support of leaders is related to employees’ knowledge seeking intentions. Similarly, Madzar (2001) conducted a survey among 75 engineers from a US medical technology company. The goal of the study was to determine the impact of leadership style of subordinates’ information seeking behaviors. The results revealed that employees increased the frequency of their information seeking when their leaders were perceived as transformational.
Extant literature provides a number of job-related factors that influence employees’
knowledge seeking behaviors. For example, task interdependence, task-relevant expertise
and task complexity positively impact knowledge seeking. Cross, Rice, and Parker (2001)
conducted a study to determine if the organizational and social structures impact the
benefits (e.g. knowledge, legitimacy, and validation) of information seeking. The data
collected from 34 information scientists at a global pharmaceutical organization revealed
that while social relations impact the receipt of knowledge, the key predictor to
information seeking is task interdependence.

In another study, Rice, Collins-Jarvis, and Zydney-Walker (1999) studied the impact
of role (expert or novice), ease of use, gender, organizational, spatial and relational
proximity, task interdependency, and socialization on information seeking behaviors. The
researchers conducted two surveys (before and after the implementation of new
information systems) at a multi-state customer service organization. The first survey
included 180 respondents, while the second one included 112. The results revealed that
task interdependence impacted employees' knowledge seeking behaviors.

Cross and Sproull (2004) used a mix of qualitative and quantitative methodology to
examine how contribution of knowledge is donated by information sources. The
researchers conducted a survey among 118 consultants, senior consultants and managers
from three offices of a Big Five business consulting practice. The results of the
quantitative study showed that knowledge seekers’ task-relevant expertise is positively
related to the receipt of referrals, problem reformulation, and validation; seekers receive
knowledge from sources outside of their units; superiors were considered important
sources of referrals, validation and legitimation knowledge, while seekers relied on peers for problem reformulation.

Xu, Kim, et al. (2010) sought to understand the motivations behind interpersonal information seeking and to compare the effects of these motivations in the task and social information seeking. The researchers surveyed 425 employees from a large IT company in order to examine the employees’ information seeking behaviors for the purposes of task or social information. Respondents to the survey worked within 14 different departments and occupied six different rank levels (from frontline employees to directors). The authors found that the relevance of perceived information is an antecedent to source preference while perceived relational benefit is significant for seeking task information. Moreover, their study suggested that organizational ICTs should support not only information delivery, but also provide seekers with the ability to build and manage relationships with their sources.

Byström and Järvelin (1995) found that task complexity influenced information seeking behaviors. In their qualitative study of 25 task descriptions collected from the Finnish public administration domain, higher task complexity was associated with an increased need for problem solving information and general-purpose sources. Task complexity also led to an increase in the number of sought information sources.

Specific job characteristics have also been demonstrated to positively impact knowledge seeking behaviors. For example, Gray and Meister (2004) studied the impact of knowledge sourcing on employees’ learning outcomes. They hypothesized that employees with greater job demands will engage in greater knowledge seeking behaviors. Through the use of cross-sectional survey, responses from 313 employees from variety of
job roles (e.g. front line employees, project leaders, managers and supervisors) at a technology company were collected and analyzed. The results demonstrated that high demanding work led individuals to engage in greater knowledge seeking behaviors.

Ashford and Cummings (1983) proposed a model to explain individuals’ feedback seeking behaviors and argued that in environments characterized by higher role ambiguity, individuals will engage in greater feedback seeking behaviors. Haas and Witte (2001) investigated the transfer of tacit knowledge via a mix of words, gestures and documents among city government employees and an engineering agency. They found that coherence depends on reduction of ambiguity between documented and verbal knowledge. Vandenbosch and Huff (1997) conducted a field study among 36 Canadian executives from the largest financial institutions. The main goal of the study was to determine the antecedents to the use of executive information systems (EIS) both scanning (general browsing for information) and focused searches (specific knowledge seeking). The results indicated that three quarters of the executives used the EIS to seek for specific knowledge. Furthermore, the researchers found a link between scanning behavior, tolerance for ambiguity and divergent jobs. Executives engaged in scanning for information (rather than focused search) if they had increased tolerance for ambiguity as well as divergent jobs.

Work-related conflict also impacts knowledge seeking behaviors. For example, Marineau and Labianca (2010) conducted a survey among 75 respondents at a mid-size manufacturing company in the US in order to determine whether individuals who perceived work-related conflict with colleagues would seek out work-related advice and knowledge from them. The results revealed that “work conflict was significantly
positively related to advice relationships suggesting that individuals who perceive work conflict with another person will seek that person for advice and knowledge,” (Marineau & Labianca, 2010, p. 6).

In addition to work-related factors, time pressure, perceived time cost, looming deadlines, and ease of knowledge accessibility have also been found to drive knowledge seeking behaviors. For example, Lee and Thomas (2008) investigated knowledge seeking practices of consultants at a global IT services firm. Through a series of observations and semi-structured interviews, the researchers collected data from 16 participants. The results showed that consultants sought information quickly (between 30 minutes and one hour) and in pieces (e.g. paragraphs and bullets) after weighing the time cost to create deliverables from scratch versus finding useful information.

Anderson, Glassman, McAfee, and Pinelli (2001) studied variables that impacted the information seeking behaviors of aerospace scientists and engineers. They surveyed 872 private sector employees and discovered that higher task uncertainty led knowledge seekers to widen the search for knowledge sources (from oral contacts to literature searches and finally to communication with library sources). Seekers preferred sources that were easily accessible due to time constraints.

Similarly, Hertzum and Pejtersen (2000) investigated barriers to knowledge seeking and approaches to knowledge source discovery among engineers. They conducted two case studies among engineers at two product-development organizations. The final results revealed that employees engaged in mixed knowledge seeking methods. They sought documents in order to determine their authors and sought information from people in order to discover documents for the purposes of knowledge acquisition. Furthermore,
they found that the main impediment to both oral and written information seeking was cost/time involved in obtaining the information.

O'Reilly (1982) examined the frequency and variations of information sources. They hypothesized that easily accessible information sources will be used more frequently by knowledge seekers. The researcher surveyed 163 employees of a welfare agency. The results showed that source accessibility was a determinant of knowledge seeking frequency. The researcher concluded that time pressure to complete large workloads caused severe time constraints leading employees to seek knowledge from easily accessible sources. Correspondingly, Yitzhaki and Hammershlag (2004) studied workplace impacts on information seeking behaviors. The main goal of their study was to determine which information source was sought for specific knowledge. The researchers surveyed 233 computer scientists and software engineers employed by both companies and universities in Israel. The results showed that industry professionals preferred oral discussions with colleagues and experts for knowledge seeking purposes due to easier accessibility. The academy respondents preferred textbooks as their immediate knowledge source due to the convenience of their location (office, laboratory or near-by library).

Yuan, Rickard, Xia, and Scherer (2011) investigated the factors that influenced both knowledge seeking behaviors and preferences for electronic versus interpersonal knowledge sources. They used interviews, surveys, and social network analysis to examine knowledge seeking practices of 24 educators and 25 dairy farmers. The results demonstrated that knowledge accessibility and availability were key determinant of knowledge seeking behavior. Moreover, time played an important role in the selection of
knowledge source since “To accomplish a task, participants showed great agency and resourcefulness to bypass social or geographic constraints,” (Yuan et al., 2011, p. 542).

Fidel and Green (2004) also studied factors that influenced preferences for information sources. In particular, they were interested in the role accessibility played in information seeking behaviors. The researchers interviewed 32 engineers from a large manufacturing company. The results demonstrated that highly accessible sources were the ones that provided quick information. Time saving was the highest motivator for choosing documentary sources of information.

Bock, Kankanhalli, and Sharma (2006) examined the impact of norms, costs and benefits, and perceived behavioral controls on knowledge seeking via EKRs. They surveyed 134 working professionals who pursued part time graduate degrees at a large university. The researchers found that time to complete work significantly impacted knowledge seeking via EKRs.

Su and Contractor (2011) conducted a study among 110 consultants from nine project team in two multinational consulting firms. Their goal was to determine if there were any differences between employees’ information seeking from human versus digital knowledge repositories and if there were, to examine specific characteristics of the knowledge domain. The data was collected using a web survey. The results demonstrated that consultants sought knowledge from others based on expertise and accessibility level of team members and from digital knowledge repositories based on the amount of information stored and whether colleagues with strong social ties also sought information from the same digital source.
Knowledge Contributing Behavior

Knowledge contributing is a behavior that involves knowledge, information, and assistance exchange between individuals and groups (Connelly & Kelloway, 2003; Davenport & Prusak, 2000; Yang, 2004). Bock et al. (2005) argued that personal beliefs play a key role in enabling this behavior since individuals who share expertise with others risk losing the competitive advantage, or damage to their reputation (in the cases of providing the wrong information). Social exchange theory has been used to explain knowledge contributing behaviors (Blau, 1964). The theory suggests that individuals constantly weigh the costs and benefits to them before making a determination whether to engage in knowledge contribution (Cyr & Choo, 2010).

The majority of extant knowledge management literature explores extrinsic factors (organizational rewards, promotions, raises, and incentives) and intrinsic factors (e.g. reciprocity, enjoyment in helping others, altruism, and personal achievement) that motivate knowledge contributing behaviors. For example, Hsu et al. (2007) studied antecedents that facilitated or impeded knowledge sharing behaviors. They conducted a survey among 274 participants in virtual communities from Taiwan, Hong Kong and China on the topics of engineering, computers, science, humanities, entertainment, business, politics, health, and others. The results showed that extrinsic motivators such as status change, promotions, and raises had positive effects on knowledge sharing behavior.

Similarly, Kankanhalli et al. (2005) investigated the impact of cost and benefit, and contextual factors on knowledge contributing behaviors via EKRs. They surveyed 150 employees among ten organizations in Singapore. The researchers found significant positive relationships between organizational rewards and knowledge contribution via
electronic repositories. Enjoyment in helping others and reciprocity were found to be key intrinsic motivators to knowledge contributing behaviors. In their study on the motivating factors that impacted Wikipedians’ knowledge contributing behaviors, Wagner and Prasarnphanich (2007) surveyed 35 contributors and found that altruism and the feeling of personal achievement were key knowledge sharing motivators.

Watson and Hewett (2006) examined employees’ frequency of access, reuse and willingness to contribute knowledge to KMS at a multinational services firm. They surveyed 430 non-clerical employees. The researchers found ease of knowledge access and value of knowledge to be positively related to the frequency of knowledge reuse. Moreover, advancement within organizations was positively related to frequency of knowledge contribution to knowledge systems.

Extant literature indicates that a blend of individual and organizational factors also impact knowledge contributing behaviors. For example, a host of studies report that individual’s characteristics such as agreeableness, openness to experience, self-efficacy, sense of belonging, ideology, values, and sense of self-worth have been found to impact knowledge sharing. The same studies also find that organizational characteristics such as ethical culture, social ties, community identity, social awareness, organizational climate, and perceived management support affect knowledge contributing behaviors.

In a study of 372 employees from a large multinational IT company, Cabrera et al. (2006) investigated the psychological and organizational factors that impacted individual knowledge contributing behaviors. In their study, they found that agreeableness, conscientiousness, openness to experience, and role breadth self-efficacy were the primary factors that impacted employees’ knowledge contributing practices.
Chai and Kim (2012) studied social and technical factors that impacted knowledge contributing practices of social network site users. The researchers surveyed 212 social networking site users at a large US university. The results demonstrated that ethical culture, sense of belonging, and social ties were positively related to knowledge contributing behaviors.

Tseng and Kuo (2010) examined the impact of social capital and social cognitive factors on knowledge contributing behaviors. The researchers surveyed 161 teachers enrolled in an online K-12 community. The results indicated that knowledge contributing behaviors were impacted by community identity, social awareness, and knowledge sharing self-efficacy.

Bock et al. (2005) aimed to determine facilitating and impeding factors to employees’ knowledge contributing intentions. They surveyed 154 managers from 27 Korean organizations. The results revealed that anticipated reciprocal relationships and sense of self worth impacted attitudes toward knowledge contribution while subjective norms (e.g. normative beliefs and motivation to abide by them) and organizational climate (fairness, innovativeness, and affiliation) impacted individual intentions to share knowledge.

Radaelli, Mura, Spiller, and Lettieri (2011) hypothesized that organizational knowledge contributing behaviors were affected by intellectual capital and knowledge sharing climate. They conducted a survey among 226 doctors, psychologists, physiotherapists, nurses and other healthcare professional from three healthcare companies. The results showed the employees’ perceptions of organizational and social capital, and knowledge sharing climate positively impacted their knowledge contributing behaviors.
Masrek and Edang (2012) examined factors that influenced knowledge contributing behaviors of Internet users. They surveyed 265 undergraduate and post-graduate IS students at a large university in Malaysia. The findings showed that fairness, identification, openness, and usefulness affected knowledge contribution behaviors. Nov (2007) surveyed 151 Wikipedians and discovered that enjoyment, ideology, and values drove the contributors to share knowledge.

Paroutis and Saleh (2009) investigated determinants of knowledge contributing behaviors at a large multinational technology and services firm. They conducted a case study and interviewed 11 employees. The results revealed that trust, history, outcome expectations, and perceived management/organizational support were key determinants to knowledge sharing.

Yeh, Lai, and Ho (2006) studied the roles that leadership, culture and people played in enabling knowledge contributing behaviors in organizations. They conducted case studies at two engineering companies. The findings revealed that knowledge contributing behaviors were impacted by support from senior management, existence of sharing culture, speedy KMS access, and employee incentive programs.

Research provides evidence that work-related characteristics, such as in-role behavior, work and task conflict, decentralization, and work engagement also impact knowledge contributing behaviors. For example, Flowers, Xia, Burnett, and Shapiro (2010) conducted a study to determine what extrinsic, contextual, and intrinsic factors affected employees’ contribution of knowledge to KMS. They surveyed 173 employees at large US university and found that affective commitment (individual’s emotional attachment to
the organization) and perceived in-role behavior (requirement of the job) were positively related to the extent of knowledge contribution.

Lu, Zhou, and Leung (2011) examined the effects of task and personal conflict on supervisors and subordinates’ knowledge contributing behaviors. The researchers surveyed 166 part-time MBA students from China. The results showed that task conflict (conflict in understanding expectations) was positively related to knowledge contributing behaviors.

Willem and Buelens (2009) studied the impact of decentralization (horizontal-coordination among teams) on knowledge contributing behaviors. They surveyed a total of 408 employees from two mid-size companies (in the energy and financial sectors) in Europe. The results indicated that under certain conditions, decentralization led to an increase in knowledge contributing behaviors.

Chen, Zhang, and Vogel (2011) investigated the impact of task and relationship conflict, and work-engagement factors (meaningfulness, safety, availability) on knowledge contributing behaviors. They surveyed 139 software engineers and developers within two Chinese companies. The results demonstrated that work engagement significantly and positively impacted knowledge contributing in organizations. Likewise, Teh and Sun (2012) investigated the impacts of work attitude on employees’ knowledge contributing behaviors. They surveyed 116 IS employees in three multinational companies. The results demonstrated that organizational citizenship behavior (OCB), job involvement and job satisfaction factors had a significant positive relationship with knowledge contributing behaviors.
Barriers to Knowledge Sharing

Knowledge sharing in organizations frequently fails as a result of numerous critical factors, also known as sharing barriers (Riege, 2005; Yeh et al., 2006). The existence of these barriers can impact organizational decision making processes on the acquisition and use of ICTs to facilitate knowledge sharing behaviors (Sedighi & Zand, 2012). The following section examines extant literature on the most common knowledge sharing barriers. It also assumes that these barriers are mere symptoms of problems caused by specific contributors. Potential contributors are also investigated.

Lack of Time

One of the biggest barriers for both contributors and seekers of knowledge in organizations is lack of time (Lin, Tan, & Chang, 2008). According to Lin et al. (2012), the lack of time barrier is one that never changes regardless of the knowledge management maturity level of an organization. It is characterized as the employees’ unwillingness to devote time and resources for knowledge sharing (Lin et al., 2008), lack of contact time and interaction between knowledge sources and recipients, lack of time to share knowledge and time to identify colleagues in need of specific knowledge (Riege, 2005), tools available to share knowledge are very time consuming (Santos et al., 2012), and due to time pressure (defined as “a severe form of a time constraint that invokes stress and fears of retribution for missing a deadline,” (Fugate, Thomas, & Golicic, 2012, p. 700)). For example, in a survey among 522 experienced project managers from the UK, US, and China, 67% attributed lack of employee time as the leading inhibitor to knowledge sharing in their organizations (Williams, 2008). Similarly, in a study among 53 top UK civil engineering and construction companies, 68% of the respondents
indicated that lack of time, attributed to tight schedules and lean organizational structure, was a significant barrier to engaging in knowledge sharing (Carrillo, Robinson, Al-Ghassani, & Anumba, 2004). Keegan and Turner (2001) analyzed the knowledge management practices of 19 project-based companies from a variety of industries and interviewed 44 of their members. They found that the key barrier to learning among all organizations operating in “turbulent product market domains” was time pressure. Employees cited lack of time to engage in knowledge sharing meetings and lessons learned reviews since they were often reassigned to new engagements immediately after the completion of their current projects.

Dai, Wertenbroch, and Brendl (2008) introduced the term value heuristic and argued that “people judge the frequency of class of objects on the basis of the subjective value of the objects,” (Dai et al., 2008, p. 18). Time “is fixed in its amount – there are only 24 h in a day,” (Pfeffer & DeVoe, 2012, p. 49), as such it is considered limited and individuals tend to perceive it as valuable and scarce (DeVoe & Pfeffer, 2011). As a result, individuals alter their behavioral patterns to accommodate this perception (e.g. decreased patient behavior in response to time scarcity) (Darley & Batson, 1973).

In his exploratory study on time as contextual factor for information seeking, Savolainen (2006) noted that time is a qualifier for information seeking and is typically influenced by situations (e.g. people, places, and events). Furthermore, the researcher argued that “Temporal factors are significant contextual qualifiers of information seeking in that they usually posit a major constraint to accessing information sources; in most cases, time is a scarce resource for information seekers,” (Savolainen, 2006, p. 116).
Markus (2001) found that time constraints inhibit quality knowledge contributions. In her exploratory study on factors impacting knowledge reuse in organizations, she cited the studies of Orlikowski (1995) at Zeta company and Leonard-Barton and Sensiper (1997) at American Management Systems in support of her argument that high quality repositories have high production costs (in terms of time). Problems centered around “the amount of time available to produce high quality and sanitized knowledge for dissemination,” (p.80) and “If you ask people, they will tell you that they really want to learn and they really want to contribute, but they are out working on a project for 15, 16, 17 hours a day, five to six days a week, and knowledge management is not their first priority,” (p.81).

Pentland (1992) investigated factors that affected knowledge seeking and knowledge transferring in organizations. He conducted a six-month observation of specialists at two software support hot lines. The results showed that time impacted the type of knowledge sought and contributed. Quick questions posted by knowledge seekers were interpreted by knowledge contributors as inquiries that demanded “the interaction be short and unobtrusive,” and “that the degree of responsibility for finding an answer would be minimal,” (p.537). The researcher argued that the likelihood that a knowledge contributor will respond to a knowledge seeker increased when the contributor perceived that the request required a limited time to respond.

Wasko and Faraj (2000) examined factors that impacted individuals’ knowledge contributing behaviors to public online communities. Specifically, they were interested in determining whether self-interest or altruism guided knowledge contributors. The researchers surveyed 342 users of three electronic communities who voluntarily
contributed knowledge to other peers. They found that one of the barriers to knowledge contribution was lack of time as a result of increased work duties.

In the field of decision making, research demonstrates that under increased time pressure, individuals filter information more and spend less time processing each new piece of information. For example, Ben Zur and Breznitz (1981) investigated risk behaviors under the conditions of time pressure. They conducted a lab experiment with 36 subjects who were monitored during a gambling game. The results indicated that participants subjected to high time pressure exhibited less risky behavior by spending more time observing the negative consequences of their choices (e.g. amount and probability of loss). Furthermore, subjects exhibited accelerated information processing information filtration behaviors under the conditions of higher time pressures.

In another study, Payne, Bettman, and Johnson (1988) conducted two experiments among sixteen and 28 students respectively. In both experiments, the subjects were asked to seek knowledge and make decisions both under conditions of time pressure and without time pressure. The researchers observed that the subjects acquired less information. Furthermore, time pressure significantly increased the subjects’ information processing, selectivity and filtration of information. Subjects also shifted information acquisition and processing from depth (alternative-based) to breath (attribute-based) (Payne et al., 1988). Effort/accuracy framework has been used to explain decision-making based on multiple task demands (where effort concerns operations associated with cognitive information acquisition and processing) (Bockenholt, Albert, Aschenbrenner, & Schmalhofer, 1991; Payne, Bettman, & Johnson, 1993). For example, Creyer, Bettman, and Payne (1990) studied the accuracy and effort feedback on
individual decision-making processes. The study involved an experiment with 81 undergraduate students at a large northwestern university. The results of the experiment showed that when the objective to pick an alternative was focused on accuracy, individuals took more time, acquired more information, and focused on alternative-based processing strategy.

Additional studies reported that when the variable of time constraint was present, individuals increased information search efficiency, accelerated decision-making, decreased decision quality, and experienced stress, distraction, excessive work progress monitoring and remaining time monitoring (Arnold, Sutton, Hayne, & Smith, 2000; Karau & Kelly, 1992; Keinan, Friedland, Kahneman, & Roth, 1999; Kelly, Jackson, & Hutson-Comeaux, 1997). Adaptive cost theory (Cohen, 1978) has been used to explain knowledge sharing under time pressure (Connelly, Ford, Turel, Gallupe, & Zweig, 2013). The theory proposes that individuals are forced to prioritize their cognitive resources in response to changing environmental stressors. The result of such stressors may lead to a decreased response and sensitivity to the needs of others, lower task motivation, and diminished socialization behavior (Boman & Hygge, 2000; Cohen, 1980; Hui, Organ, & Crocker, 1994).

Connelly et al. (2013) applied the adaptive cost theory in their study of 403 second-year undergraduate students in a communication course. The students were allowed, but not required, to contribute knowledge to their peers while working on a specific problem-solving exercise. The results showed that “perceptions of time pressure affected people’s likelihood of engaging in knowledge sharing behaviors,” (Connelly et al., 2013, p. 6).
Students’ perceptions of the environmental stressors resulted in individual feelings of time pressure and preoccupation that prevented them from sharing knowledge.

Time pressure has also been shown to have a negative effect on knowledge management system use. For example, Durcikova, Fadel, Butler, and Galletta (2011) studied how climate of innovation and autonomy, and KMS access impacted employees’ knowledge seeking practices. The researchers surveyed 110 technical support analysts from 26 companies. The researchers found a negative correlation between time pressure and KMS access and reuse. When faced with increased time pressure, the analysts opted to create new solutions rather than searching for existing ones in the KMS.

In a study on group information-seeking behavior in emergency response scenarios, which involved 11 groups (7 from Federal Emergency Management Agency and 4 from undergraduate programs of a medium-sized northeastern university), Gu and Mendonça (2009) found that time pressure negatively impacted the search for information in both novice and expert groups. Higher time pressure was also found to decrease knowledge exchange between individuals. For example, Thomas, Esper, and Stank (2010) investigated the time pressure effects on supplier-retailer relationships. The researchers surveyed 204 professionals enrolled in a weekend Executive MBA program at a large southeastern university. The findings demonstrated that under time pressure, participants decreased information exchange, limited collaborative behaviors, and reduced relationship loyalty (affective and emotional connections between parties).

Gray and Durcikova (2006) studied factors that impacted the knowledge seeking behaviors of technology support analysts at a software development company. They hypothesized that increased levels of work-related time pressure will lead individuals to
seek knowledge from colleagues, electronic repositories, and written documents. To validate their hypotheses, the researchers surveyed 110 participants. The results showed that perceived time pressure had a negative impact on knowledge seeking from repositories (but not from documents, or colleagues). The researchers reasoned that colleagues and documents provided faster access to knowledge than repositories because “the process of finding and accessing knowledge in the repositories we studied remains too time-consuming,” (Gray & Durcikova, 2006, p. 181).

Van der Kleij, Lijkwan, Rasker, and De Dreu (2009) examined team performance under time pressure settings and specific communication conditions. They conducted an experiment with 72 students from a university in the Netherlands. The students were assigned to 36 teams and asked to create a written plan. Teams were split into high and low time pressure groups. The results indicated that time pressure had significant negative effect on the perceived information exchange between members. Moreover, time pressure impacted the quality of the solutions, quality of planning and satisfaction with the team’s performance.

Even exhibiting time pressure coping mechanisms by some (e.g. hastiness, rash decision-making, being less available) have been found to negatively influence the willingness of others to share knowledge in return. Fugate et al. (2012) examined the way time pressure impacted the collaboration process between buyers and suppliers. The researchers conducted an experiment with 126 working professionals enrolled in an Executive MBA program at a major northeastern university. Each participant was assigned to one of six treatment conditions and was asked to read unique buyer-supplier cases and answer a set of questions. The results of the experiment indicated that time
pressure had a negative influence on participants’ information exchange, solidarity and stewardship.

Thomas, Fugate, and Koukova (2011) investigated how knowledge sharing behaviors between suppliers and buyers were impacted by time pressure. The researchers conducted an experiment with 126 full-time managers enrolled in a part-time graduate program at a private northeastern university. The results showed that time pressure negatively impacted information exchange, operational knowledge transfer activities and shared interpretation. In another study, Huber and Kunz (2007) experimented with 40 subjects in order to determine the impact of time pressure on risk defusing behaviors. The results of the study revealed that under time pressure, individuals searched for less information, considered a limited amount of information, and stopped information seeking sooner.

Borgatti and Cross (2003) studied factors that impacted information seeking among employees. They hypothesized that information seeking is affected by perceived timely access to the information source and that accessibility is “a question of timeliness,” (Borgatti & Cross, 2003, p. 435). To validate their hypotheses, the researchers conducted surveys between two organizations with 37 information scientists and 35 researchers. The results confirmed that individuals will engage in knowledge seeking behaviors if they perceive they have timely access to the knowledge source.

Braganza, Hackney, and Tanudjojo (2009) examined factors that facilitated successful knowledge transfer strategies in organizations. The researchers conducted a case study at an organization that underwent the implementation of a knowledge management system. Based on the findings, the researchers developed several theoretical propositions and outlined 30 key attributes that impacted creation and transfer of knowledge. Real-time
access to knowledge source was considered the second most important attribute. Senior management at the organization noted: “Our people need to have the ability to interact with the knowledge system real time. This will facilitate them to ask question and get the necessary knowledge at real time. Question is one of the basis for knowledge creation,” (Braganza et al., 2009, p. 516).

Extant literature suggests that perceived time pressures occur as a result of changes (such as adding new tasks) or interruptions to the employee’s work role. For example, Bailey and Konstan (2006) experimented with 50 participants to determine the impact of interruption on the participants’ task completion time, error rate, annoyance, and anxiety. The results of the study indicated that interrupted users required up to 27% more time to complete a task, committed double the errors, experienced up to 106% more annoyance and double the anxiety rates. In a similar experiment, Eyrolle and Cellier (2000) found that interruptions led to an increase in processing time for primary tasks and increase in error rates for secondary tasks.

Consequences of changes or interruptions to tasks typically result in additional work to be completed (including new knowledge to be acquired) within the original allotted timeframe accompanied by an increase in the perceived time pressure. For example, Baethge and Rigotti (2013) studied the impact of external interruptions on participants’ ability to complete primary tasks. The researchers collected data via diaries from 133 nurses from German hospitals. The results showed that time pressure had a significant negative effect on performance satisfaction. Time pressures resulted in higher mental demands and increased irritation.
In a related study, Mark, Gudith, and Klocke (2008) investigated the disruption cost of interruptions. They conducted an experiment with 48 German university students. The results revealed that in order to compensate for interruptions, participants worked faster, but experienced higher stress levels, increased frustration, higher perceptions of time pressure and increased workload and effort.

**Poor Communication Skills**

Improvements in communication have been linked to knowledge transfer activities. For example, Modi and Mabert (2007) examined the role of communication and the use of organizational knowledge transfer activities on performance improvement of supplier companies. They conducted a survey among 114 respondents representing 228 development programs. The results revealed that increased operational knowledge transfer activities positively affected performance improvements. Furthermore, knowledge transfer was positively related to collaborative communication practices and collaborative communication had a positive impact on performance improvements.

Poor communication skills (such as verbal, written, and interpersonal) have been proposed as a major barrier to knowledge sharing. Riege (2005) conducted an extensive literature review of over 70 knowledge management articles in order to determine “a wide range of knowledge sharing barriers that are central to effective KM,” (Riege, 2005, p. 20). He classified KM barriers into three categories: individuals, organizational and technology-based. Among the individual knowledge sharing barriers, he indicated poor verbal/written communication and interpersonal skills and noted that “the ability of employees to share knowledge depends first and foremost on their communication skills. Effective communication, both verbal (the most common vehicle of sharing tacit
knowledge), and written, is fundamental to effective knowledge sharing,” (Riege, 2005, p. 24).

Riege (2005) also found that among the organizational knowledge sharing barriers, restriction of communication and knowledge flow into specific direction (e.g. top down) was another major knowledge sharing barrier. He noted that adequate resource allocation to support collaboration and knowledge was necessary to prevent this barrier. Finally, from the technology barriers, Riege noted that a major technology barrier to knowledge sharing is the lack of communication on the advantages of new systems over current ones.

Sandhu, Jain, and Ahmad (2011) investigated knowledge sharing barriers, knowledge contributing and knowledge seeking behaviors of public sector employees in Malaysia. They surveyed 170 public sector executives from the technical arm of Malaysian civil service. The results showed that employees regarded poor communication and interpersonal skills barrier as one of the top three. Similarly, Syed-Ikhsan and Rowland (2004) conducted a case study at the Ministry of Entrepreneur Development of Malaysia in order to examine public sector employees’ knowledge transfer barriers. A questionnaire was distributed to employees, and the results of 154 directors, engineers, system and administrative officers, accounts and auditors were analyzed. The results indicated that 53% of respondents considered poor communication channels between officers as major knowledge sharing barrier.

Al-Alawi, Al-Marzooqi, and Mohammed (2007) examined specific organizational culture factors that facilitate knowledge sharing success among employees in public and
private organizations. They conducted a survey among 231 public and private sector employees and found that communication, “human interaction through oral conversations and the use of body language while communicating.” (Al-Alawi et al., 2007, p. 25), impacted knowledge sharing and was critical in facilitating team collaboration, face-to-face interaction and common language among employees.

In a four-month field study at a blown-molded glass factory, Nakano, Muniz Jr, and Batista Jr (2013) investigated factors that aided tacit knowledge sharing in unstructured work environments. Fourteen semi-structured interviews were conducted with operators, production supervisors, tool shop workers and leaders. The respondents reported that communication between teams was essential in creating information relationships that facilitated the development of trust, shared language, collegiality, openness, and knowledge sharing practices.

Sun and Scott (2005) studied unique knowledge transfer barriers in organizations with a Delphi group comprised of 17 members. The participants, ranging from junior to senior management from seven different organizations, went through two review stages with a total of three rounds of analysis and identified a total of 90 knowledge sharing barriers. Sun and Scott classified the barriers into four categories: individual, team, organizational and inter-organizational. From the individual category, the results indicated that skills of communication and persuasion, “the skills in expressing effectively any thoughts or information on your mind.” (Sun & Scott, 2005, p. 81), were identified as the top two barriers to transfer knowledge from an individual to a team by 94% of the participants.

Santos et al. (2012) conducted a similar study among professionals from six different countries working in the areas of mechanical engineering, IS, multimedia, power
systems, industrial management, and construction, who were employed at institutes, universities, IT corporations, and industrial associations. The researchers conducted 24 interviews in order to determine knowledge sharing barriers within complex research and development projects. The results showed that the second most widely noted KS barrier was inadequate IT, which concerned the lack of “easy communication with other tools and assurance that people really understand the meaning (ambiguity),” (Santos et al., 2012, p. 31). Furthermore, the second highest issue listed among collaboration in research and development activities in large multinational projects was the communication barrier. This barrier referred to “difficulties in establishing a common technical language understandable by all participants; personal backgrounds, time zones, national cultures, and technical contexts (leading to misunderstandings and conflicts); difficulties in communicating with and managing expectations and requirements of the clients; and use of miscellaneous technologies (e-mail, videoconference, and portals) to try to deal with challenges (however to solve problems, according to the participants, it is better to have personal interactions such as meetings or conversations),” (Santos et al., 2012, p. 33). Participants indicated that creating a common communication language represents a major challenge in establishing sound knowledge exchange. Moreover, communication was indicated as one of the highest requirements for knowledge sharing as participants indicated that personal interactions and conversations were preferred for problem solving tasks.

Lin et al. (2008) studied determinants and barriers to knowledge flow in healthcare organizations. Through a comprehensive literature review, they categorized five barriers that included knowledge characteristics, knowledge source barriers, knowledge receiver
barriers, contextual barriers and insufficient mechanisms. Using interviews, surveys, and a Delphi method to collect data among 174 physicians, experts and middle medical managers, they found that poor communication skills between the knowledge source and receiver were critical factor for knowledge sharing. Moreover, the researchers also found that communication was an essential barrier to knowledge transfer between physicians and patients.

In a case-based study among three organizations, a law firm, an educational institution and local council, Southon, Todd, and Seneque (2002) investigated factors that impacted knowledge use and integration within these environments. The researchers interviewed 21 senior, middle managers and professionals to determine individual factors to knowledge management adoption practices. The final results revealed that knowledge sharing among members was accomplished primarily through meetings and forums that relied heavily on formal and informal communication. Moreover, communication was indicated as a critical barrier among all participants. Informal communication and coaching among teams were considered problematic and indicative of poor communication culture within the organization.

Tokar, Aloysius, Waller, and Williams (2011) examined the effect of information sharing about promotions on cost efficiency among supply chain partners. They conducted two controlled lab experiments, the first one with 30 undergraduate students at a large US university, and the second one with 76 senior members of multiple departments from a large consumer products manufacturer in the US. The results indicated that communication was essential for reduction of coordination risk, planning problems, uncertainty about promotion’s timing and magnitude. Furthermore, the
researchers concluded that communication was intertwined with coordination risk and both needed to be managed into order to improve decision making about promotional timing and magnitude.

Kumar and Ganesh (2009) developed a morphological framework in order to investigate the dimensions of knowledge transfer in KM literature. To develop the framework, the researchers systematically browsed through the KM literature published within EBSCO, Proquest, Emerald and Sciencedirect online databases. They classified five contextual factors that impacted knowledge sharing within organizations: cognitive, social-psychological, social, infrastructural, and administrative. The social-psychological option, consisting of social-psychological factors (SPFs) responsible for influencing individual’s behavior in social settings, was influenced by the frequency and quality of personal communication.

Cramton (2001) investigated to what extent the geographic dispersion of team members and use of ICTs impacted the sharing of mutual knowledge. Her goal was to determine the factors that led to the development of collaboration and knowledge sharing difficulties. The researcher studied thirteen geographically dispersed teams. The results showed five major types of issues that affected knowledge sharing. Two of them included failure to communicate and difficulty communicating and understanding the importance of information.

Song and Teng (2008) examined the effects of work unit environment on voluntary and solicited knowledge sharing behaviors in organizations. Specifically, they hypothesized that open communication will be positively related to knowledge sharing. The data for the study was collected via a survey of 149 working professionals enrolled
in an MBA program at a large southern university in the United States. The final results demonstrated that open communication led to “higher intensity of solicited sharing behaviors,” (Song & Teng, 2008, p. 7). Further, the authors found that internalization (the process of face-to-face communication and learning by doing for the purposes of knowledge acquisition) had a significant influence on solicited knowledge sharing behaviors.

Ko, Kirsch, and King (2005) investigated antecedents to the transfer of knowledge between stakeholders engaged in ERP implementations. They hypothesized that knowledge transfer was impacted by specific communication, knowledge, and motivational factors. To test their model, they surveyed 118 organizations within variety of industries and collected data from 96 projects. The results indicated that communication factors had both direct and indirect impact on knowledge transfer. Specifically, source credibility and receiver’s communication decoding competence influenced knowledge transfer. The researchers concluded that knowledge transfer was affected negatively when poor communication skills (e.g. inability to listen or pay attention) were present.

**Lack of Trust**

Extant literature suggests that trust is a vital component of knowledge seeking and knowledge contributing behaviors. Rotter (1971) defined trust as a general disposition toward others. Frost, Stimpson, and Maughan (1978) conceptualized trust as “an expectancy held by an individual that the behavior (verbal or nonverbal) of another individual or group of individuals would be altruistic and personally beneficial to himself,” (Frost et al., 1978, p. 104). Rousseau, Sitkin, Burt, and Camerer (1998) argued
that trust is a “psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another,” (Rousseau et al., 1998, p. 395). Hosmer (1995) characterized trust as the “expectation by one person, group, or firm of ethical behavior—that is, morally correct decisions and actions based upon ethical principles of analysis—on the part of the other person, group, or firm in a joint endeavor or economic exchange,” (Hosmer, 1995, p. 399).

In the domain of knowledge management, trust has been shown to impact knowledge sharing. For example, Nelson and Cooprider (1996) investigated factors that influenced knowledge sharing within 132 IS groups from seven organizations with the pharmaceuticals, insurance, gas and oil, consumer goods, computer manufacturing, and automotive industries. The researchers found that mutual trust and mutual influence between IS and line groups led to increased level of knowledge sharing. Further, the researchers noted that mutual trust resulted in increased information seeking about the other groups and knowledge sharing among participants.

Andrews and Delahaye (2000) investigated individual factors that impacted knowledge processes and organizational learning of employees. In their study, they gathered data through 15 semi-structured interviews of senior scientists, managers, technicians and assistants at a bio-medical consortium. They found that individuals shared knowledge with those they perceived as trustworthy. As a result, perceived trustworthiness was regarded as a central psychosocial factor that influenced knowledge-sharing decisions.

Holste and Fields (2010) examined the role of affect-based and cognition-based trust on employees’ willingness to seek and contribute tacit knowledge. The researchers
hypothesized that affect-based trust influenced tacit knowledge sharing, while cognition-based trust influenced use of tacit knowledge. The data for the study was collected via survey among 202 employees of an international non-profit organization. The results supported their hypotheses. Moreover, both affect-based and cognitive-based trusts were positively related to employees’ willingness to share knowledge. Holste and Fields concluded that “warm personal relationships most likely developed through face-to-face interactions and solid respect for another worker’s professional capability is required for the sharing of tacit knowledge,” (p. 135).

Chowdhury (2005) also investigated affect-based and cognition-based trusts, but the focus of his study was on the sharing of tacit (complex) knowledge between dyads. To confirm his hypotheses, the researcher surveyed 164 MBA students who produced 229 dyads with 31 teams. The results confirmed that affect-based trust and cognition-based trust levels were related to the level of shared tacit knowledge among the dyads. The researcher showed that either of the two forms of trust (but not both) can produce tacit knowledge sharing.

Lack of trust was reported as a key barrier to knowledge sharing. For example, Seba, Rowley, and Delbridge (2012) investigated knowledge sharing barriers and challenges at the Dubai police force. They conducted fifteen semi-structured interviews with officers from various ranks and positions and discovered that lack of trust was one of the key factors that inhibited knowledge exchange between the officers.

Liao (2006) investigated the relationship between learning organization, knowledge sharing, and innovation in firms. She posited that trust had positive impact on both knowledge sharing and innovation and surveyed 254 employees from eight computer
manufacturing companies to validate her hypotheses. The final results revealed that trust had direct and positive relationship with both knowledge sharing and firm innovation. The researcher noted that trust is prerequisite for knowledge sharing since it builds social relationships and is a necessity for the development of cooperation and interdependence.

Ardichvili et al. (2003) explored barriers to employees’ knowledge contributions in virtual communities of practice. Semi-structured interviews were held with managers of three communities including members and experts. The researchers concluded that in order to limit employees’ apprehension to share knowledge, organizations need to build knowledge-based and institution-based trust as these instill confidence in the company’s integrity.

Pardo, Cresswell, Thompson, and Zhang (2006) researched the knowledge sharing processes that occurred with the development of an IS system in two public sector organizations. In their analysis of the cases, the researchers found that interpersonal and identity-based trust established a foundation for knowledge sharing practices. Further, they noted that higher levels of trust and the lower levels of mistrust among employees result in greater knowledge sharing, consensus building, and learning.

Staples and Webster (2008) explored the impacts of trust, task interdependence and virtualness on knowledge sharing practices in organizations. The researchers hypothesized that trust among team members is related to knowledge sharing within the team. They conducted a survey among 824 members from a high tech company and an online panel. Trust was found to have a strong relationship with knowledge sharing among local, hybrid, and distributed teams.
Muthusamy and White (2005) investigated the effects of commitment, trust, and power sharing on knowledge transfer in strategic alliances. They hypothesized that ability-based, benevolence-based, and integrity-based trusts were all positively related to knowledge sharing. To test their model, they surveyed 144 alliance managers from a variety of companies and industries within the US. The final results revealed that only ability-based trust and integrity-based trust had positive relationship with knowledge transfer. The researchers concluded that partner trustworthiness was essential to the “meaningful and productive exchange of information, knowledge and skills,” (Muthusamy & White, 2005, p. 434).

Trust that others will not misuse the shared knowledge to their advantage has been found to significantly influence knowledge sharing behavior. Renzl (2008) found that fear of losing one’s unique value has a negative impact on knowledge sharing. She collected 201 survey responses from two companies and discovered that an employee’s fear of losing his or her unique value had a negative impact on knowledge sharing within and between teams, since trust in people reduced fear in cooperating behavior.

Fear of loss of control over ownership of knowledge has been shown as a high barrier to knowledge sharing between individual and the team (Sun & Scott, 2005). Jarvenpaa and Majchrzak (2008) conducted a study to determine the impact of network motives on individual’s perceived level of distrust in transaction memory systems (TMS) when receiving knowledge from others. They surveyed 104 members of FBI’s InfraGuard program. The results indicated that competition in virtual communities resulted in increased concern among employees that their ownership of expertise was lost after knowledge transfer. The researchers concluded that “In mixed-motive situations, TMS
achieves its coordination benefits by indicating not only what should be shared (because others do not know what you might know) and what need not be shared (because others already know it), but also what should not be shared (since others may act in a harmful way with that knowledge),” (Jarvenpaa & Majchrzak, 2008, p. 270).

Rosen et al. (2007) examined barriers and strategies to facilitate knowledge sharing in virtual teams. They conducted a mixed method study involving multiple interviews with virtual team leaders and members in several organizations and three surveys with 200 responses. The researchers identified lack of trust among team members as the first barrier to knowledge sharing. The results showed that minimal communication among team members limited opportunities for useful conversations, identification of common interests, and the sharing of personal information. As a result, trust was not built among the members and knowledge was never shared.

Ridings et al. (2002) investigated antecedents and the impact of trust on knowledge seeking and knowledge contributing in virtual communities. They surveyed 663 online forum members from 36 different communities. The results showed that sharing personal information with others in a virtual community led to increase of trust among the team. Further, trust was found to have two dimensions: ability and integrity/benevolence. Trust was also found to increase in individuals by the presence of disposition to trust. Finally, sharing personal information increased trust in others, while perceived responsiveness to shared information also increased trust in knowledge contributors.

Abrams et al. (2003) examined how interpersonal trust developed in knowledge sharing context. They proposed two dimensions of trust that impact knowledge sharing behaviors: benevolence (perceived trust that others care about my well-being) and
competence (perceived trust in the competence of others). Benevolence-based trust allows individuals to seek knowledge without fear that the knowledge contributors will inflict harm on their reputation, or self-esteem. Competence-based trust allows knowledge seekers to feel confident in the expertise of the knowledge contributors. The researchers interviewed 40 employees across 20 different organizations. The results showed that knowledge contributors promoted different dimensions of trust. For example, both benevolence-based and competence-based trusts were promoted by contributors who engaged in frequent, rich, and collaborative communication with the seekers. Only benevolence-based trust was promoted when contributors created personal connections with the seekers, while only competence-based trust was promoted when disclosure of expertise and personal limitations was performed.

Levin and Cross (2004) investigated the impacts of strong and weak ties, and competence-based and benevolence-based trust on receipt of useful knowledge in a network. They surveyed 127 employees from three separate companies (pharmaceutical, bank, and oil and gas). The results demonstrated that benevolence-based and competence-based trusts mediated the relationship between strong ties and the receipt of useful knowledge. The researchers concluded that benevolence-based trust was a necessity for the knowledge exchange process, because it “shapes the extent to which knowledge seekers will be forthcoming about their lack of knowledge, even after seeking out the knowledge source,” (Levin & Cross, 2004, p. 1480). Moreover, they argued that competence-based trust impacted the perceived usefulness of the received knowledge, because it allowed knowledge seekers to rely on the contributor’s competence when accepting the knowledge.
Contributors to Knowledge Sharing Barriers

The following section is based on the results of the content analysis that was conducted on the articles from the literature review. It draws on the identified common knowledge sharing barriers as well as several theories in order to explain potential contributors to these barriers. First, the constructs of role conflict and role ambiguity are examined in conjunction with the organizational role theory. These are followed by analysis of the construct of locus of control and its reference to the social learning theory.

Role Conflict

Role conflict, one aspect of role stress (Peterson et al., 1995), is characterized as over-demand on employees to complete specific tasks that they perceive as excessive on their time availability (Sales, 1970). Organizational role theory (ORT) is used to explain the behavior of individuals in the workplace based on a set of rules and norms (Kahn, Wolfe, Quinn, Snoek, & Rosenthal, 1964). Its origins are rooted in the role theory, which holds that people behave in predictable ways depending on their social identities and situation (i.e. assume roles just as actors in a play). Depending on circumstances, individual behavior will be the result of a role determined by social position, social interaction, and expectations. “Most versions of role theory presume that expectations are the major generators of roles, that expectations are learned through experience, and that persons are aware of the expectations they hold.” (Biddle, 1986, p. 69).

In the workplace, ORT proposes that employee roles are associated with specific social positions guided by normative expectations and organizational demands. As a result of the plurality of expectations, employees often experience role conflicts that require behavioral adjustments. Furthermore, the proliferation of new technology into the
enterprise is frequently associated with divergence in job responsibilities as a result of change in the organizational culture (Hosono & Shimomura, 2012). The following examples illustrate this statement:

• New configuration technology, coupled with the adoption of agile development methodologies, result in the emergence of DevOps, a new role in the information technology group, which combines responsibility for both development and operations to fulfill deployment and automated testing of software (Spinellis, 2012);

• The traditional roles of project management and business analysts are integrated into a new role as a result of the combination of virtual server technology with the Infrastructure-as-a-Service (IaaS) model. The new hybrid role, known as a solution architect, encompasses the responsibilities for capturing customers’ needs, translating them into technical specifications, and managing the project from conception to closure (Cleveland & Ellis, 2013; Konstantinou et al., 2009);

• Cloud computing, a new model to deliver applications and infrastructure using a shared pool of resources, has been associated with a shift in the responsibilities of the traditional CIO role toward strategic business activities (Malladi & Krishnan, 2013).

In a nationwide study on the effects of psychological and physical role demands on employee job satisfaction, Kahn et al. (1964) discovered that increased levels of role conflict resulted in greater work-related tensions and lower levels of job satisfaction.

Wickham and Parker (2007) argued that employees faced with new roles and without sufficient training to transition into their new responsibilities were destined to experience role conflict as a result of the varying, and in some cases conflicting, expectations. Noor (2004) noted that conditions leading to role conflict included lack of sufficient time to
perform the new role and stress caused by the inability to meet expected requirements and behaviors.

Boshoff and Mels (1995) investigated the effects of role stress on organizational commitment and internal service quality. The researchers hypothesized that role conflict had a negative impact on organizational commitment. To validate their model, they surveyed 140 insurance salesmen from a national insurance company. The results confirmed that role conflict had an inverse relationship with organizational commitment so that an increase in role conflict led to decrease in organizational commitment.

In a similar study, Judeh (2011) investigated the relationship between employee socialization practices and organizational commitment, and mediating effects of role stress (role conflict and role ambiguity) on the relationship between the two. She defined socialization as the process that companies use to educate new employees on their roles and behaviors. The researcher surveyed 256 employees at a large telecommunications company in Jordan. The results showed that socialization was significantly related to role conflict and role ambiguity. Moreover, lower levels of socialization resulted in higher levels of role conflict and role ambiguity as well as reduced organizational commitment.

IS research suggests that the lack of time barrier stems from the introduction of new technology, conflicting expectations and norms of employees’ roles in the enterprise. For example, Tarafdar, Tu, Ragu-Nathan, and Ragu-Nathan (2007) conducted a study to investigate the impact of ICT-created stress (technostress) on employees’ role stress and productivity. The researchers theorized that technostress has a positive effect on role stress. To validate this hypothesis, they surveyed 223 ICT users from two public-sector companies in the US. The final results showed direct relationship between technostress
and role stress. The researchers noted that “users are often overloaded by vast amounts of information, disturbed by the blurring of work time and family time,” and “the introduction of new technology often means completing the same amount of work with fewer people and through leaner organization structures,” (Tarafdar et al., 2007, p. 320). Moreover, their study showed that increase in role stress resulted in time pressure and a need for multitasking.

**Role Ambiguity**

Role ambiguity, a second aspect of role stress (Peterson et al., 1995), is defined as “the lack of the necessary information available to a given organizational position,” (Rizzo et al., 1970, p. 151) and is related to conflicting supervisory expectations, ambiguous definitions of tasks, and lack of clarification of duties. Role theory suggests that individuals experiencing role ambiguity will engage in attempts to resolve the issues associated with the vagueness of their positions since new or changing roles have the potential to increase ambiguity in conditions of novel technologies, rapid organizational growth, reorganizations, and shifts in managerial philosophies (Kahn et al., 1964).

Miller and Jablin (1991) developed a theoretical model and series of propositions to explain newly-hired employees’ information seeking practices. They argued that newcomers will engage in knowledge seeking tactics from their supervisors and colleagues in order to reduce uncertainty about their new roles. The researchers argued that new hires who engage in greater knowledge seeking will experience reduced levels or role ambiguity/role conflict. Conversely, those who do not engage in knowledge seeking will experience higher levels of role ambiguity/role conflict. The researchers noted: “Experiences of role ambiguity/role conflict, may in turn, simulate more
information information-seeking activity. Thus, it is expected that the levels of role ambiguity/role conflict experienced by new comers during the organizational encounter period may depend upon their information-seeking behaviors,” (Miller & Jablin, 1991, p. 102). Further, the researchers proposed that new comers who rely on third-parties as information-seeking sources while excluding their supervisors will encounter higher levels of ambiguity and role conflict than the ones relying on both third-party and supervisors for information sources. New comers who relied on indirect questions and disguised conversation for information sources were also expected to experience higher role ambiguity and role conflict than the ones who less frequently used such tactics.

Holder (1996) aimed to confirm Miller and Jablin’s propositions. In her study, she investigated the type of information-seeking strategies that proved most effective in order to reduce role ambiguity for new employees. The data for the study was collected through focus group interview and survey. A total of 111 participants responded to the survey. The results indicated that a higher level of uncertainty with a work role was positively related to information-seeking via the use of observation, third-party inquiries and indirect knowledge-seeking tactics. Indirect information-seeking tactics (indirect, ‘face-saving’ questions) were also positively related to role ambiguity, while overt tactics (direct interaction and solicitation of information) were negatively related to role ambiguity.

In the same nationwide study cited earlier, Kahn et al. (1964) discovered that increased levels of role ambiguity translated into lower levels of job satisfaction, lower levels of self-confidence, and increased level of work related tensions. Job dissatisfaction led to perceived lack of time to provide information to patients about their conditions
(Sales & House, 1971), while perceived lack of competence inhibited knowledge seeking as “by seeking help, one publicly acknowledges incompetence, inferiority, and dependence in front of another person,” (Lee, 2002, p. 19). As a result, role ambiguity is considered as another factor that contributes to the lack of time barrier.

Knight, Kim, and Crutsinger (2007) examined the impact of role ambiguity on customer and sales orientation among retailers. They posited that role ambiguity has a negative impact on customer orientation (focus on meeting customer needs), sales orientation (focus on sales with short term results), and job performance. The researchers surveyed 259 employees in the clothing, accessories, shoe, and home furnishings areas of a national department store retailer. The results showed that role ambiguity had a negative effect on the two sales approaches as well as a negative effect on job performance. The researchers noted that “employees who are unsure of job requirements and expectations might be unable to meet performance standards,” (p. 389). To mitigate this, researchers recommended retail managers contribute sufficient knowledge and feedback to the sales force in order to clarify any ambiguous role areas.

Spreitzer (1996) investigated the effects of role ambiguity, access to information and sociopolitical support on employees’ perceived empowerment. They surveyed 393 middle level managers from a variety of units at a Fortune 50 company. The results indicated that role ambiguity had a strong impact on empowerment. The researchers argued that ambiguous tasks or goals introduced a great level of uncertainty into employees’ work which resulted in increased expectations from multiple stakeholders and decreased perception of empowerment. Correspondingly, access to information
helped to reduce such uncertainty, increased understanding of work roles and increased employee empowerment.

Tang and Chang (2010) examined the effects of roles stress on employee creativity. They hypothesized that role ambiguity will have a negative effect on creativity and surveyed 202 employees of Taiwanese companies to validate their model. The results showed that role ambiguity had a significant negative effect on employee creativity and job satisfaction. The findings suggested that consistent feedback on clarifying employee’s role improved creativity and increased job satisfaction.

In their study on the antecedents of executive information system use among 36 executives, Vandenbosch and Huff (1997) found that executives were predisposed toward scanning for information behaviors (rather than focused search) if they had increased tolerance for ambiguity. Moreover, executives with divergent jobs engaged in scanning for knowledge more than those with convergent jobs.

Jackson and Schuler (1985) conducted a meta-analysis to determine the strength and consistency of relationship between role conflict, role ambiguity, and 29 respective correlates. They used 96 journal articles from a variety of indexes and derived 58 pairs of variables including role conflict, role ambiguity, ten context, five individual, ten affective, and four behavioral variables. Analysis of the results demonstrated that role ambiguity was negatively correlated with feedback from others (knowledge contribution). The researchers argued that feedback from others was associated with low role ambiguity, because individuals learned their roles primarily through such feedback.

Ayyagari, Grover, and Purvis (2011) investigated the impact of ICTs’ technology characteristics in inducing work-related stress on employees. They hypothesized that
demands created by ICTs can lead to increased workload, work interruptions, and ambiguity on what tasks need to be completed first. The researchers surveyed 661 ICT users from a variety of companies and industries. The final results indicated that consistent connectivity to an ICT “increases the workload by enhancing the speed of work flow,” and “the dynamic nature of ICTs also increased perceived work overload when technologies change beyond an individual’s ability to cope,” (p.848). The consistent connectivity to an ICT (e.g. email) resulted in frequent interruptions to employees’ work practices, while changes to the ICT resulted in role ambiguity due to new learning demands. Workload and role ambiguity were found to the dominant stressors that led to exhaustion and turnover intentions.

**Locus of Control**

Locus of control (LOC) is the extent to which employees believe that others have control over events in their lives (Rotter, 1966). According to the social learning theory (SLT), people’s motivations to engage in a specific behavior are impacted by the results of previous behaviors (Rotter, 1954). Rotter (1966) proposed that since individuals strive to minimize negative consequences while maximizing positive results, they will engage in behaviors that are expected to have a high probability of resulting in positive outcomes. Positive results will either reinforce or weaken repetitions of that behavior, depending on whether an individual believes that the reinforcement resulted from his or her personal behavior or from an outside entity. This personal locus (location) of control is characterized as internal or external.

Individuals with high external locus of control believe that factors such as luck, fate, or powerful others determine what happens to them (Rotter, 1966). They tend to be more
withdrawn, less likely to take risks and rely more on information from their inner circle since this makes them feel safe, while individuals with high internal locus of control believe that their behaviors determine what occurs to them. For example, Lam and Mizerski (2005) investigated the impact of locus of control on word-of-mouth communications. They proposed that internals will tend to engage in word-of-mouth communication (seeking advice, promote a product) with members of out-groups (weaker tie relationship such as colleagues) rather than members of in-groups (stronger tie relationships such as friends and family). To validate their hypothesis, the researchers surveyed 197 undergraduate students at an Australian university. The results showed that individuals with internal LOC tended to engage in word-of-mouth communication with out-group members, while externals preferred communicating with the in-group (friends and family). The researchers reasoned that the preferences of the externals were influenced by “uncertainty associated with being in a less familiar environment… promoted or encouraged more in-group communication and sharing,” (Lam & Mizerski, 2005, p. 223).

Extant literature demonstrates that individuals with internal LOC tend to engage in increased level of information seeking in order to remain in control of their environment. For example, Srinivasan and Tikoo (1992) investigated the impact of locus of control on consumer’s information searching behavior. They hypothesized that individuals with internal locus of control will engage in greater information search and rate themselves as more knowledgeable than externals. A mail survey collected 1401 responses from residents in a Northeast metropolitan area. The results of the study indicated that internals
engaged in a higher level of information seeking than external. As a result, internal scored themselves as more knowledgeable of the product class than externals.

Flaherty, Pearce, and Rubin (1998) examined motives for using ICTs for communication purposes versus face-to-face interactions as well as the impact of locus of control on communication apprehension. They surveyed 132 ICT users at a Midwestern university. The final results showed that compared to internals, who found greater enjoyment in face-to-face and computer mediated communication with others, externals communicated for the purpose of inclusion.

Darley and Johnson (1993) also examined the effects of locus of control on information search as it related to fashion. In their survey, they discovered that individuals with external locus of control preferred shopping in small clothing stores, didn’t preplan their shopping and were “less likely to be fashion opinion leaders and less likely either to desire or to search for fashion-related information,” (Darley & Johnson, 1993, p. 149).

In a similar study, Poole and O’Cass (2002) investigated that effects of personality traits on preference for shopping online versus malls. They argued that significant differences in preferences will be observed between individuals with internal versus external LOC. To test their hypothesis, the researchers surveyed 569 employees from a city council, and members from two online forums. The results showed that internal LOC individuals exhibited greater preference for the online shopping environment, because it allowed them to experience greater level of perceived control. Conversely, external LOC individuals preferred shopping in malls, because they sought “an environment where they
can experience pleasure at a lower level of perceived control,” (Poole & O'Cass, 2002, p. 1775).

Aaronson, Mural, and Pfoutz (1988) examined what personality traits impacted the information seeking behaviors of pregnant women. The researchers conducted an exploratory study by surveying 529 pregnant women from eight different physician practices around Seattle, Washington. The results confirmed a relationship between locus of control and information seeking behaviors. Moreover, women with higher internal LOC sought more information from print media, while external LOC women preferred radio and television as information sources. The researchers reasoned that “This may reflect the fact that obtaining information from newspapers and magazines requires more direct action by the individual. On the other hand, information obtained from television or radio is more likely to be a chance occurrence,” (Aaronson et al., 1988, p. 343).

Avtgis, Brann, and Staggers (2006) investigated the impact of patients’ perceptions of control over health issues on information exchanges with doctors. To determine the effects, the researchers surveyed 537 students at a large eastern university. The results showed that patients with internal LOC reported higher levels of information contribution, while those with external LOC demonstrated little information contribution.

Research into communication practices provides evidence of an association between personal communication, locus of control and information sharing. For example, Friedrichsen and Milberg (2006) investigated the problems that physicians perceived when sharing information with terminal patients. They interviewed 30 Swedish physicians from ten different clinics. One of the key findings of the study showed that doctors perceived a certain loss of control (e.g. of emotions, professionalism, confidence)
when sharing bad news with terminal patients. Physicians felt that maintaining control was critical during the process of information sharing which aimed at achieving a sense of understanding with the patient.

Libert et al. (2003) examined whether a relationship exists between physicians’ locus of control and their communication skills. They hypothesized that physicians with external LOC will engage in more informative and supportive conversations with cancer patients than the ones with internal LOC. To test their hypothesis, the researchers used simulated interviews with 81 doctors and clinical interviews with 75 doctors, all from Belgium. The results confirmed that LOC influenced physicians’ communications style where “physicians with external LOC gave more appropriate information in the highly emotional simulated interview and less premature information in the clinical interview than physicians with internal LOC,” (Libert et al., 2003, p. 507). Moreover, doctors with external LOC were found to exhibit higher levels of perceived stress, higher levels of depersonalization, and less personal growth.

In another study, Libert et al. (2006) investigated the impact of locus of control on the acquisition of communication skills during training programs for physicians. The researchers posited that internal LOC physicians will acquire greater communications skills during training and will use such skills (e.g. open ended questions, seeking and clarifying information) to a greater degree than doctors with external LOC. A total of 67 doctors were interviewed and the results analyzed. The researchers found that after the training, doctors with internal LOC exhibited to a greater degree the use of more directive questions, greater assessing functions (e.g. checking, summarizing), between negotiations with patients, and decreased use of premature information. The researchers concluded
that doctors with external LOC “could also feel less confident in their ability to handle the consequences of communication skills promoting disclosure of concerns and hence decide not to use them,” (Libert et al., 2006, p. 561).

Rubin (1993) investigated the impacts of locus of control on communication motivation, avoidance, and satisfaction from individual interactions. The researcher surveyed 400 undergraduate students at a large Midwestern university. The results revealed that individuals with external locus of control regarded communication as less satisfying, tended to avoid it, and exhibited anxiety when communicating with others.

McCroskey, Daly, and Sorensen (1976) investigated the effects of communication apprehension and personality variables (locus of control, anxiety, confidence, self-control). They surveyed 189 elementary and secondary teachers and found positive correlation between communication apprehension and external LOC.

Avtgis and Rancer (1997) studied the relationships between individual’s traits, such as argumentativeness and verbal aggressiveness, and locus of control orientation. In a study of 210 participants at a large Midwestern university, the researchers found that locus of control orientation impacted both argumentativeness and verbal aggressiveness. Individuals with internal locus of control orientations reported lower avoidance levels of argumentativeness (“which predisposes individuals in communication situations to advocate positions on controversial issues while simultaneously refuting the positions that others hold on those issues,” (Avtgis & Rancer, 1997, p. 442)). In contrast, individuals oriented toward external locus of control exhibited higher levels of verbal aggressiveness (“attacking the self-concept of another in order to inflict psychological pain,”(Avtgis & Rancer, 1997, p. 442).
To understand how these results impact individual knowledge exchange practices, it is important to examine the traits that facilitate the communication’s behavioral process. One classification system that organized such personal traits was proposed by Infante, Rancer, and Womack (1997). The system suggests that communication behavior is influenced by an individual’s apprehension, presentation, adaptation, and aggressive traits. Relationship between the apprehension traits (consisting of communication apprehension, receiver apprehension, and willingness to communicate), argumentativeness, and verbal aggressiveness has also been found (Edwards, Bello, Brandau-Brown, & Hollems, 2001; Infante & Rancer, 1982; Schrodt & Wheeless, 2001; Wheeless, 1975; Wheeless, Preiss, & Gayle, 1997). These studies reported a negative relationship between argumentativeness and receiver apprehension, and a positive correlation between verbal aggressiveness and communication difficulty. Moreover, in a study among 208 participants of on-going task groups, Anderson and Martin (1999) found that argumentative rather than verbally aggressive group members, experienced higher communication satisfaction, better consensus, and a greater sense of cohesion.

Studies have demonstrated relationships between internal locus of control, information acquisition, and learning motivation. For example, Boone and Van Witteloostuijn (2005) studied the impact of locus of control on information acquisition in teams. The researchers hypothesized that internal LOC teams will engage in greater information gathering with decision-making context. To test their hypothesis, the researchers surveyed 178 individuals from 44 teams that participated in a simulation exercise. The final results showed that individuals with internal LOC processed information better than individuals with external LOC. The researchers noted that if
internal LOC team members were added to team, the team experienced an increased information-processing capacity “resulting in more information acquisition behavior and, as a result, better team performance;” (Boone & Van Witteloostuijn, 2005, p. 903).

Colquitt, LePine, and Noe (2000) conducted a meta-analysis study to determine the effects of personal characteristics (e.g. locus of control) on training motivation. The researchers analyzed a total of 106 articles from a variety of journals related to human psychology, personality, and organizational behaviors. The researchers found that individuals with internal LOC exhibited strong motivation to learn, and higher self-efficacy, while people with external LOC learned more and had higher transfer levels of declarative knowledge.

Studies also demonstrate a relationship between locus of control and trust. For example, Frost et al. (1978) investigated variables (e.g. locus of control and social power) that impacted trust among individuals. To determine any potential relationships, the researchers surveyed 59 Brigham Young University undergraduate students. They found that individuals who possessed internal LOC were trusted more by their peers than those with external LOC. The researchers concluded that individuals invested their trust in someone who had “internal locus of control, and therefore being somewhat less subject to external and situational forces,” (Frost et al., 1978, p. 108).

Carnevale and Wechsler (1992) studied the impact of psychological factors on the formation of individual trust toward organizations. They hypothesized that individuals with internal LOC will have higher levels of organizational trust than individuals with external LOC. The researchers surveyed 1279 employees at a driver’s licensing agency. The results confirmed the hypothesis. The researchers concluded that employees with
internal LOC perceived less threat from their work environment, took greater responsibility for their experience at work, and had greater capacity for trust.

**Summary**

The review of literature examined the knowledge sharing process as a set of knowledge seeking (knowledge demand) and knowledge contributing (knowledge supply) activities (Ardichvili et al., 2003). The theory of information foraging was proposed as model to explain individuals’ knowledge sharing behaviors (Pirolli & Card, 1999). Analysis of the literature on knowledge seeking revealed a host of individual factors that impacted knowledge seeking behaviors (e.g. perceived information and source quality, perceived trust, perceived transformational leadership, perceived time constraints, perceived time cost and time savings, perceived time pressure, perceived ease of knowledge accessibility). Moreover, work-related factors were also found to impact knowledge seeking behaviors (e.g. task-relevant expertise, task interdependence, task complexity, role ambiguity, work load, and work conflict).

The literature review demonstrated that extrinsic factors (e.g. status change, promotions, raises, and organizational rewards) and intrinsic motivators (e.g. enjoyment in helping others, altruism, feeling of personal achievement) affected knowledge contributing practices. Further, individual characteristics (e.g. agreeableness, conscientiousness, openness to experience, self-efficacy, sense of belonging, knowledge sharing self-efficacy and sense of self worth), organizational characteristics (e.g. ethical culture, social ties, community identity, social awareness, organizational climate, organizational capital, and perceived management/organizational support) and work-
related characteristics (e.g. in-role behavior, task conflict, decentralization, work engagement, and job involvement) also impacted knowledge contributing behaviors.

Three major barriers to knowledge sharing (time, communication, and trust), and three underlying factors that potentially contributed to these barriers (i.e. role conflict, role ambiguity, and locus of control) were also reviewed. The analysis recognized a link between job characteristics, time limitations, and organizational roles. It also established a need for research into: 1) how on-the-job role conflict and role ambiguity impact employees’ knowledge seeking behaviors via the use of ICTs, and 2) how perceived locus of control impacts employees’ knowledge contributing behaviors via ICTs. In the next chapter, a model that integrates the potential factors impacting knowledge seeking and knowledge contributing via ICTs is proposed. Furthermore, the methodology used to validate the model is also examined.
Chapter 3

Methodology

Introduction

This section describes the elements of the research design and lays out the method used to conduct the study. First, a review of the type of study, setting, unit of analysis, and time horizon are provided. These are followed by a synopsis of each step from the methodology.

Details of Study

The goal of this research was to answer two questions:

1) What are the potential factors that contribute to the commonly accepted barriers to knowledge sharing?

2) How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing?

To answer the first question, a literature review and a descriptive study in the form of content analysis were conducted to identify potential factors resulting in individual knowledge sharing barriers at work. Next, a causal modeling study in the form of hypotheses testing was performed to investigate the factors’ impact on the knowledge seeking and knowledge contributing behaviors of employees via ICTs.
Since the study sought to examine the impact of variables on individual knowledge seeking and knowledge contributing behaviors, each employee response was treated as a data source. Therefore, the study population was employees of organizations who use ICTs for the purpose of knowledge sharing. Of particular interest were users of ICTs that offer peer-to-peer communication, group communication, collaboration capabilities, and were designed to facilitate real time conversations, information sharing, online meetings, and electronic repositories (e.g. email, instant messaging, micro/wiki blogging, activity streaming, and content collaborating). Products with such functionalities include: Microsoft’s suite (e.g. Microsoft Outlook, SharePoint, Skype, Yammer), Google’s suite (e.g. Google Mail, Google +, Google Cloud Connect, Google Docs), IBM’s Lotus suite, EMC’s Center Stage, Glasscubes, Twitter, Facebook, Wordpress, YouTube, GotoMeeting, and WebEx.

The data collection was performed via the use of a survey. As a result, the time horizon for this study was cross-sectional (Sekaran & Bougie, 2009). Extant literature provided the foundation for this study’s approach. For example, Yan et al. (2013) conducted a cross-sectional study of employees who participated in Web 2.0 virtual communities for the purposes of knowledge seeking, knowledge contributing, and shared content creation. Similarly, Pee (2011) conducted a cross-sectional study on employees of organizations that used EKRs for knowledge-intensive professional work. Paroutis and Saleh (2009) investigated knowledge sharing determinants among employees using Web 2.0 technologies for collaboration purposes. Chen and Hung (2010) studied factors that influenced knowledge sharing in professional virtual communities of practice dedicated
to information exchange on topics such as operating systems, databases, programming, and network skills.

Figure 2 outlines the high-level methodology approach, followed by a description of each step:

**Figure 2. Methodology Approach**

**Step 1 - Conduct Literature Review**

To address the first research question, an extensive review of the literature covering a wide spectrum of studies within a variety of fields was performed in chapter 2 to investigate potential barriers to knowledge sharing. Creswell (2003) noted that through literature reviews researchers can refine the breadth of their topic and inform their audience about the significance of their studies. Levy and Ellis (2006a) explained that the literature review represents the foundation for all scholarly research and proposed a three-stage model (input, processing, output) to organize it. The literature review of this study was organized around their model.

During the input stage, quality knowledge management literature from journals and conferences within a variety of domains such as information systems, information technology consulting, healthcare, education, research, government and new product development were reviewed. Keyword searches on knowledge barriers, knowledge sharing constraints, knowledge impediments, knowledge obstacles, and knowledge
hurdles were used. Backward and forward searches were performed on selected sources to further refine the results (Webster & Watson, 2002).

During the first step of the processing stage, knowledge of the articles was demonstrated through meaningful descriptions. Next, summary and interpretation of the results were used to demonstrate comprehension of the literature. Levy and Ellis (2006a) proposed the use of a table during the third step (application) as a method to identify and categorize the major concepts relevant to the study. As a result, a literature review matrix was prepared as outlined in Table 1 with columns that identified resource citations, type of study, knowledge behavioral context, identified knowledge sharing barriers and potential causes (Appendix A).

<table>
<thead>
<tr>
<th>Authors</th>
<th>Study Type/Sample</th>
<th>Seeking</th>
<th>Contributing</th>
<th>Lack of Time</th>
<th>Poor Communication</th>
<th>Lack of Trust</th>
</tr>
</thead>
</table>

Table 1. Literature Review Matrix

During the fourth step (analysis), significance of the selected research was identified. This was followed by the synthesis step where integration of the selected literature and generalization of the concepts were performed. Finally, recommendation and conclusions based on the reviewed literature were performed in the sixth step (evaluation).

**Step 2 - Conduct Content Analysis Study**

Next, a content analysis study was conducted on the articles indentified in the literature review in order to extract potential contributing factors to knowledge sharing
barriers. Content analysis is one of the fastest growing techniques in quantitative research and has been defined as the “systematic, objective, quantitative analysis of message characteristics,” (Neuendorf, 2002, p. 1). It has been widely used in the area of knowledge management for the purposes of categorizing KM frameworks (Heisig, 2009), clustering of organizations with KM implementation stages (Lee & Kim, 2001), model testing of knowledge contribution (Wasko & Faraj, 2005), determination of antecedents to knowledge sharing (Taylor & Wright, 2004), scale development for measuring knowledge management behaviors (Darroch, 2003), and factor extraction for KMS diffusion (Quaddus & Xu, 2005). The method allowed the researcher “to analyze (large amounts of) textual information and systematically identify its properties, such as the presence of certain words, concepts, characters, themes, or sentences,” (Sekaran & Bougie, 2009, p. 386).

The content analysis consisted of six stages (Krippendorff, 1989): 1) Design – context definition, exploration of data sources, and identification of construct; 2) Unitizing – definition of unit of analysis; 3) Sampling; 4) Coding – categorizing the units; 5) Drawing inferences – demonstration of relationship between coded data and constructs; and 6) Validation.

*Stage 1 – Design*

Berg (2001) proposed two types of content analysis: manifest, which is focused on physically present elements that can be counted, and latent – the interpretation of the symbolic meaning of the message. He argued that both can be used during a content analysis study. For this study, a mixed approach of manifest and latent analysis of the data was utilized. An example of a manifest content analysis is presented in the following
excerpt: “The consequence is that more tasks have to be done in the same amount of time. The more workflow interruptions that occur, the more time that is lost (by the accomplishment of these additional tasks) and the accumulating time loss likely leads to time pressure,” (Baethge & Rigotti, 2013, p. 5). In this example, the researcher coded the text as ‘work load’ under the ‘lack of time’ barrier since it demonstrated a link between work-related stress and time pressure (see table 2 for sample coding schema). Similarly, content of articles that have physically present keywords that explicitly linked role stress to lack of time, or personal characteristics to poor communication skills and to lack of trust barriers were captured and counted as part of the manifest content analysis process.

In contrast, an example of a latent content analysis concerning the effects of role conflict was interpreted from the following text: “We expect that individuals who feel busy will prioritize task performance at the expense of knowledge sharing,” (Connelly et al., 2013, p. 3). In this instance, the content of the text implied that work-related conflict (keyword is ‘busy’) led to limited time to perform certain tasks at the expense of other tasks. Such content interpretations were coded as ‘work conflict’ under the ‘lack of time’ barrier as part of the latent content analysis process.

*Stage 2 – Unitizing*

The unit of analysis for the proposed study consisted of phrases, sentences and paragraphs. Weber (1990) argued that sentences are used as units when the researcher is looking for “words or phrases that occur closely together,” (p.22). In addition, Weber recommended the phrases as coding units in the instances when there is limited number of coders (as was the case with this study).
Stage 3 – Sampling

The sampling method used in the study was purposive and consisted of articles examined during the literature review. Article selection was based on their relevance to the goal of this study (Creswell, 2003). The analysis was focused on articles related to the discipline of knowledge management from the domains of information systems, information technology consulting, healthcare, education, research, and new product development. Articles that referred to knowledge sharing barriers as well as to knowledge seeking and knowledge contributing behaviors were targeted. Sources for knowledge management articles were databases as recommended by Levy and Ellis (2006b). These included ABI/Inform Complete-ProQuest, ACM Digital Library, IEEE Computer Society Digital Library, Computers and Applied Sciences Complete - EBSCO host, Wiley Online Library - Blackwell Publishers, IBI Global Science Direct – Elsevier, Taylor & Francis, JSTOR, ProQuest Computing – ProQuest, and SpringerLink - Springer.

Stage 4 – Coding

A single coder, the researcher, was used to perform the coding in this study. A number of studies reported successful use of single coders in their studies. For example, Marti and Seifert (2012) used a single coder during the content analysis stage to develop a conceptual framework for quantitative assessment of companies’ strategies. Heisig (2009) used a single coder in his study to analyze 160 KM frameworks from research and practice. Ahuvia (2001) reported that a single coder was sufficient for interpretive content analysis studies.

The researcher used both an inductive and deductive approach to determine the categories for content analysis. Berg (2001) suggested that during the inductive approach,
the researcher absorbed him/herself in the articles to determine the theme or meaning of
the authors’ message, while the deductive approach relied on schemes grounded in
theory. The meaning unit (coding unit) used in the study was a mixture of words and
textual references. The categories for the coding were words that represented specific
themes. For example, coded sentences, or paragraphs that described increased task
conflict, task interdependence, as well as any associated synonyms were categorized
under the category *job complexity*. These categories were assigned to specific concepts
that constituted variables in a typical research hypothesis (Berg, 2001). These concepts
were determined during the content analysis review of each article. The final grouping of
the categories percolated to a single concept (role conflict in this case).

Table 2 demonstrates an example of the coding sheet. In it, code refers to the unit’s
alpha-numerical id; description includes the unit’s text (phrase, sentence or paragraph)
extracted from the article; article section identifies where the reference in the article
occurred; researchers indicates the article’s authors; study type denotes the type of
research described in the article; barrier denotes notation of associated knowledge barrier;
category refers to the number of times the concept appeared in the article; and concept
indicates an inferred variable.

<table>
<thead>
<tr>
<th>Code #</th>
<th>Description</th>
<th>Article Section</th>
<th>Researchers</th>
<th>Study Type</th>
<th>Barrier</th>
<th>Category</th>
<th>Concept</th>
</tr>
</thead>
</table>

**Table 2. Sample Coding Sheet**

The following keywords were used during the coding phase to discover sentences and
paragraph references for the variables identified in this study: job, work, responsibility,
duties, activities, task, role, conflict, ambiguity, rewards, awards, promotion,
interdependency, policy, complexity, uncertainty, need, and problem. Based on the
analysis, the following categories percolated for the role conflict variable: *job role, job responsibility, job complexity, job conflict, job interdependence, resource conflict, and role conflict*. In addition, the following categories percolated for the role ambiguity variable: *job clarity, job expectation, job duties, job responsibility, job clarity, and role ambiguity*. Finally, the following categories percolated for the locus of control variable: *job awards, personality, job advancement, and job control*.

**Stage 5 – Drawing Inferences**

Descriptive statistics, such as frequency distribution of the number of occurrences recorded for each of the coded units and concepts, were analyzed in order to determine the magnitude of observations and demonstrate more fully the overall analysis (Berg, 2001). The count stopped when no new concepts appeared in the selected literature. Special attention was paid to eliminate potential overlapping between concepts and to ensure no unit was counted twice. Concepts that percolated from the content analysis were used to answer the first research question for this study “What are the potential factors that contribute to the commonly accepted barriers to knowledge sharing?”

**Stage 6 - Validation**

Testing the reliability of the coding ensured that the procedures can be reliably reapplied. Since a single coder (the researcher) was used for the coding process, Riffe, Lacy, and Fico (2005) recommended the coder “tests the reliability against herself at two points in time – testing the stability of coding. This tests whether slippage has occurred in the single coder's understanding or application of the protocol definitions,” (p. 123).
Random selection of certain number of units was performed for the reliability test. The number of units was determined by the following formula proposed by Riffe et al. (2005):

\[ n = \frac{[(N-1)(SE)^2 + PQN]/[(N-1)(SE)^2 + PQ]}{1} \]

- \( n \) = the sample size of the reliability check
- \( N \) = total number of content units from the coding
- \( P \) = population level of agreement
- \( SE \) = standard error
- \( Q = (1-P) \)

Once the random samples were selected, the researcher recoded them and compared them against the original coding. Observed agreement was calculated as a percentage of units for which the two test results matched. Reliability level above 70% agreement between the tests was achieved and was considered acceptable (Riffe et al. 2005). Measure to determine whether a perfect agreement, or agreement by chance had occurred was performed using a formula to calculate Cohen (1960) kappa statistic. This coefficient of agreements between the tests represented “the proportion of joint judgments in which there is agreement, after chance agreement is excluded,” (Cohen, 1959, p. 46). Kappa equal to 1.0 indicates perfect agreement between the tests, a value of 0 indicates agreement as a result of chance, while a negative number indicated less than chance agreement. Kappa values between .61 and .8 are indicative of substantial agreement, while values between .21 and .4 are considered fair agreement (Viera & Garrett, 2005). The kappa value of .7, achieved in this study, was considered indicative of substantial agreement.
Step 3 - Develop Theoretical Model

This section outlines the theoretical model and hypotheses of the conducted study. The second research question investigated in this study was:

2) How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing?

To address this question, a theoretical model derived from the review of literature, identified theories (information foraging and social exchange theories) and the content analysis study was developed (Figure 3) to demonstrate causal links between the exogenous variables (role conflict, role ambiguity, and locus of control) and the endogenous variables (knowledge seeking and knowledge contributing behaviors). Specific hypotheses and recommended instruments to measure the causal links are provided next.

Figure 3. Proposed Theoretical Model

*Role Conflict Hypotheses*

Employees seek to resolve their role conflicts by engaging in information seeking about their roles, expectations and values from internal sources (colleagues and
supervisors), and external groups (sources outside their work group) (Sparrowe & Liden, 1997). For example, organizational ICT users engage in information sharing related to task and time coordination (Riemer, Altenhofen, & Richter, 2011), requests for factual knowledge from their colleagues (Seebach, 2012), and specific updates relevant to daily work activities (Zhao & Rosson, 2009). Moreover, in accordance with the information foraging theory (Pirolli & Card, 1999), it was argued that employees will seek knowledge via ICTs as long as it takes them the least amount of effort and time to locate it, while achieving the maximum value of information relevant to their role conflict. As a result, it was proposed that:

**H1a. Role conflict positively impacts knowledge seeking behaviors via ICTs.**

Knowledge contribution requires time and effort to complete. Role conflict, characterized by lack of time and resources to complete tasks, constricts employees’ abilities to engage in knowledge contributing behaviors. This reduction in knowledge contributing is explained by the social exchange theory, which states that opportunity costs are “rewards foregone from alternative behavior not chosen,” (Kankanhalli et al., 2005, p. 116). Since knowledge contribution diverts employees from completing other tasks during the limited time they have, knowledge contribution was perceived as an opportunity cost. Therefore, it was proposed that:

**H1b. Role conflict negatively impacts knowledge contributing behaviors via ICTs.**
Role Ambiguity Hypotheses

Rizzo et al. (1970) role ambiguity scale includes items that measure clarity about role responsibilities, time allocation, relationships with others, guides, policies, and the ability to predict sanctions as outcomes of behavior. Individuals faced with expectations of their new duties tend to seek clarification and engage in information seeking behaviors (Hsieh, 2009; Miller & Jablin, 1991). They engage in socialization practices in order to transfer tacit knowledge that can assist them in completing their new roles (Nonaka, 1994). These practices require continuous informal communication for the purposes of knowledge transfer in situations when low ambiguity is present. Individuals experiencing higher levels of ambiguity face larger number of task uncertainties that require greater effort and time to attain valuable information to resolve their role ambiguity (Pirolli & Card, 1999). As a result, it was argued that higher role ambiguity negatively impacts knowledge seeking, while low role ambiguity results in increased knowledge seeking behaviors. The hypothesis was proposed as:

H2a. Role ambiguity positively impacts knowledge seeking behaviors via ICTs.

According to Grace, Zhao, and boyd (2010), employees used ICTs to share information usually exchanged in informal places (e.g. by the water cooler, or when bumping in the hallway). These conversations led to sharing of random ideas, noteworthy items, or other personal experience that can clarify ambiguities. Riemer et al. (2011) discovered that ICTs are used for discussions, clarification, informal communication, and problem solving. Moreover, according to the social capital theory (Bourdieu, 1986), individuals who build social networks end up benefiting from their value in the long run.
as a result of reciprocity that promotes knowledge contribution among the member-
network. As with the prior hypothesis, it was expected that low role ambiguity led to
increased knowledge contributing behaviors. As a result, it was proposed that:

**H2b. Role ambiguity positively impacts knowledge contributing behaviors via ICTs.**

*Locus of Control Hypotheses*

Individuals with high external locus of control believe that factors such as luck,
fate, or powerful others determine what happens to them (Rotter, 1966). A study on
predictors of knowledge sharing behaviors among 120 members of trustee boards found
that “stronger internal locus of control is more likely to demonstrate increased intention
to share knowledge” (Thakadu, Irani, & Telg, 2013, p. 20). Therefore it was proposed
that:

**H3a. Internal locus of control positively impacts knowledge seeking behaviors via
ICTs;**

**H3b. Internal locus of control positively impacts knowledge contributing
behaviors via ICTs.**

*ICT Hypothesis*

Finally, ICTs have been shown to impact individual motivation to share knowledge
(Hendriks, 1999). As argued in prior hypotheses, information foragers will seek to
minimize effort and time on searching for valuable knowledge, while maximizing the
value of the discovered knowledge. ICTs were anticipated to increase this rate of return
by providing quick access to stored knowledge and/or knowledge sources. As a result,
ICTs were expected to exert influence on the strength of the relationships between the
proposed variables. Consequently, ICT was added to the model as a categorical
moderating variable and it was proposed that:

\textbf{H4. ICTs moderate the relationships between the exogenous and endogenous
variables.}

**Step 4 – Develop Measures and Determine Sample Size**

This section describes the instrument scales that were used to measure the constructs
of the proposed study, goodness of fit measures, as well as population and sample size.

**Scales**

Full version of the questions for each construct is included in Appendix B. Role
conflict and role ambiguity scales (9 items for role conflict and 6 items for role
ambiguity) were measured using a 7-point scale ranging from very false (1) to very true
(7). These scales were developed by Rizzo et al. (1970) for the purposes of testing role
stress in complex organizations. The researchers tested the scales with a sample of 298
employees from the managerial, technical, research and engineering ranks of a large
company. The scales have been successfully applied in studies within the domains of
information systems (Tarafdar et al., 2007), military and civil services (Johnson &
Stinson, 1975), retail sales (Knight et al., 2007), and manufacturing and services (Tang &
Chang, 2010). A mean (between 1 and 7) was calculated so that higher scores indicated
high role ambiguity, or high role conflict.

Spector (1988)’s Work Locus of Control Scale (WLOC) was used to measure
participants’ locus of control. There were eight items in the scale that measured the belief
of employees about control of work outcomes. One half of the scale items measured
external WLOC (e.g., “getting the job you want is mostly a matter of luck”) and the other
half measured internal WLOC (e.g., “people who perform their jobs well generally get rewarded”). External WLOC was represented by high scores, while internal WLOC was represented by low scores. Wei and Si (2013) used Spector’s scale in their study on counterproductive work behaviors among 398 employees at a large multinational company. Similarly, Sprung and Jex (2012) used the WLOC scale in their study on work stressors among 191 full-time non-self-employed workers in the United States. The original WLOC instrument used 6-scale anchors where 1 = Disagree very much and 6 = Agree very much. The WLOC scale used in this study was converted to a 7-point Likert scale with anchors 1 = Strongly disagree and 7 = Strongly agree in order to maintain consistency with the other instruments.

Knowledge seeking and knowledge contributing behaviors were measured via scales that were originally developed by Van den Hooff and Hendrix (2004) and then modified by De Vries, Van den Hooff, and Ridder (2006) to demonstrate clear separation between the knowledge seeking (collecting) and knowledge contributing (donating) behaviors. De Vries et al. (2006) reported that while the reliabilities of these scales were measured at .72 and .68 (with .54 correlation between each other) in prior studies, in their 2006 study, Cronbach’s alpha was measured at .75 for knowledge seeking and .84 for knowledge contributing, with intercorrelation of the scales = .69 (p < .01). The original instrument used 5-point Likert scale and consisted of a total of eight items. For the present study, the scale was modified to a 7-point Likert scale and the wording of the items was modified in order to fit the ICT context of this study. Description of the scale items and survey validation process of the instrument are provided in the survey validation section. In order to minimize confusion around the broad descriptor “ICT,” knowledge seeking and
knowledge contributing scales were prefaced with a general definition of ICTs (e.g. “ICTs are combination of email, instant messaging, micro/wiki blogging, online forums, and knowledge repositories.”). Additionally, a question for the type of ICT used was added to each of the knowledge scales to assist the researcher in determining the common set of ICTs used for each behavior.

**Population and Sample Size**

According to Chui et al. (2012), knowledge workers spend 28 hours of their work week (61%) sharing knowledge, communicating and collaborating internally with their colleagues and only 12 hours (39%) on role-specific tasks. Of the 28 hours, 28% is dedicated to reading and answering e-mails, 19% to searching and gathering information, 14 % communicating and collaborating. Some researchers report that email is still the main communication form in the business world. According to Levenstein (2013), there were 929 million business email boxes worldwide in 2013 and the figure is expected to exceed 1.1 billion by the end of 2017. Moreover, there were 100 billion sent and received business emails. This number is expected to top 132 billion by 2017.

In addition, a survey of 4200 executives reported that 70% of their companies use social technologies such as social networking, blogs/microblogs, wikis, discussion forums, and shared workspaces (Chui et al., 2012). The same report projected that the use of such technologies can increase knowledge workers’ productivity by up to 25%.

As a result, the population of this study was considered the entire group of employees who used ICTs (e.g. email, instant messaging, micro/wiki blogging, online forums, and knowledge repositories) to seek and contribute knowledge. An example of a system that provides online forum and knowledge repository functionality was Microsoft’s
SharePoint Services and according to Low (2011), the population of Microsoft SharePoint users was over 100 million (including 78% of the Fortune 500 companies); however, this system did not provide instant messaging, or email services to its users. Accordingly, the sample of participants was not delimited based on a system name, but based on the system type (i.e. only employees who used email, instant messaging, micro/wiki blogging, online forums, or knowledge repositories were sampled). Furthermore, in order to delimit the scope of the study, the specific job category of analyst was selected as described in the delimitations section of this report.

Extant literature on factor analysis presents a wide range of recommendations concerning the appropriate sample sizes. For example, a sample of at least 100 participants is considered sufficient to perform factor analysis (Gorsuch, 1983; Kline, 1979), while recommendations for samples between 200 and 300 are considered good sizes (Cattell, 1978; Comrey & Lee, 1992; Guilford, 1954). Green (1991) proposed the following formula to calculate sample size for multiple regression studies:

\[ n \geq 50 + 8m \]

\( n \) = sample size

\( m \) = the number of independent variables

Using this formula, a sample size of 74 was calculated (50+8*3). Since this sample size was lower than the minimum size of 100, another formula proposed by Bartlett, Kotrlik, and Higgins (2001) was used.

\[ n_0 = \frac{[t^2 * (s)^2]}{(d)^2} \]

\( n_0 \) = sample size

\( t \) = alpha level of .025 in each tail = 1.96
s = population standard deviation

d = acceptable margin of error

Based on this formula, a sample size of 118 was calculated:

$$n_0 = \frac{[(1.96)^2 \times (1.167)^2]}{(7 \times .03)^2} = 118$$

In this formula, the estimated standard deviation in the population of 1.167 was based on the variance deviation estimate calculated for a 7-point scale and divided by 6 (number of standard deviations that included 98% of the possible range values (Bartlett et al., 2001)). The acceptable estimated margin of error for mean (d) was = .21 (7-point scale * .03 acceptable margin of error).

Other researchers recommended larger sample sizes. Bentler and Chou (1987) noted that while the ratio of sample size to number of parameters can be as low as 5:1, 10:1 for arbitrary distributions, a larger ratio was preferred in order to derive to correct evaluation of the model. Loehlin (1992) and Weston and Gore (2006) suggested sample sizes of 200 or more for structural equation modeling (SEM) studies. Since research shows that average response rate for surveys is approximately 20% (Kaplowitz, Hadlock, & Levine, 2004; Sheehan, 2001), 1368 participants were invited to participate in this study in order to achieve the recommended sample size. A total of 498 responses were received and 173 participants were disqualified. The final analysis of the study included 326 responses.

**Step 5 – Collect Data**

This section addresses the data collection method for the causal study. It describes the design of survey instruments, reliability and validity testing, and final survey administration.
To conduct the study, a cross-sectional survey was adopted since individual, self-reported data was required to address the second research question, as well as a generalization of results to a larger population was necessary (Rea & Parker, 2005). Sekaran and Bougie (2009) proposed three design principles for the questionnaire design: 1) principles of wording, 2) general appearance, and 3) principles of measurement. The first two are addressed below, while the latter was already addressed in step 4.

Adhering to the principles of wording, short questions not exceeding 20 words were used in the instrument (Oppenheim, 1986). Personal information, such as respondents’ names were not collected in order to preserve the anonymity of the participants. Demographic data, such as age, gender, educational level, annual income, and location (based on census region) was provided by SurveyMonkey for each participant in order to determine sample characteristics. Furthermore, general appearance of the survey required a good introduction that identified the researcher, survey’s purpose, assurance of confidentiality, and gratitude for participation (Sekaran & Bougie, 2009). The survey can be found in Appendix B and permissions to use the survey instruments in Appendix C.

**IRB Approval**

Prior to the survey validation, the researcher completed the Nova Southeastern University Institutional Review Board (IRB) forms and submitted the survey instrument for IRB review and approval. The IRB approval was received on February 11, 2014 and can be found in Appendix D.

**Survey Validation**

The role conflict, role ambiguity and work locus of control scales have been tested repeatedly for internal consistency reliability. Cronbach’s alpha scores for the role
conflict scale were reported at .81 by Rizzo et al. (1970) in a study of 199 employees from the headquarters of a plant and .82 in a second study among 91 engineers. The same studies reported alpha scores of .78 and .80 for the role ambiguity scales. Spector’s (1988) locus of control scale achieved alpha ranges between .72 and .86 for internal control, and between .85 and .87 for external control in three separate studies (Macan, Trusty, & Trimble, 1996). For the purpose of this study, Cronbach’s alpha values close to the reported ranges were expected for each of the three scales.

The wording of the survey items used to measure the endogenous variables (knowledge seeking and knowledge contributing behaviors) were modified from the original instrument developed by De Vries et al. (2006) in order to fit the context of the this study. For example, one of the original knowledge contribution items of the instrument states: “When I’ve learned something new, I tell my colleagues about it.” This item was modified to “I use the ICT to tell my colleagues when I’ve learned something new about my job.” The rewording of the instrument items ensured that the questions measured behaviors performed via ICT systems. In this study, ICTs were defined as systems that supported communications processes for the purposes of sharing knowledge within organizations and this clarification was also included in the final survey instrument. Moreover, since one of the delimitation factors was to solicit users of such systems, ambiguities associated with the terms ICT versus KMS were not expected to occur.

To determine the understandability (clarity) of the questions and the loading (whether only a single response was applicable) of the modified instrument, the scale was validated with a purposive sample of six experts. Extant literature demonstrates that such sample
sizes were sufficient to determine instrument clarity. For example, Myers et al. (2006) used a convenience sample of four to pretest the clarity of their instrument. Abraham et al. (2004) used five participants for their pilot test, while Hart, Jan Hultink, Tzokas, and Commandeur (2003) used six participants. The participants were selected based on the same characteristics of the respondents to the final survey. These characteristics included full time employees that fulfilled the job functions of analysts and used ICTs to share knowledge within their organizations. Furthermore, knowledge of survey preparation techniques was required in order to leverage recommendations for improvement of the instrument items.

Based on the identified characteristics, experts were contacted by the researcher, informed about the purpose of the study and asked if they were willing to participate in the validation of the instrument. Participants that expressed interest were provided with a word document containing the modified scale items. Participants were asked to respond to the instrument statements as well as mark Yes/No responses for whether they believed the items were clear and whether the items allowed only one response. An example of the feedback form is enclosed in Appendix E. Participants were also asked to provide recommendations for rewording of items where necessary and were solicited to provide their perspectives on the clarity of the term 'ICTs.' After the researcher reviewed each participant’s response, the researcher interviewed each participant individually to address the reasons behind any items with No responses. Any differences in opinions were addressed in follow-up interviews with the participants. Based on the comments, the survey items were modified to accommodate any additional changes. Consolidated list of the feedback from the expert panel is provided in Appendix E.
De Vries et al. (2006) reported Cronbach’s alpha value of .75 for the knowledge seeking scale and a value of .84 for the knowledge contributing scale in their study. In this study, Cronbach’s alpha for the knowledge seeking scale achieved a value of .85 (with the first item being dropped from the scale), while the knowledge contributing scale achieved .87.

Final Survey Administration

The following section describes the approach used to administer the final survey. Using the SurveyMonkey Audience services, a sample of full-time employed analysts who used ICTs at work (e.g. email, instant messaging, micro/wiki blogging, online forums, and knowledge repositories) were contacted from organizations within a variety of industries (e.g. health care, consumer goods, financial services, government, etc.) and invited to take the survey located at a SurveyMonkey.com website (Appendix F). The invitation sent to the users included an introductory letter informing the users of the purpose of the study, disclosure notice, and a link to the survey site, which was accessible via the major Internet browsers (e.g. Internet Explorer, Firefox, Chrome, and Safari). On the second and fourth day of the survey, reminders were sent only to those participants who had not taken the survey (Appendix G). Reminder emails were administered by SurveyMonkey Audience personnel without the involvement of the researcher in order to safeguard the identity of the participants. The survey ran for a period of five days and allowed the participants to leave the survey at any point. No private information was collected at any point.

To delimit the survey only to users of ICT systems, each participant was pre-qualified prior to taking the survey. The pre-qualification process was conducted by requiring each
participant to answer an initial question before taking the survey. The pre-qualification question (provided in Appendix H) asked: “Do you use any of the following systems at work: Email, Instant Messaging, Micro/wiki blogging, Online forums, or Knowledge repositories?” Depending on the selected answer, the SurveyMonkey system either allowed participants to advance to the survey (those that answered Yes), or displayed: “Thank you for your input. Unfortunately, you do not qualify for this survey,” and disqualified the participants.

**Step 6 - Test the Model**

*Screening of Data*

Once the final results were collected, the data was screened for missing data, distributional properties, outliers and unengaged responses using the SPSS software. The survey site forced participants to answer each question in order to advance to the next one. This ensured that there were no missing responses to any of the questions. Any participant who responded with the same value for every single question was excluded from the final analysis. Similarly, the standard deviations of the latent variables were examined and any that contain zero were eliminated (the same answers on all questions).

To examine the distributional properties of the variables, the data was screened for skewness (to determine whether the distribution differed from a normal distribution) and kurtosis (to determine the relative concentration of data values). Skew index greater than 1 or less than –1 was considered problematic, while cutoff of values of +/- 10 was considered “problematic” kurtosis (Kline, 2005). Influential outliers that had the potential to impact the results were eliminated from the final analysis. Scatter plots were used to
determine any outliers that contained standardized scores of more or less than 3.29
standard deviations from the mean and these were excluded (Bollen, 1989b; Hua, 2010).

Mahalanobis distance statistics (data point’s measure of the distance from a common
point) for p-value of 0.001 were used to identify and remove multivariate outliers (Kline,
2005). Multicollinearity was diagnosed via a regression where one of the variables was
considered the dependent while the rest was designated as independent variables. Any
bivariate correlations with values higher than r = .85 were flagged as potential problems.
The variance inflation factor (VIF) was used to determine multicollinearity issues (e.g.
values higher than 10) (Kline, 2005).

**Confirmatory Factor Analysis**

SEM, which has been used for testing reflective, formative, or both types of indicators
(Fornell & Larcker, 1981), was employed to test the model. Prior to testing the
hypotheses, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA)
were performed in order to establish validity, reliability and good fit of the measurement
model (Anderson & Gerbing, 1988). Further, CFA was also used in this study, because
the proposed model was based on specific hypotheses (Walker & Maddan, 2008).

The two-stage model proposed by Bowen and Guo (2011) was used to perform the
CFA. The first stage included specifying the model. This stage consisted of four steps: 1)
Expressing the hypotheses in a diagram with identified relationships between the
observed and latent variables. The diagram indicated the latent variables and the observed
variables that load on each of latent ones; 2) Setting the scale for each latent variable.
Kline (2005) recommended fixing one of the factor loadings to 1.0 for each latent
variable in the model in order to tie the other factors to this specific reference point; 3)
Identifying the measurement error (and if error terms are correlated) for each observed item; 4) Indicating correlated latent variables. Correlations that exceed the 0.85 threshold suggested one latent variable as the cause of the observed items as opposed to two (Kline, 2005).

The second stage included the model estimation. This was accomplished through series of iterations that continued “until parameter adjustments no longer result in smaller minimization values, that is, the difference between the discrepancy function associated with the current model-implied matrix is below a convergence criterion,” (Bowen & Guo, 2011, p. 101). In this study, the use of maximum likelihood estimator (ML) was applied as it was recommended for the study’s proposed sample size and data type (Bollen, 1989).

*Structural Equation Modeling Analysis*

The SEM analysis was conducted using the AMOS software to test the relationships between the constructs. It consisted of the same stages as the CFA analysis. During the first stage, the model was specified including the directional relationships among the latent and observed structural variables, and error terms were identified for the endogenous variables (AMOS defaults the paths from structural errors to dependent variables to = 1.0) (Bowen & Guo, 2011). During the second stage, estimation of the SEM model was performed using ML. Bowen and Guo also recommended that the fit of the measurement model was established before the structural model testing in order to ensure that accurate validity and reliability scores were used to test the constructs. Bowen and Guo noted that the testing of the SEM model (third step) can be done by validating the measurement quality, and providing support for the hypothesis.
Once the testing of the SEM model was completed, evaluation of the model fit was performed. Root Mean Square Error of Approximation (RMSEA) was used to test the fit as “The RMSEA is a measure of how close the implied matrix is to the observed variance–covariance matrix,” (Bowen & Guo, 2011, p.144). Browne, Cudeck, Bollen, and Long (1993) recommended RMSEA value of less than or equal 0.05 (with 90% confidence interval), as an indicator of approximate fit.

Next, parameter estimates were evaluated for factor loadings and to eliminate latent variables with non-significant variances (e.g. value of 0 since they do not represent meaningful differences among participants) (Bowen & Guo, 2011). Tests for the effects of the categorical moderator variable ICT on the relationship of the predictor to the criterion variables were performed. The sample was divided into categories (e.g. type of ICT such as email, instant messaging, micro/wiki blogging, online forums, or knowledge repositories) and a Chi-square test of the significance of the difference between designated structural parameters across groups was performed (Sauer & Dick, 1993). The discrete moderator shaped homogeneous groups within the sample after the parameters were constrained across each category. Moreover, consideration of equivalent models was performed, which included examination of different variations of the hypotheses in order to explain why the causal model was accepted.

**Step 7 – Produce the Report**

The final stage in the methodology includes a report of the results. The results section is organized around the research questions and the supporting data from the content analysis, expert panel validation, and the CFA and SEM analyses. Administration of the final survey and reliability tests are also addressed in detail. Discussion of each variable
from the model is performed, including comparing and contrasting with existing literature
to determine contribution of the research. Finally, conclusions, implications,
recommendations, generalizability of the results, and relevance of the study to the
knowledge management body of knowledge are presented in support of the research
questions

Summary

This chapter addressed the methodology approach for the proposed study. A three-
stage literature review approach and a six-stage content analysis study were presented in
order to demonstrate how the first research question was addressed concerning the
identification of factors that contribute to the common knowledge sharing barriers. Next,
a theoretical model derived from the literature review and content analysis was proposed.
A set of five variables and seven hypotheses were outlined, followed by a description of
the survey method used to test the model. Finally, statistical methods used to screen the
surveyed data (skewness, kurtosis, Mahalanobis distance, and multicollinearity) and to
analyze the data (confirmatory factor analysis and structural equation modeling) were
addressed.
Chapter 4

Results

Introduction

Chapter 4 is organized around the analysis in support of the two research questions proposed in the study. It begins with examining the results of the literature review and content analysis study that were conducted in support of the first research question: What are the potential factors that contribute to the commonly accepted barriers to knowledge sharing? Next, results from the survey and a detailed analysis of the validity, reliability, confirmatory factor analysis, and structural equation modeling are provided in support of the seven hypotheses proposed in chapter 3 that answer the second research question: How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing?

Literature Review and Content Analysis Results

To uncover the potential factors that contribute to the commonly accepted barriers to knowledge sharing, a total of 103 articles (Appendix A) were sampled as part of the literature review analysis stage. The articles were selected from the following information sciences databases as recommended by Levy and Ellis (2006): ABI/Inform Complete-ProQuest, ACM Digital Library, IEEE Computer Society Digital Library, Computers and Applied Sciences Complete - EBSCO host, Wiley Online Library - Blackwell Publishers, IBI Global Science Direct – Elsevier, Taylor & Francis, JSTOR, ProQuest Computing – ProQuest, and SpringerLink - Springer.
Of the total sample of articles, 49% (50 articles) addressed both knowledge seeking and contributing behaviors, 31% (32 articles) addressed only knowledge seeking behaviors, and 20% (21 articles) addressed only knowledge contributing behaviors. Table 3 provides frequency of occurrences of each barrier and percentages of the total for each behavior. The results indicated that nearly three quarters of the knowledge seeking articles (72%) cited lack of time as a major inhibitor in the search for knowledge. The lowest barrier among the knowledge seeking articles was poor communications skills (31%). On the other hand, 74% of both knowledge seeking and knowledge contributing articles cited lack of trust as major inhibitor, followed by lack of time (64%) and poor communication skills (62%).

![Table 3. Summary of Literature Review Analysis](image)

Only 15% of the articles on knowledge seeking identified both lack of time and poor communication skills as major inhibitors (Table 4). From the knowledge contributing studies, the majority (76%) cited poor communication skills as a major knowledge transferring inhibitor, while 29% of the knowledge contributing articles cited both lack of time and lack of trust as major barriers (Table 5). Similarly, articles on both knowledge seeking and knowledge contributing behaviors cited poor communication skills and lack
of trust among the highest barriers (44%), while the lowest barriers cited by articles on both behaviors (only 30%) were lack of time and poor communications skills (Table 6).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>11</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>15%</td>
<td>29%</td>
<td>16%</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Results on Combined Barriers for Knowledge Seeking Articles

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>33%</td>
<td>29%</td>
<td>40%</td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Results on Combined Barriers for Knowledge Contributing Articles

<table>
<thead>
<tr>
<th>Knowledge Seeking and Knowledge Contributing Behaviors</th>
<th>Poor Comm. Skills and Lack of Trust and Lack of Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of Time and Poor Comm. Skills</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>44%</td>
</tr>
<tr>
<td></td>
<td>32%</td>
</tr>
</tbody>
</table>

Table 6. Results on Combined Barriers for Articles on Both Behaviors

Following the literature review analysis, a content analysis study was conducted on the same sample of 103 articles. During the coding phase, searches identified in the methodology section of this study were used to eliminate 42 sources since those contained no references for any of the variables proposed in the study. Of the remaining
61 sources, a total of 199 references for the role conflict, the role ambiguity, and the locus of control variables were identified (Appendix I).

Table 7 provides the frequency distributions and percent of totals for the appearances of all variables across the different knowledge sharing articles.

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Total</th>
<th>Role Conflict</th>
<th>Role Ambiguity</th>
<th>Locus of Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Seeking</td>
<td>129</td>
<td>47</td>
<td>77</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>36%</td>
<td>60%</td>
<td>4%</td>
</tr>
<tr>
<td>Knowledge Contributing</td>
<td>35</td>
<td>12</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>34%</td>
<td>20%</td>
<td>46%</td>
</tr>
<tr>
<td>Knowledge Seeking and Knowledge Contributing</td>
<td>69</td>
<td>22</td>
<td>31</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32%</td>
<td>45%</td>
<td>23%</td>
</tr>
</tbody>
</table>

Table 7. Frequency Distribution and Percent for All Variables

The role conflict variable was coded through seven different categories that collectively appeared 80 times throughout the sources (Table 8). Two of these categories (job complexity and job interdependence) accounted for 70% of the references. The role ambiguity variable was coded through five different categories that appeared 123 times throughout the sources (Table 9). One of these categories (job clarity) accounted for 76% of all references. Finally, the locus of control variable was coded through four different categories that appeared 39 times (Table 10). One of these categories (job awards) accounted for 62% of all references.
The results of the literature review and content analysis revealed three potential contributors to the most common knowledge sharing barriers: role conflict, role ambiguity, and locus of control. These were considered sufficient to provide an answer to the first research question: What are the potential factors that contribute to the commonly accepted barriers to knowledge sharing?
Survey Analysis

Based on the contributing factors discovered during the literature review and the content analysis study, a survey was conducted to investigate the seven hypotheses proposed in chapter 3 in support of the second research question of this study: How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing? To collect the data for the analysis of these hypotheses, a survey instrument was distributed via email by the SurveyMonkey Audience team. Survey invitations were sent to 1,368 participants with characteristics that fit the delimitation criteria specified in chapter 1 of this study. The active survey period began on March 5, 2014 and concluded on March 10, 2014.

Before the hypotheses testing was performed, screening of the collected survey data was done in order to ensure the data was reliable, useful, and valid for testing the causal model of the study. The data screening process reported below included tests for: missing data, unengaged responses, univariate and multivariate outliers, normality, linearity, homoscedasticity, and multicollinerarity. Additionally, response rate and respondents’ demographics were also provided.

Response Rate

The survey process returned 498 responses. Of these, 173 responses were disqualified since they responded negatively to the question: “Do you use any of the following systems at work: Email, Instant Messaging, Micro/wiki blogging, Online forums, or Knowledge repositories?” The remaining 326 respondents successfully completed the survey, yielding a response rate of 23.8%.
Missing Data

As specified in chapter 3, the survey was designed to make every question a required question. If respondents didn’t answer a required question, they were unable to advance to the next question. This ensured that no data was missed during the survey collection. Analysis of the data frequency and descriptive statistics confirmed there was no missing data.

Unengaged Responses

Standard deviations for the independent and dependent variables were calculated via SPSS. Five cases contained standard deviations equal to 0 (Cases 18, 79, 288, 308, and 320). All survey responses with standard deviation equal to 0 were visually inspected to determine whether the respondents were engaged through the survey. The visual inspection revealed that these cases contained the same responses from every single question, suggesting the respondents were unengaged. These five cases were removed from the final analysis. Additionally, three more cases were visually inspected and removed due to unengaged responses on all but one question of the survey (standard deviations <.6) (Cases 27, 106, 199).

Univariate and Multivariate Outliers

Cases with extreme values on one of the variables (standardized scores in excess of +/- 3.29) were considered univariate outliers, while cases with extreme values on two or more variables were considered multivariate outliers (Tabachnick & Fidell, 2007). The z-scores for each variable were calculated. Two univariate outliers with z-scores over 3.29 were detected and removed from the analysis (Case 76 and 292).
To detect multivariate outliers, the Mahalanobis distance ($D^2$) was computed using linear regression, and two cases with $p=0$ (Case 40, $D^2=.02$, and Case 31, $D^2=.05$) were removed from the final analysis.

**Demographics**

Demographic analysis was conducted on the remaining 314 cases. The sample contained approximately 10% more males than females (Table 11).

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>172</td>
<td>54.8</td>
</tr>
<tr>
<td>Female</td>
<td>142</td>
<td>45.2</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 11. Frequency Distribution and Percent for Gender

Nearly 70% of the respondents were between the ages of 30 and 60 (Table 12).

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-29</td>
<td>55</td>
<td>17.5</td>
</tr>
<tr>
<td>30-44</td>
<td>113</td>
<td>36.0</td>
</tr>
<tr>
<td>45-60</td>
<td>105</td>
<td>33.4</td>
</tr>
<tr>
<td>&gt; 60</td>
<td>41</td>
<td>13.1</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 12. Frequency Distribution and Percent for Age

Nearly three quarters of the sample had attained an associate’s or higher college degree (Table 13).
64% of the respondents had six or more years of work experience.

The majority of the respondents (87.6%) earned an annual income of $50,000 or more (Table 15).

Table 13. Frequency Distribution and Percent for Education

<table>
<thead>
<tr>
<th>Education</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than high school degree</td>
<td>1</td>
<td>.3</td>
</tr>
<tr>
<td>High school degree</td>
<td>10</td>
<td>3.2</td>
</tr>
<tr>
<td>Some college</td>
<td>65</td>
<td>20.7</td>
</tr>
<tr>
<td>Associate or bachelor degree</td>
<td>138</td>
<td>43.9</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>100</td>
<td>31.8</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 14. Frequency Distribution and Percent for Work Experience

<table>
<thead>
<tr>
<th>Work Experience</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5 years</td>
<td>112</td>
<td>35.7</td>
</tr>
<tr>
<td>6-10 years</td>
<td>80</td>
<td>25.5</td>
</tr>
<tr>
<td>11-15 years</td>
<td>41</td>
<td>13.1</td>
</tr>
<tr>
<td>16-20 years</td>
<td>30</td>
<td>9.6</td>
</tr>
<tr>
<td>&gt;20 years</td>
<td>51</td>
<td>16.2</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 15. Frequency Distribution and Percent for Education

<table>
<thead>
<tr>
<th>Income</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 - $24,999</td>
<td>7</td>
<td>2.2</td>
</tr>
<tr>
<td>$25,000 - $49,999</td>
<td>32</td>
<td>10.2</td>
</tr>
<tr>
<td>$50,000 - $99,999</td>
<td>109</td>
<td>34.7</td>
</tr>
<tr>
<td>$100,000 - $149,999</td>
<td>75</td>
<td>23.9</td>
</tr>
<tr>
<td>$150,000+</td>
<td>91</td>
<td>29.0</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Approximately 60% of the respondents worked in mid-size companies with over 500 employees (Table 16).

<table>
<thead>
<tr>
<th>Company Size</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-50 employees</td>
<td>62</td>
<td>19.7</td>
</tr>
<tr>
<td>51-500 employees</td>
<td>61</td>
<td>19.4</td>
</tr>
<tr>
<td>501-2000 employees</td>
<td>43</td>
<td>13.7</td>
</tr>
<tr>
<td>2001-10,000 employees</td>
<td>69</td>
<td>22.0</td>
</tr>
<tr>
<td>&gt;10,000 employees</td>
<td>79</td>
<td>25.2</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 16. Frequency Distribution and Percent for Education

By far, the largest industry represented by the sample (22%) was government, followed by financial services (12.7%), and telecommunications and internet (6.7%) (Table 17).

<table>
<thead>
<tr>
<th>Industry</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertising and Marketing</td>
<td>13</td>
<td>4.1</td>
</tr>
<tr>
<td>Agriculture</td>
<td>6</td>
<td>1.9</td>
</tr>
<tr>
<td>Airlines, Aerospace, and Defense</td>
<td>9</td>
<td>2.9</td>
</tr>
<tr>
<td>Automotive</td>
<td>5</td>
<td>1.6</td>
</tr>
<tr>
<td>Business Support and Logistics</td>
<td>14</td>
<td>4.5</td>
</tr>
<tr>
<td>Construction, Machinery and Home</td>
<td>4</td>
<td>1.3</td>
</tr>
<tr>
<td>Education</td>
<td>20</td>
<td>6.4</td>
</tr>
<tr>
<td>Entertainment and Leisure</td>
<td>11</td>
<td>3.5</td>
</tr>
<tr>
<td>Finance &amp; Financial Services</td>
<td>40</td>
<td>12.7</td>
</tr>
<tr>
<td>Food and Beverages</td>
<td>5</td>
<td>1.6</td>
</tr>
<tr>
<td>Government</td>
<td>69</td>
<td>22.0</td>
</tr>
<tr>
<td>Health Care and Pharmaceuticals</td>
<td>21</td>
<td>6.7</td>
</tr>
<tr>
<td>Insurance</td>
<td>17</td>
<td>5.4</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>12</td>
<td>3.8</td>
</tr>
<tr>
<td>Nonprofit</td>
<td>13</td>
<td>4.1</td>
</tr>
<tr>
<td>Retail and Commercial Durables</td>
<td>12</td>
<td>3.8</td>
</tr>
<tr>
<td>Real Estate</td>
<td>6</td>
<td>1.9</td>
</tr>
<tr>
<td>Telecommunications, Technology, Internet and Electronics</td>
<td>32</td>
<td>10.2</td>
</tr>
<tr>
<td>Utilities, Energy, and Extraction</td>
<td>5</td>
<td>1.6</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 17. Frequency Distribution and Percent for Industry
Finally, 21% of the sample resided in the Pacific region of the United States, followed by the South Atlantic (19.4%) and the Middle Atlantic (13.4%) (Table 18).

<table>
<thead>
<tr>
<th>Location</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>New England</td>
<td>18</td>
<td>5.7</td>
</tr>
<tr>
<td>Middle Atlantic</td>
<td>42</td>
<td>13.4</td>
</tr>
<tr>
<td>East North Central</td>
<td>36</td>
<td>11.5</td>
</tr>
<tr>
<td>West North Central</td>
<td>28</td>
<td>8.9</td>
</tr>
<tr>
<td>South Atlantic</td>
<td>61</td>
<td>19.4</td>
</tr>
<tr>
<td>East South Central</td>
<td>10</td>
<td>3.2</td>
</tr>
<tr>
<td>West South Central</td>
<td>27</td>
<td>8.6</td>
</tr>
<tr>
<td>Mountain</td>
<td>26</td>
<td>8.3</td>
</tr>
<tr>
<td>Pacific</td>
<td>66</td>
<td>21.0</td>
</tr>
<tr>
<td>Total</td>
<td>314</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Table 18. Frequency Distribution and Percent for Location

*Normality*

To determine the normality of the variables’ distributions, West, Finch, and Curran (1995) recommended assessing the histograms and absolute values of skewness (symmetry) and kurtosis (peakedness) of the variables’ data distribution in sample sizes greater than 300. Substantial non-normality results in absolute skewness values greater than 2 and absolute kurtosis values greater than 7. Visual inspections of the normal probability plots were performed to determine any amount of deviations from the diagonals (Tabachnick & Fidell, 2007). All absolute values were within the specified ranges and as a result, the data was considered normally distributed.

*Linearity*

Tests for linearity were performed using deviation from linearity of the composite variables (Argyrous, 2005). In all tests, the significant values were greater than .05 (Table 19). As a result, it was concluded that the independent and dependent variables were linearly related.
### ANOVA Table

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Combined)</td>
<td>2050.361</td>
<td>52</td>
<td>39.430</td>
<td>1.383</td>
<td>.054</td>
</tr>
<tr>
<td>Linearity</td>
<td>38.593</td>
<td>1</td>
<td>38.593</td>
<td>1.353</td>
<td>.246</td>
</tr>
<tr>
<td>Deviation from Linearity</td>
<td>2011.768</td>
<td>51</td>
<td>39.446</td>
<td>1.383</td>
<td>.055</td>
</tr>
<tr>
<td>Within Groups</td>
<td>7442.926</td>
<td>261</td>
<td>28.517</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Combined)</td>
<td>1845.920</td>
<td>52</td>
<td>35.498</td>
<td>1.135</td>
<td>.260</td>
</tr>
<tr>
<td>Linearity</td>
<td>24.743</td>
<td>1</td>
<td>24.743</td>
<td>.791</td>
<td>.375</td>
</tr>
<tr>
<td>Deviation from Linearity</td>
<td>1821.177</td>
<td>51</td>
<td>35.709</td>
<td>1.142</td>
<td>.252</td>
</tr>
<tr>
<td>Within Groups</td>
<td>8162.742</td>
<td>261</td>
<td>31.275</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Combined)</td>
<td>997.550</td>
<td>30</td>
<td>33.252</td>
<td>1.108</td>
<td>.325</td>
</tr>
<tr>
<td>Linearity</td>
<td>259.840</td>
<td>1</td>
<td>259.840</td>
<td>8.655</td>
<td>.004</td>
</tr>
<tr>
<td>Deviation from Linearity</td>
<td>737.710</td>
<td>29</td>
<td>25.438</td>
<td>.847</td>
<td>.695</td>
</tr>
<tr>
<td>Within Groups</td>
<td>8495.736</td>
<td>283</td>
<td>30.020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Combined)</td>
<td>1166.111</td>
<td>30</td>
<td>38.887</td>
<td>1.245</td>
<td>.184</td>
</tr>
<tr>
<td>Linearity</td>
<td>397.832</td>
<td>1</td>
<td>397.832</td>
<td>12.733</td>
<td>.000</td>
</tr>
<tr>
<td>Deviation from Linearity</td>
<td>768.778</td>
<td>29</td>
<td>26.510</td>
<td>.848</td>
<td>.694</td>
</tr>
<tr>
<td>Within Groups</td>
<td>8842.052</td>
<td>283</td>
<td>31.244</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Combined)</td>
<td>1122.957</td>
<td>38</td>
<td>29.552</td>
<td>.971</td>
<td>.523</td>
</tr>
<tr>
<td>Linearity</td>
<td>7.569</td>
<td>1</td>
<td>7.569</td>
<td>.249</td>
<td>.618</td>
</tr>
<tr>
<td>Deviation from Linearity</td>
<td>1115.388</td>
<td>37</td>
<td>30.146</td>
<td>.990</td>
<td>.490</td>
</tr>
<tr>
<td>Within Groups</td>
<td>8370.329</td>
<td>275</td>
<td>30.438</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Combined)</td>
<td>1471.307</td>
<td>38</td>
<td>38.719</td>
<td>1.247</td>
<td>.162</td>
</tr>
<tr>
<td>Linearity</td>
<td>1.411</td>
<td>1</td>
<td>1.411</td>
<td>.045</td>
<td>.831</td>
</tr>
<tr>
<td>Deviation from Linearity</td>
<td>1469.896</td>
<td>37</td>
<td>39.727</td>
<td>1.280</td>
<td>.138</td>
</tr>
<tr>
<td>Within Groups</td>
<td>8537.355</td>
<td>275</td>
<td>31.045</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 19. Test for Linearity

**Homoscedasticity**

According to Tabachnick and Fidell (2007), “The assumption of homoscedasticity is that the variability in scores for one continuous variable is roughly the same at all values of another continuous variable,” (p. 85). To determine whether homoscedasticity was present, scattered plots were produced where the dependent variables’ standardized residuals were regressed onto the standardized predicted values. No pattern in the data was observed, therefore the assumption that homoscedasticity was present was accepted.
**Multicollinearity**

Multicollinearity occurs when the variables contain redundant information and as a result are not needed in the analysis (Tabachnick & Fidell, 2007). To determine if the variables were highly correlated (>0.90), Pearson product moment correlation coefficient was calculated among the variables. None of the correlations exceeded correlation values of 0.659 (Table 20).

<table>
<thead>
<tr>
<th>Variable</th>
<th>CompKS</th>
<th>CompKC</th>
<th>CompRC</th>
<th>CompRA</th>
<th>CompWLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CompKS</td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.659**</td>
<td>.064</td>
<td>.165**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.260</td>
<td>.003</td>
<td>.618</td>
</tr>
<tr>
<td>CompKC</td>
<td>Pearson Correlation</td>
<td>.659**</td>
<td>1</td>
<td>.050</td>
<td>.199**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.380</td>
<td>.000</td>
<td>.834</td>
</tr>
<tr>
<td>CompRC</td>
<td>Pearson Correlation</td>
<td>.064</td>
<td>.050</td>
<td>1</td>
<td>-.371**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.260</td>
<td>.380</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>CompRA</td>
<td>Pearson Correlation</td>
<td>.165**</td>
<td>.199**</td>
<td>-.371**</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.003</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>CompWLC</td>
<td>Pearson Correlation</td>
<td>.028</td>
<td>-.012</td>
<td>.278**</td>
<td>-.303**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.618</td>
<td>.834</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

**Table 20. Pearson Coefficient**

Furthermore, a Variable Inflation Factor (VIF) for each independent variable was calculated. All VIF values ranged from 1.08 to 1.16 (Tables 21-23) and were within the VIF threshold limit of 10 (Hair, Anderson, Tatham, & Black, 1998). As a result, the conclusion was drawn that multicollinearity was not problematic.
<table>
<thead>
<tr>
<th>Model</th>
<th>Collinearity Statistics</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Comp_RA</td>
<td>.908</td>
<td>1.101</td>
</tr>
<tr>
<td>1</td>
<td>Comp_WLC</td>
<td>.908</td>
<td>1.101</td>
</tr>
</tbody>
</table>

**Table 21.** Role Conflict VIF

<table>
<thead>
<tr>
<th>Model</th>
<th>Collinearity Statistics</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Comp_WLC</td>
<td>.923</td>
<td>1.084</td>
</tr>
<tr>
<td>1</td>
<td>Comp_RC</td>
<td>.923</td>
<td>1.084</td>
</tr>
</tbody>
</table>

**Table 22.** Role Ambiguity VIF

<table>
<thead>
<tr>
<th>Model</th>
<th>Collinearity Statistics</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Comp_RC</td>
<td>.862</td>
<td>1.160</td>
</tr>
<tr>
<td>1</td>
<td>Comp_RA</td>
<td>.862</td>
<td>1.160</td>
</tr>
</tbody>
</table>

**Table 23.** Work Locus of Control VIF

The data screening process confirmed that the data was clean and ready for further statistical analysis. Furthermore, an EFA was conducted to assess construct validity. First, Cronbach’s alpha values were calculated on the instrument items and these yielded the following results: KS = .852; KC = .874; RC = .894; RA = .748; WLOC = .843. Principal components analysis with varimax rotation, and Kaiser normalization was performed on all constructs. Several items were removed to arrive to a clean pattern matrix without cross-loadings. The procedure produced a five-factor model with factor loadings that explained 68% of the total variance (eigenvalues >1).
Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was the next step in the statistical analysis. It was necessary in order to test whether the collected data fit the proposed theoretical model in chapter 3 as well as the factor structure (Anderson & Gerbing, 1988). The CFA consisted of the following steps described below: model specification, model estimation, tests for reliability and validity (including common method variance), and tests for measurement model invariance.

First, model specification was performed in AMOS (Bowen and Guo, 2011), by expressing in a diagram the latent variables and the observed variables that load on each of the latent ones. One of the factor loadings for each latent variable was set to 1.0 in the model in order to tie the other factors to this specific reference point (Kline, 2005). Measurement errors were set for each observed item. Covariances between the latent variables were also set.

Next, model estimation was performed using the maximum likelihood estimator (ML) as it fit the study’s sample size and data type (Bollen, 1989). Series of iterations were performed on the model by covarying the error terms with the highest values of the modification indices within variables until no smaller minimization values could be reached. Additionally, items that cross loaded on factors were removed. The model fit was assessed based on the following evaluations (Ryu, Ho, & Han, 2003):

- Absolute fit measures including observed normed $\chi^2$ ($\chi^2$/df), goodness of fit index, (GFI) and root mean square error of approximation (RMSEA);
- Incremental fit measures including normed fit index (NFI), adjusted goodness of fit (AGFI), and comparative fit index (CFI);
- Parsimonious fit measures including parsimony goodness-of-fit index (PGFI) and parsimony normed fit index (PNFI).

The model fit (Table 24) was considered estimated as soon as it reached the established literature thresholds (Ahn, Ryu, & Han, 2007; Bollen, 1989a; Browne & Cudeck, 1992; McDonald & Marsh, 1990; Wheaton, 1977). The final CFA model is demonstrated in Figure 4.

<table>
<thead>
<tr>
<th>Fit index</th>
<th>Scores</th>
<th>Recommended cut-off value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absolute fit measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi-squares/degree of freedom ($x^2$/df)</td>
<td>1.76</td>
<td>&lt;2&lt;sup&gt;a&lt;/sup&gt;; &lt;3&lt;sup&gt;b&lt;/sup&gt;; &lt;5&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>GFI</td>
<td>0.909</td>
<td>≥0.90&lt;sup&gt;a&lt;/sup&gt;; ≥0.80&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.049</td>
<td>&lt;0.08&lt;sup&gt;a&lt;/sup&gt;; &lt;0.1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Incremental fit measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFI</td>
<td>0.91</td>
<td>≥ 0.90&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>AGFI</td>
<td>0.882</td>
<td>≥0.90&lt;sup&gt;a&lt;/sup&gt;; ≥0.80&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>CFI</td>
<td>0.959</td>
<td>≥0.90&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Parsimonious fit measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PGFI</td>
<td>0.701</td>
<td>The higher, the better</td>
</tr>
<tr>
<td>PNFI</td>
<td>0.768</td>
<td>The higher, the better</td>
</tr>
</tbody>
</table>

**Notes:** Acceptability: <sup>a</sup>acceptable; <sup>b</sup>marginal

**Table 24.** Overall Fit Indices of the CFA Model
Figure 4. Estimated CFA Model
Reliability and Validity

Table 2 provides the reliability and validity values for the estimated model. Construct reliability (CR) (the degree to which the scale indicators reflect underlying factors) is considered a good measure of reliability and internal consistency. All CR values were calculated at >.80, ensuring that each of the items loaded on a single indicator.

Convergent validity is achieved when the average variance explained (AVE) is greater than the unexplained variance (AVE >.5) (Fornell & Larcker, 1981). All values for AVE met the established literature threshold.

Finally, to determine whether the measures were unrelated, a test for discriminant validity was performed and the square root values of all AVEs (on the diagonal) were evaluated. All values were below the established threshold of <.85 (Campbell & Fiske, 1959). As a result, it was established that the criteria for construct reliability, convergent validity, and discriminant validities were satisfied.

<table>
<thead>
<tr>
<th></th>
<th>CR</th>
<th>AVE</th>
<th>MSV</th>
<th>ASV</th>
<th>W LCS</th>
<th>KnowSeek</th>
<th>KnowContr</th>
<th>RoleConf</th>
<th>RoleAmb</th>
</tr>
</thead>
<tbody>
<tr>
<td>WLCS</td>
<td>0.848</td>
<td>0.584</td>
<td>0.052</td>
<td>0.027</td>
<td>0.764</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KnowSeek</td>
<td>0.857</td>
<td>0.667</td>
<td>0.549</td>
<td>0.150</td>
<td>0.173</td>
<td>0.817</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KnowContr</td>
<td>0.855</td>
<td>0.597</td>
<td>0.549</td>
<td>0.148</td>
<td>0.097</td>
<td>0.741</td>
<td>0.773</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RoleConf</td>
<td>0.889</td>
<td>0.501</td>
<td>0.163</td>
<td>0.055</td>
<td>0.227</td>
<td>0.041</td>
<td>0.043</td>
<td>0.708</td>
<td></td>
</tr>
<tr>
<td>RoleAmb</td>
<td>0.801</td>
<td>0.592</td>
<td>0.163</td>
<td>0.058</td>
<td>0.129</td>
<td>-0.139</td>
<td>-0.180</td>
<td>0.404</td>
<td>0.769</td>
</tr>
</tbody>
</table>

Table 25. Reliability and Validity Values

Common Method Variance

Since all the survey data was collected through the same questionnaire during the same period of time, systematic measurement error can impact the estimates of the relationships between the constructs. Such error, attributed to common method variance,
often stems from the measurement method. According to Podsakoff, MacKenzie, Lee, and Podsakoff (2003) the common method variance (CMV) is “variance that is attributable to the measurement method rather than to the constructs the measures are assumed to represent” (p.879). Williams and Brown (1994) argued that when there is CMV present, the measurement intercorrelation can be either inflated or deflated, resulting in measurement errors. To detect any presence of CMV, Harman’s single-factor test was conducted (Harman, 1976). All the five variables were entered into an exploratory factor analysis, using unrotated principal axis factoring and constrained to a single factor. The results indicated a single factor that explained only 19% of the variance.

In addition, common latent factor (CLF) was added to the model to determine the variance that is common to all factors. This method uses the CLF to capture the common variance among all observed variables in the model. The standardized regression weights from the model were compared to the standardized regression weights of a model without the CLF to determine whether differences required the retention of the CLF during the computation of the structural model (Bollen, 1989b). Since none of the compared values exceeded .08, it was concluded that the presence of CMV was not of significant size to impact the interpretations of the results.

**Measurement Model Invariance**

In order to determine whether the various items of the survey instruments held the same meaning across the different groups (email, instant messaging, online forums, and knowledge repositories), tests for invariance were performed (Meredith, 1993). First, a configural invariance test was conducted to determine model fit when the four groups
(for ICT type: email, instant messaging, online forums, and knowledge repositories) were computed with and without cross-group path constraints. Since the model fit was within expected thresholds ($\chi^2$/DF=1.63, GFI=.840, RMSEA=.034, NFI=.833, AGFI=.792, CFI=.926, PGFI=.647, PNFI=.703), it was concluded that configural invariance was present (the four groups were equivalent).

Additionally, a metric invariance test was performed by constraining the regression weights of latent factors of the CFA model to 1 and naming the regression weights so that the paths were constrained to be equal to each other (Figure 5). Next, the Chi-square differences between the unconstrained and constrained models were calculated (Table 26). The resultant p-value (.49) was not significant and therefore it was concluded that the four groups were invariant (not different).
Figure 5. Constrained CFA Model
### Table 2. Chi-square Metric Invariance Test

<table>
<thead>
<tr>
<th>Overall Model</th>
<th>Chi-square</th>
<th>df</th>
<th>p-val</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconstrained</td>
<td>1272.045</td>
<td>780</td>
<td></td>
</tr>
<tr>
<td>Fully constrained</td>
<td>1337.591</td>
<td>846</td>
<td></td>
</tr>
<tr>
<td>Number of groups</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difference</td>
<td>65.546</td>
<td>66</td>
<td>0.493</td>
</tr>
</tbody>
</table>

The CFA produced a good fit measurement model from the observed and latent variables. Next, structural equation modeling was conducted to test the proposed hypotheses in chapter 3.

**Structural Equation Modeling**

Structural equation modeling (SEM) was conducted to estimate the causal relationships between the constructs of the proposed theoretical model. It consisted of the following steps described below: model specification, model estimation, test for multi-group moderation, and hypotheses testing.

As with CFA, the first step of the SEM process was specification of the model. The model was specified using the CFA measurement model. The correlations between the endogenous variables were removed and directional relationships among the latent and observed variables were identified following the proposed hypotheses model identified in chapter 3.

Next, the SEM model estimation was performed using ML. Series of iterations were performed on the model by covarying the error terms with the highest modification indices within variables until no smaller minimization values could be reached. An improvement to the model was made when a regression line was added between the knowledge seeking and knowledge contributing variables (as they appeared to be...
causally correlated) to account for the correlation between the endogenous variables. The model fit (Table 27) was considered estimated when the threshold values were met (Bollen, 1989a; Browne & Cudeck, 1992; McDonald & Marsh, 1990; Wheaton, 1977).

<table>
<thead>
<tr>
<th>Fit index</th>
<th>Scores</th>
<th>Recommended cut-off value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Absolute fit measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi-squares/degree of freedom ($x^2$/df)</td>
<td>1.659</td>
<td>$&lt;2^a; &lt;3^b; &lt;5^b$</td>
</tr>
<tr>
<td>GFI</td>
<td>0.833</td>
<td>$\geq 0.90^a; \geq 0.80^b$</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.035</td>
<td>$&lt;0.08^a; &lt;0.1^b$</td>
</tr>
<tr>
<td><strong>Incremental fit measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFI</td>
<td>0.831</td>
<td>$\geq 0.90^a; \geq 0.80^b$</td>
</tr>
<tr>
<td>AGFI</td>
<td>0.787</td>
<td>$\geq 0.90^a; \geq 0.70^b$</td>
</tr>
<tr>
<td>CFI</td>
<td>0.924</td>
<td>$\geq 0.90^a$</td>
</tr>
<tr>
<td><strong>Parsimonious fit measures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PGFI</td>
<td>0.652</td>
<td>The higher, the better</td>
</tr>
<tr>
<td>PNFI</td>
<td>0.713</td>
<td>The higher, the better</td>
</tr>
</tbody>
</table>

**Notes:** Acceptability: $^a$acceptable; $^b$marginal

**Table 27.** Overall Fit Indices of the SEM Model

**Multi-Group Moderation Based on ICT System Type**

Before conducting hypotheses testing, tests for the effects of the categorical moderator variable ICT on the relationship of the predictors to the criterion variables were performed in AMOS. Multi-group moderation tests were necessary in order to determine whether the hypothesized relationships in a model differed based on the value of the moderator (ICT type: email, instant messaging, online forums, and knowledge repositories). To conduct these tests, the dataset was split along values of the categorical variable (ICT), followed by tests of the model with each set of data.

Four groups were created (email, instant messaging, online forums, and knowledge repositories) based on the responses from the survey. Grouping for micro/wiki blogging was not performed in AMOS using ML due to insufficient number of responses related to
this system type. Factor loadings were analyzed, and the effects between role conflict and knowledge contribution and locus of control and knowledge contribution were trimmed from the model due to insignificant p values. Model fit was estimated again and the new model’s values met the expected thresholds ($\chi^2$/DF=1.659, GFI=.833, RMSEA=.035, NFI=.831, AGFI=.787, CFI=.924, PGFI=.652, PNFI=.713). The resultant model was used to estimate the moderating effects of each ICT system type on the relationships between the other variables. Figure 6 demonstrates the final SEM model (the values indicate path coefficients for the email group).
Figure 6. Final SEM Model
**Hypothesis Testing**

This section of the SEM analysis included tests of the seven hypotheses proposed in chapter 3 in order to answer the second research question: How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing?

Table 2 shows the results of the hypotheses testing based on the multi-group moderation of the SEM model by ICT type described in the previous section.

Hypothesis H1a posited that role conflict positively impacts employees’ knowledge seeking behaviors via ICTs. This was supported only for users of online forums and was rejected for all other ICT types. Next, H1b posited that role conflict negatively impacts employees’ knowledge seeking behaviors via ICTs. No support was found for this hypothesis and as a result, it was rejected.

Hypothesis 2a proposed that role ambiguity positively impacts knowledge seeking behaviors via ICTs. This hypothesis was supported for users of all ICT system types except knowledge repositories. H2b, which posited that role ambiguity positively impacts knowledge contributing behaviors via ICTs, was also supported for all ICTs except knowledge repositories.

To determine the impact of internal versus external LOC on the knowledge seeking behaviors (hypothesis H3a), each case was coded for high (external LOC) versus low (internal LOC) value as recommended by Spector (1988). Next, the SEM model was tested for each group. The results demonstrated that internal locus of control impacted knowledge seeking behaviors, thus providing support for H3a (Table 29). No support was found for the H3b where internal LOC positively impacted knowledge contributing behaviors. As a result, H3b was rejected.
The last hypothesis (H4) proposed that ICTs moderate the relationships between the exogenous and endogenous variables. Tests for the moderating effect of the number of ICT systems used were conducted and the results demonstrated support for this hypothesis. The results of these tests were provided in the next section.

<table>
<thead>
<tr>
<th>ICT Type</th>
<th>Hypothesis</th>
<th>Hypothesized Path</th>
<th>Path Coefficient (β)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>H1a</td>
<td>KnowSeek &lt;-- RoleConf</td>
<td>0.08</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H1b</td>
<td>KnowContr &lt;-- RoleConf</td>
<td>0.08</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H2a</td>
<td>KnowSeek &lt;-- RoleAmb</td>
<td>0.18*</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H2b</td>
<td>KnowContr &lt;-- RoleAmb</td>
<td>0.09**</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H3a</td>
<td>KnowSeek &lt;-- WLCS</td>
<td>0.13**</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H3b</td>
<td>KnowContr &lt;-- WLCS</td>
<td>-0.05</td>
<td>Rejected</td>
</tr>
<tr>
<td>Instant Messaging</td>
<td>H1a</td>
<td>KnowSeek &lt;-- RoleConf</td>
<td>0.07</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H1b</td>
<td>KnowContr &lt;-- RoleConf</td>
<td>0.04</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H2a</td>
<td>KnowSeek &lt;-- RoleAmb</td>
<td>0.24*</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H2b</td>
<td>KnowContr &lt;-- RoleAmb</td>
<td>0.19*</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H3a</td>
<td>KnowSeek &lt;-- WLCS</td>
<td>0.14*</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H3b</td>
<td>KnowContr &lt;-- WLCS</td>
<td>-0.09</td>
<td>Rejected</td>
</tr>
<tr>
<td>Online Forums</td>
<td>H1a</td>
<td>KnowSeek &lt;-- RoleConf</td>
<td>0.34**</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H1b</td>
<td>KnowContr &lt;-- RoleConf</td>
<td>0.08</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H2a</td>
<td>KnowSeek &lt;-- RoleAmb</td>
<td>0.41*</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H2b</td>
<td>KnowContr &lt;-- RoleAmb</td>
<td>0.28*</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H3a</td>
<td>KnowSeek &lt;-- WLCS</td>
<td>0.1</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H3b</td>
<td>KnowContr &lt;-- WLCS</td>
<td>-0.11</td>
<td>Rejected</td>
</tr>
<tr>
<td>Knowledge Repositories</td>
<td>H1a</td>
<td>KnowSeek &lt;-- RoleConf</td>
<td>-0.09</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H1b</td>
<td>KnowContr &lt;-- RoleConf</td>
<td>0.15</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H2a</td>
<td>KnowSeek &lt;-- RoleAmb</td>
<td>0.2</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H2b</td>
<td>KnowContr &lt;-- RoleAmb</td>
<td>-0.06</td>
<td>Rejected</td>
</tr>
<tr>
<td></td>
<td>H3a</td>
<td>KnowSeek &lt;-- WLCS</td>
<td>0.35*</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H3b</td>
<td>KnowContr &lt;-- WLCS</td>
<td>-0.001</td>
<td>Rejected</td>
</tr>
</tbody>
</table>

* *p ≤ .05; **p ≤ .10

Table 28. Hypotheses Testing Results Based on ICT Type
Table 29. Internal Locus of Control Testing Result

Table 30 displays the percent of variances explained in knowledge seeking and knowledge contributing for each type of ICT. Low R-squared values are not uncommon for cross-sectional analyses since human behavior is difficult to predict (Wooldridge, 2012).

<table>
<thead>
<tr>
<th>ICT Type</th>
<th>Knowledge Seeking $R^2$</th>
<th>Knowledge Contributing $R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>0.04</td>
<td>0.60</td>
</tr>
<tr>
<td>Instant Messaging</td>
<td>0.09</td>
<td>0.77</td>
</tr>
<tr>
<td>Online Forums</td>
<td>0.23</td>
<td>0.62</td>
</tr>
<tr>
<td>Knowledge Repositories</td>
<td>0.14</td>
<td>0.73</td>
</tr>
</tbody>
</table>

Table 30. Squared Multiple Correlations

**Moderating Effect of the Number of ICT Systems Used**

This section details the test conducted in support of hypothesis 4. To test the moderating effect of the number of ICT systems used on the relationships between the exogenous and endogenous variables in SPSS, two separate categorical variables were created. The categories in each variable were classified on the basis of the answers received on two questions from the survey: ‘What type of ICT system do you use to seek knowledge (select more than one if it applies)’, and ‘What type of ICT system do you use to seek or contribute knowledge (select more than one if it applies)’. Five categories were created in each variable: category 1- one system; category 2- two systems; category 3- three systems; category 4- four systems, and category 5- five systems) (Tables 31-32).
<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>One system</td>
<td>82</td>
</tr>
<tr>
<td>Two systems</td>
<td>116</td>
</tr>
<tr>
<td>Three systems</td>
<td>75</td>
</tr>
<tr>
<td>Four systems</td>
<td>31</td>
</tr>
<tr>
<td>Five systems</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>314</td>
</tr>
</tbody>
</table>

Table 31. Categorical ICT Seeking Variable (ICT_seek_ADD)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>One system</td>
<td>129</td>
</tr>
<tr>
<td>Two systems</td>
<td>115</td>
</tr>
<tr>
<td>Three systems</td>
<td>52</td>
</tr>
<tr>
<td>Four systems</td>
<td>14</td>
</tr>
<tr>
<td>Five systems</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>314</td>
</tr>
</tbody>
</table>

Table 32. Categorical ICT Contributing Variable (ICT_Contr_ADD)

Prior to the analysis of the moderation effects, each predictor variable was centered in accord with the recommendations by Aiken and West (1991). To examine the interaction effect, scatter plots were created where the endogenous variables (knowledge seeking and knowledge contributing) were regressed on the predictor variables with a categorical moderator (categorized across the number of systems) (Howell, 2013). The plots represented the correlation effects of role conflict, role ambiguity, and locus of control on knowledge seeking and knowledge contributing based on the various ICT groups.

The strongest negative correlation effect between role conflict and knowledge seeking was found to be .21 % ($\sqrt{r^2} = \sqrt{.047}$) for people who used four systems (Figure 7). In other words, as role conflict increased, knowledge seeking decreased among users of four ICT systems. In contrast, a strong positive correlation effect was found for people who used two systems ($r = .17$), or as role conflict increased, knowledge seeking increased among users of two ICT systems. No effect was found for people who used only one system.
The strongest negative correlation effect between role conflict and knowledge contributing was found to be .63 % (\(\sqrt{r^2} = \sqrt{.40}\)) for people who used five systems (Figure 8). In this case, when participants used five ICT systems, knowledge contribution decreased as role conflict increased. Conversely, a strong positive effect was found between role conflict and knowledge contributing for people who used four systems (\(r = .26\)).

As expected, the majority of effects between role ambiguity and knowledge seeking were found to be negative for high role ambiguity, with the strongest effect .62 %
(\sqrt{r^2} = \sqrt{.386}) between the variables among users of five systems (Figure 9). In other words, as role ambiguity increased, knowledge seeking decreased (and vice versa). The only exception was among users of two ICT systems where knowledge seeking increased when role ambiguity increased (r = .03).

**Figure 9. RA/KS Moderation Effect**

Similarly, higher role ambiguity resulted in decreased knowledge contributing with the strongest effect between the variable at .9 % (\sqrt{r^2} = \sqrt{.812}) for people who used five systems (Figure 10).

**Figure 10. RA/KC Moderation Effect**
The strongest positive correlation effect between locus of control and knowledge seeking was found to be .1% ($\sqrt{r^2} = \sqrt{.011}$) for people who used two systems (Figure 11).

![LOC/KS Moderation Effect](image)

**Figure 11. LOC/KS Moderation Effect**

The strongest negative correlation effect between locus of control and knowledge contributing was found to be .91% ($\sqrt{r^2} = \sqrt{.84}$) for people who used five systems (Figure 12). A small positive correlation effect was found among the variables for people who used three systems ($r = .1$).

![LOC/KC Moderation Effect](image)

**Figure 12. LOC/KC Moderation Effect**
Based on the results of the multi-group moderations and the regressions based on the moderating effect by the number of ICTs used, it was concluded that the ICT variable acted as a moderator and exerted influence on the relationships between the proposed variables, thus lending support for H4.

**Summary**

This chapter presented the results of a three-step analysis identified in the methodology section of this document. It was organized around the two research questions that motivated this research. The first research question asked: What are the potential factors that contribute to the commonly accepted barriers to knowledge sharing? To answer this question, a literature review analysis examined 103 articles on knowledge seeking and knowledge contributing behaviors. It identified three major knowledge sharing barriers (lack of time, poor communications skills, and lack of trust). Based on this analysis, a content analysis study was performed on the same articles, which identified a total of 199 references regarding three major contributors to these barriers. As a result, the answer to the first question was: role conflict, role ambiguity, and locus of control.

The second research question of the study was: How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing? To answer this question, a survey, consisting of 41 questions, was designed, validated by a panel of six experts and distributed to 1,368 employees. The survey yielded 314 useful responses and the data was analyzed using confirmatory factor analysis and structural equation modeling techniques.
The final results demonstrated that the proposed contributors impacted employees’ use of ICT differently. For example, employees used three types of ICTs to seek and contribute knowledge when low role ambiguity was present (the exception being knowledge repositories). Conversely, employees only used online forums to seek knowledge when they experienced role conflict and avoided using any of the four ICTs to contribute knowledge when role conflict was present. The results also demonstrated that employees with internal locus of control used all four types of systems to seek knowledge, but avoided the same systems to contribute knowledge. Finally, ICT was found to moderate the relationships between the proposed contributors and the knowledge seeking and knowledge contributing behaviors.
Chapter 5

Conclusions, Implications, Recommendations, and Summary

Introduction

The goal of this study was to gain an understanding of the contributing factors that influence common knowledge sharing barriers in the workforce and to determine the impact of these factors on the knowledge seeking and knowledge contributing behaviors of employees through the use of ICTs. This chapter presents the conclusions that were derived from the study based on the two research questions. Next, a set of limitations are discussed, followed by implications for the KM community. Finally, specific recommendations and potential future research are addressed. The chapter concludes with a summary of the research.

Conclusions

This research argued that organizations failed to transfer and retain knowledge through technology among their employees not because of lack of ICTs or their complexity, but as a result of hidden factors that cultivated knowledge sharing barriers and inhibited sharing practices. To substantiate this argument, the study proposed to determine the answers to two research questions: 1) What are the potential factors that contribute to the commonly accepted barriers to knowledge sharing?, and 2) How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing?
To answer the first research question, an extensive literature review was conducted on 103 knowledge management articles. The results uncovered three major contributors to the common knowledge sharing barriers. Of these, role conflict and role ambiguity were found to contribute to employees’ lack of time to seek or contribute knowledge. Locus of control was found to promote employees’ poor communication skills and lack of trust to share knowledge. Next, a content analysis was conducted to validate the results of the literature review. The results substantiated the findings from the literature review in that role conflict, role ambiguity, and locus of control inhibited employees’ knowledge seeking and knowledge contributing behaviors.

To answer the second research question, seven hypotheses were tested via a CFA and SEM analyses of the survey responses received from 314 full-time employees. Five types of ICTs were used to investigate the knowledge sharing practices of the employees: email, instant messaging, micro/wiki blogging, online forums, and knowledge repositories.

**Role Conflict**

First, it was hypothesized (H1a) that role conflict would positively impact employees’ knowledge seeking behaviors via ICTs. The results supported this hypothesis for employees who used online forums. This finding was explained by the propositions of the information foraging theory (Pirolli & Card, 1999). Online forums (e.g. internet message boards) are ICTs characterized by lengthier online conversational posts (when compared to the short messages relayed by the instant messaging ICTs) that are organized under specific categories known as threads. Users of online forums enjoy benefits that are not afforded by the other three ICT types. For example, an employee needs specific
knowledge due to an increased level of role conflict brought by conflicting demands from multiple authorities. The employee forgoes the time consuming effort of typing up an email message, avoids engaging a colleague in an online chat due to the time required to explain the knowledge need, and ignores the effort required to drill through a variety of topics in a knowledge repository due to time constraints. Instead, the user chooses to seek knowledge within the topic and time ordered threads of an online message board where the hidden prey (knowledge answer) is found among the discussions between several individuals. This process of maximizing the benefit of discovering the knowledge, while minimizing the costs (time investment) associated with locating it, is the essence of the information foraging theory.

Further analysis on the moderating effect of the number of ICTs used showed that as role conflict increased, knowledge seeking behaviors also increased for employees who used two systems. Conversely, the opposite effect was found for employees who used more than two systems. The results showed that as their role conflict increased, their knowledge seeking behaviors decreased. Again, the findings coincided with the propositions of the information foraging theory, where knowledge seekers trade costs (in this case time) for the opportunities to uncover knowledge, but only up to a certain level.

Extant literature suggests an association among role conflict, role ambiguity, and ICT number and complexity (Beehr, 1976; Miles & Perreault Jr, 1976; Tarafdar et al., 2007). For example, organizations increase the number of ICTs in order to improve employees’ productivity, increase communication, and decrease production time (Borghans & Weel, 2006). At the same time, a greater number of ICTs translates into increased complexities and an increase in employees’ time required to learn how to operate and use them. If an
employee’s role conflict is increased at this time, perceived time pressure also increases, leading to a decrease in the amount of time available for knowledge sharing practices. This research provides evidence in support of this statement. The results suggest that for employees who used more than two ICTs, a negative influence on the relationship between their role conflict and knowledge sharing practices was observed with decreased levels of knowledge seeking behaviors.

Hypothesis 1b posited that role conflict would negatively impact employees’ knowledge contributing behaviors via ICTs. The results of the CFA and SEM analyses did not support this hypothesis for users of a single system; however, this hypothesis was supported for employees who used two systems when the moderating effect of the number of ICTs was examined. As it was argued in H1a, role conflict creates increased time pressure for employees, and its effect was exacerbated when multi-system complexities were added to this mix. The resultant effect was a negative impact on employees’ knowledge contributing behaviors.

Additional analysis of the endogenous variables revealed that knowledge seeking proved to be a very strong predictor of knowledge contributing, especially for users of knowledge repositories (β=.9, which explained nearly 80% of the total variance) (Table 33).

<table>
<thead>
<tr>
<th>ICT Type</th>
<th>Path</th>
<th>Path Coefficient</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>KnowContr &lt;-- KnowSeek</td>
<td>0.76*</td>
<td>0.60</td>
</tr>
<tr>
<td>Instant Messaging</td>
<td>KnowContr &lt;-- KnowSeek</td>
<td>0.84*</td>
<td>0.77</td>
</tr>
<tr>
<td>Online Forums</td>
<td>KnowContr &lt;-- KnowSeek</td>
<td>0.65**</td>
<td>0.62</td>
</tr>
<tr>
<td>Knowledge Repositories</td>
<td>KnowContr &lt;-- KnowSeek</td>
<td>0.9*</td>
<td>0.79</td>
</tr>
</tbody>
</table>

*p ≤ .001; **p ≤ .05

Table 33. Predictor of Knowledge Contributing
As noted earlier, extant KM literature provides evidence that extrinsic factors such as organizational rewards, promotions, raises, and incentives motivate knowledge contributing behaviors (Hsu et al, 2007; Kankanhalli et al., 2005; Watson & Hewett, 2006). It is probable that the predictor strength of knowledge seeking behaviors for knowledge repository users was based on the extrinsic motivational factors. Knowledge repository ICTs typically store identifiable information of the original knowledge contributor, thus ensuring contribution practices can be tracked and contributors rewarded.

Intrinsic factors such as reciprocity, enjoyment in helping others, altruism, and personal achievement have been also found to serve as motivating factors to knowledge contributing behaviors (Kankanhalli et al., 2005; Wagner & Prasarnphanich, 2007). These factors may explain the predictor strength of knowledge seeking for users of email and instant messaging ICTs where knowledge was exchanged as a result of a direct request from a knowledge seeker. Moreover, the contributed knowledge in these types of ICTs was typically not stored for organization-wide use (as in the case of instant messaging ICTs). The findings for these specific ICTs and in the case of hypothesis 1b are best explained by the social capital theory (Bourdieu, 1986) which proposes that individuals who build social networks benefit from the value created by these networks since these networks foster reciprocity (a social capital norm) which in turn facilitates the flow of knowledge among the network members. Email and instant messaging ICTs facilitate a direct contact between socially connected knowledge sources with established trusting relationships. As a result, users rely on their networks for knowledge seeking and in turn reciprocate by contributing knowledge.
Role Ambiguity

Hypothesis 2a stated that role ambiguity positively impacts knowledge seeking behaviors via ICTs. The results supported this hypothesis for employees who used each of the investigated ICT systems. Role ambiguity was the strongest predictor of knowledge seeking among users of online forums (β=.41, p≤.05), followed by users of instant messaging (β=.24, p≤.05). As with the conclusions reached with hypothesis 1b, knowledge seekers select the type of ICT that will yield the highest benefit for the least costs. Online forums and instant messaging systems are among the ICTs that require the least amount of time to uncover hidden knowledge. Moreover, the moderating-effect analysis revealed that for employees who used two systems, as role ambiguity increased so did their knowledge seeking behaviors. The inverse effect observed in H1a was also observed for users of more than two systems. For these employees, as role ambiguity increased, knowledge seeking decreased due to time pressures and effort required to overcome multi-systems’ complexities.

Hypothesis 2b stated that role ambiguity positively impacts knowledge contributing behaviors via ICTs. The results demonstrated support for this hypothesis among users of all ICTs with the exception of knowledge repositories. The strongest predictor coefficient was for online forums (β=.28, p≤.05). This finding is consistent with the proposition of the social exchange theory (Blau, 1964) that individuals make a determination whether to engage in knowledge contribution on the basis of a cost/benefit analysis. In this case, an ICT (such as email, instant messaging, or an online forum) that facilitates two-way communication between a seeker and a contributor affords its users a chance to engage in a direct exchange of a commodity (e.g. knowledge) through an interaction. Similarly,
users of two ICTs reported that as ambiguity increased, their knowledge seeking behaviors also increased. In contrast, analysis of users of more than two systems showed the inverse effect observed in the prior hypotheses. For these employees, as role ambiguity increased, knowledge contributing decreased.

An unanticipated result from the analysis of the role ambiguity’s impact on knowledge contribution showed that knowledge seeking mediated the relationship between role ambiguity and knowledge contributing behaviors via ICTs. This finding is in line with the proposition of the social exchange theory that individual relationship decisions are driven by the benefits derived and costs incurred during the exchange (Blau, 1964). Monge and Contractor (2003) argued that relationships between individuals were based on the calculated worth of these relationships where worth was equal to the benefits minus the costs. The worth was greatest when the benefits outweigh the costs. In this study, employees who experienced role ambiguity contributed knowledge to others via ICTs through the knowledge seeking process despite the cost involved in this exchange.

*Locus of Control*

Hypothesis 3a posited that internal locus of control positively impacts knowledge seeking behaviors via ICTs. The results supported this hypothesis among users of all ICTs with the exception of online forums. The strongest predictor coefficient was for users of knowledge repositories (β=.35, p≤.05). This was not unexpected as internals tend to accept responsibilities for their own actions, while blaming themselves for their failures due to lack of effort to obtain necessary information (Storms & Spector, 1987). Since internals believe in controlling their own destiny, they’ll tend to rely on their own search efforts to uncover hidden information in ICTs where the data is highly codified.
and requires structured searching (e.g. knowledge repositories). If they are unable to uncover the information needed to make a decision, internals will turn for direct help from others via ICTs that will allow them to engage and potentially control the flow of information (via instant messaging and email).

Conversely, no support was found for the H3b hypothesis, which posited that internal LOC positively impacted knowledge contributing behaviors. A reason for the lack of support for this hypothesis was that internal LOC employees found greater enjoyment and preferred to engage in a face-to-face and word-of-mouth communication with others because this allowed them to maintain control of the situation (Flaherty et al., 1998; Lam & Mizerski, 2005). Internals may also perceive the act of engaging in knowledge contribution via ICTs as a loss of emotional control that can only be experienced via in-person interaction with others. Moreover, engagement in knowledge contributing via ICTs may be perceived as a time consuming event that further erodes internals’ control over their personal time.

Additional analysis was performed to examine whether any of the hypotheses were supported for employees with external LOC (Table 34). In sharp contrast to internals (where LOC was the only predictor of knowledge seeking), knowledge seeking behaviors for external LOC employees were also predicted by role conflict and role ambiguity (with role ambiguity being the strongest predictor among the three). As with internals, no support was found for the knowledge contributing hypotheses among externals either.
Table 3. Hypothesis Testing for External LOC

<table>
<thead>
<tr>
<th>WLC Type</th>
<th>Hypothesis</th>
<th>Hypothesized Path</th>
<th>Coefficient (β)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>External</td>
<td>H1a</td>
<td>KnowSeek &lt;-&gt; RoleConf</td>
<td>0.15**</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H2a</td>
<td>KnowSeek &lt;-&gt; RoleAmb</td>
<td>0.26*</td>
<td>Accepted</td>
</tr>
<tr>
<td></td>
<td>H3a</td>
<td>KnowSeek &lt;-&gt; WLCS</td>
<td>0.15**</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

*p ≤ 0.05; **p ≤ 0.10

The last hypothesis (H4) posited that ICTs moderate the relationships between the exogenous and endogenous variables. As demonstrated in the discussion thus far, the results showed that ICT was found to moderate the strength of the relationships between the contributors and the knowledge seeking and knowledge contributing behaviors. For example, in one instance (H1a) a specific ICT influenced the relationship between role conflict and knowledge seeking. In other instances (H2a and H2b), the number of ICTs influenced the relationships between role ambiguity, knowledge seeking, and knowledge contributing behaviors. As a result, this hypothesis was found to be supported.

Finally, textual analysis of the ICT brands used by the respondents to seek and contribute knowledge was conducted. The email systems most commonly used for seeking and contributing knowledge were IBM’s Lotus Notes and Google’s Gmail. Most common instant messaging systems were Microsoft’s Lync and Skype. For micro/wiki blogging, respondents listed Microsoft’s Yammer and Facebook. Among the online forums, the most commonly cited were Google’s and Yahoo’s, while Microsoft’s SharePoint and Wikipedia were cited as frequently used knowledge repositories.

Limitations

One limitation of this study was the purposive sample. Since SurveyMonkey Audience was used as a medium to obtain participants to the study, the respondents
sample may not have been a representation of the entire population. Moreover, although the sample was reflective of the population, as noted in the demographics section in chapter 4, it consisted of employees who joined a program to take surveys. As a result, it was probable that the sample was skewed somewhat from that of the overall population.

Scovetta (2013) argued that the data collection method was also a limitation. Despite the use of established and empirically tested instruments, some of the respondents might not have comprehended the instruments’ meaning and might have provided responses that conflicted with their true beliefs. Similarly, a limitation of this study was the inability to determine the beliefs and responses of those who choose not to complete the survey as the researcher was unable to get in touch with any of them and discuss these beliefs.

Another potential limitation of the study was its generalizability across certain job types. For example, this study was delimited to respondents who occupied the position of analyst. It is conceivable that the results of this study would not apply to employees with jobs where role conflict, role ambiguity, and ICTs are not present (e.g. certain trade jobs). Furthermore, it is probable that the impacts of exogenous on the endogenous variables may be much more pronounced in jobs with greater demand on the use of ICTs (e.g. system administrators, software developers, or content managers). Finally, the moderating effect of the ICTs on the relationships among the constructs might also vary as a result of the specific type or number of ICTs used in these positions.

Implications

This section addresses the implications of the present study on the field of knowledge management, effects on the professional practice, and future research. First, specific
contributions to the KM literature are discussed. This is followed by examination of the study’s potential impacts on professional organizations.

Contribution to the KM Literature

The current gap in the KM literature on how to effectively promote knowledge sharing among employees in organizations exists because barriers that inhibit knowledge sharing practices are poorly understood. This study enhanced the KM body of knowledge by providing an in-depth view of several barriers that are often disregarded in KM studies. For example, Bock et al. (2005) noted that their study overlooked time, communication, and structural barriers to knowledge sharing and urged other researchers to expand on these barriers. The findings of this study shed light on three of these barriers (lack of time, poor communication skills, and lack of trust) and their individual roles in the knowledge sharing process within organizations.

In their study on KS in virtual communities, Chiu et al. (2006) found a number of structural, relational and cognitive factors that motivated the knowledge seeking behaviors of 308 IS professionals; however, the researchers didn’t investigate what motivated knowledge contributing behaviors. As a result, they urged future researchers to study why individuals choose to contribute knowledge online. In response to their call, the results of this study advanced the KM understanding on specific factors (i.e. role conflict, role ambiguity and LOC) that motivated individuals to contribute knowledge using ICTs.

The present study also extended prior KM models by incorporating employees’ knowledge-sharing behaviors via specific technology agents. For example, Connelly and Kellowey (2003) called upon future researchers to determine whether knowledge sharing
technology (e.g. emails, or knowledge repositories) has any impact on knowledge sharing practices. The findings in this study showed that ICTs play an important moderating role in the relationship between employees’ organizational roles and their knowledge sharing practices. Connelly and Kellowey also questioned whether separate knowledge sharing practices existed among different occupations and how these practices were influenced by employees’ commitment to their roles. This study provided partial answers to these questions. The results showed that the conflict and ambiguity of the analyst role in 19 different industries influenced knowledge sharing behaviors via ICTs. Moreover, the study demonstrated that employees’ personal LOC also influenced these behaviors.

Chennamaneni, Teng, and Raja (2012) proposed a unified model for knowledge sharing behaviors in their study among 180 MBA students at a large state university in the Southwest United States. Although their contribution deepened understanding on intrinsic and extrinsic motivational factors for knowledge sharing, they acknowledged that future research should investigate factors such as personality traits and task interdependence as potential influences of knowledge sharing. The present study fulfilled this call and extended their model by demonstrating how one personal characteristic (LOC) and two job characteristics (role conflict and role ambiguity) impacted knowledge sharing behaviors in organizations.

The results of the present study extend another appeal for future research issued by Connelly et al. (2013), this one searching an answer to the question on how perceived time pressure influences knowledge seekers’ behaviors. In their study of 403 undergraduate students, the researchers found that perceived time pressure prevented students from sharing their knowledge as it fostered feelings of preoccupation. This study
showed that perceived time pressures were in fact symptoms of the conflict and ambiguity in the roles of individuals and it was precisely these contributors that influenced the knowledge seeking and contributing practices. Furthermore, the results demonstrated that these contributors positively influenced the behaviors in question.

Kankanhali, Tan, and Wei (2005) reasoned that “sufficient ‘slack’ time may also promote knowledge seeking from EKR’s,” (p. 1164). They proposed that this could be accomplished by integrating EKR usage with employees’ existing roles where time to seek knowledge from an EKR becomes part of the regular work schedule. The findings of this study showed that time pressure resulted from role constraints that had a negative effect on knowledge sharing behaviors (e.g. high role ambiguity negatively impacted knowledge sharing practices).

The results of the study offered explanations for several observations made by Santos et al. (2012). In their study, the researchers found that certain ICTs were perceived by employees as inadequate tools for KS due to the extra time required for login, folder navigation (in order to locate specific codified knowledge), and uploading of new documents. As a result, the researchers argued that “people use knowledge management systems for some weeks and then switch back to e-mail. The subjects consider that the main reason for that is it requires too much time. They are aware that it only requires a few extra seconds, but for the participants, it is still much faster to open an e-mail and attach a file,” (p. 35). The results of this study propose explanations as to why email is the preferred medium to facilitate direct or indirect communication between employees and how this ICT influenced the relationships between employees’ roles and their knowledge sharing behaviors.
Another contribution to the KM body of knowledge was the operationalization and validation of the instruments used to measure knowledge seeking and knowledge contributing behaviors via ICTs. Peinl (2011) proposed several KM instruments and argued that “most of the instruments proposed in literature are singular measures that are not aligned with other measures and are either organizational, human-oriented or technical,” (p.1). Until recently, the majority of instruments from the KM literature measured knowledge sharing behaviors for specific KM systems, such as message boards, forums, electronic knowledge repositories, or virtual communities (Bock et al., 2005; Kankanahali et al., 2005; Teh & Sun, 2011; Wasko & Faraj, 2005; Yan et al., 2013). In this study, although the original instruments were adapted from De Vries et al. (2006), the items were modified to offer greater insight into the universal characteristics of the knowledge seeking and knowledge contributing behaviors via ICTs. Moreover, the use of an expert panel in the validation of the modified instrument greatly improved the instruments’ reliability values, thus contributing a more adequate means to measure such behaviors.

Finally, a contribution of this research to the KM literature was the use of a causal modeling approach. For example, Despres and Chauvel (1999) argued that “The bulk of academic/practitioner literature on knowledge is case-based and anecdotal, e.g. pre-paradigmatic,” (p. 112). Demarest (1997) noted that KM is a soft discipline, not particularly useful beyond augmenting the corporate culture. Lloria (2008) argued that there is still “a lack of models based on the use of information technology as a basis for knowledge management,” (p. 87). The model proposed in this study provided not only a rich example of how technology can be used to influence KM in organizations, but also a
viable example of a quantitative approach to data analysis that could be applied in future research initiatives on KM.

To sum up, the present study contributed to the KM literature by closing the gap between knowledge sharing barriers, the use of ICTs for knowledge seeking and contributing, and the factors that contributed to these barriers. Results from the study provided a broader understanding of the predictors of employees’ knowledge seeking and contributing behaviors via several types of ICTs, while the theoretical model and the quantitative approach served as examples for future research practices.

**Impacts on Professional Organizations**

The present research provided several practical implications for organizations. First, the study added value to managers of the US based businesses who already invest nearly $290 billion on ICTs to prevent loss of knowledge (US Census, 2013). It did so by pinpointing specific ICTs that could enhance employees’ knowledge seeking and knowledge contributing behaviors. For example, research reported that employees spend 61% of their work week using ICTs to share knowledge, communicate and collaborate with other coworkers (Chui et al., 2012). Of these 61%, 28% is dedicated to reading and answering e-mails, 19% to searching and gathering information, 14 % communicating and collaborating. Email is still the predominant communication form with 929 million business email boxes worldwide in 2013 (Levenstein, 2013). This study explained the need for this predominant ICT. The results showed that email users who sought knowledge from other coworkers were extremely likely to also contribute knowledge through the same medium (β=.76). Similarly, organizations with employees that
experienced low to moderate levels of role ambiguity were likely to both seek knowledge 
(β=.18) and contribute knowledge (β=.09) to others via email.

The present study provided evidence to support the need for investments in a 
synchronous ICT (e.g. instant messaging). This ICT was found to benefit organizations 
whose employees experienced low to moderate role ambiguity roles. For these 
organizations, users of instant messaging not only sought knowledge from others when 
they experienced role ambiguity (β=.24), but also contributed knowledge (β=.19) via the 
same ICT.

The study showed that organizations may also benefit from investments in 
asynchronous ICTs such as online forums and message board. Specifically, organizations 
that implemented online forums and whose employees experienced high role conflict saw 
an increase in the level of knowledge seeking via these ICTs (β=.34) while users with 
low to moderate role ambiguity also sought (β=.41) and contributed knowledge (β=.28) 
via these ICTs. It is also prudent to issue a note of caution to managers who consider 
implementing multiple new systems. As shown, organizations need to be cognizant of the 
complexities and perceived time pressures that emerge among employees with the 
introduction of multiple new systems.

The study also demonstrated that employees with high internal LOC sought 
knowledge via email (β=.13), instant messaging (β=.14), and knowledge repositories 
(β=.35). For these employees, role conflict and role ambiguity didn’t play parts in their 
knowledge sharing practices. Conversely, employees with high external LOC not only 
sought knowledge via the same synchronous and asynchronous ICTs, but also engaged in 
knowledge seeking when they experienced conflict and ambiguity in their roles. As a
result, organizations need to be aware of their employees’ LOC styles prior to engaging in strategic ICT investments as this may enable them to set realistic expectations for specific knowledge sharing practices.

Finally, the study showed that most common email systems on the market were IBM’s Lotus Notes and Google’s Gmail. Moreover, most common instant messaging systems were Microsoft’s Lync and Skype. Among the online forums and message boards, the most common were Google’s and Yahoo’s, while Microsoft’s SharePoint and Wikipedia were the most frequently used knowledge repositories. These findings may assist management in their investment decision by allowing them the opportunity to investigate what functionality offered by each of these ICTs can best suit their organization’s needs.

**Recommendations**

This section provides specific recommendations for improvement of organizational practices. A discussion on potential future areas of research is also included.

**Recommendation for Organizations**

This research demonstrated the existence of an intricate web of relationships and interactions between role conflict, role ambiguity, locus of control, the number and type of ICTs, and knowledge seeking and knowledge contributing behaviors. As a result of this complexity, it is recommended that any organization planning to introduce new ICTs, or increase the number of ICTs in an effort to improve their employees’ productivity, should also pay special consideration to employees’ existing levels of role conflict and role ambiguity. As shown, the existence of multiple ICTs may have adverse effects on the employees’ level of knowledge sharing. These negative effects surface when employees’ increased perceptions of time pressures to deliver existing workloads collide with steep
learning curves associated with acquiring knowledge on how to use the new ICTs. Companies should beware of these conflicts and pay close attention to the level of role conflict and role ambiguity of their employees in times of new technology launches. Management must ensure that when new systems are introduced, employees’ roles remain unchanged otherwise organizations may see a decrease in knowledge sharing practices.

This study also demonstrated that role ambiguity positively influenced knowledge contributing behaviors and this relationship was mediated by knowledge seeking behaviors. As a result, organizations can increase knowledge contributing practices of their employees by ensuring that their role ambiguity levels remain low. To accomplish this, management needs to make certain that employees:

- Are aware of the authority they possess in their organizational roles;
- Have clearly planned goals;
- Have their time adequately divided among their work tasks;
- Have clear understanding of the expectations in their positions;
- Have clear direction on how to do their jobs.

Additionally, to increase employees’ knowledge seeking behaviors, organizations need to urge staff to use ICTs to communicate among each other about any newly acquired knowledge. Together, these recommendations will ensure that the right factors remain at play in order to influence both types of knowledge sharing behaviors via ICTs.

Finally, the study also showed that LOC was a good predictor of knowledge seeking behaviors. In fact, while internals were influenced only by their LOC to seek knowledge, externals were also influenced by role conflict and role ambiguity to seek knowledge.
Since externals are known to be communication apprehensive (McCroskey et al., 1976), organizations need to consider implementing training programs that are designed to improve communication skills among externals. These programs may help employees overcome the poor communication skill barriers created by their LOC. This in turn may break the barriers to knowledge sharing introduced by the employees’ role conflict and role ambiguity and allow them to engage more freely in knowledge sharing practices.

Future Research

Future research should expand KM understanding of the specific effects of ICT systems on knowledge sharing behaviors. First, research should investigate what ICT capacities (e.g. direct or indirect communication features) contribute to the increase in knowledge seeking and knowledge contributing practices. Moreover, studies may examine whether specific groupings of ICTs (both synchronous and asynchronous) have any significant effects on knowledge sharing behaviors. Such studies will expand our understanding on what specific behavioral patterns are influenced by specific ICT characteristics and enhance the knowledge management body of knowledge.

While the present study demonstrated that knowledge seeking and knowledge contributing practices increased when two ICTs were used, it didn’t provide evidence of what ICT types influenced such behaviors. Future research may focus on such combinations and determine how they enhance or inhibit knowledge sharing among employees.

Second, future studies should examine whether there is an optimum number of ICT systems and an optimum level of knowledge sharing that can be achieved through a certain number of features of ICTs. The present study investigated five ICTs (email,
instant messaging, micro/wiki blogging, online forums, and knowledge repositories) and showed that in some instances, a combination of the five systems had significant effects on the relationships between role conflict, role ambiguity and knowledge sharing behaviors. Future studies should find an answer to the questions: How many is too many and why?

Third, this study didn’t consider emerging technologies such as mobile collaboration, and ambient or artificial intelligence and their potential effects on KM in organizations. Future research should investigate how emerging new technologies can facilitate specific knowledge sharing behaviors.

Fourth, future research should also examine the effects of social media systems (e.g. micro/wiki blogging) on the relationships between role conflict, role ambiguity, and LOC on knowledge sharing behaviors. The sample size in the current study contained few numbers of users of such ICTs and as a result, a reliable analysis could not be performed.

Finally, role overload occurs when employee’s abilities to perform certain task are exceeded by that role’s expectations (Schaubroeck, Cotton, & Jennings, 1989). While the effect of role overload on knowledge seeking and knowledge contributing behaviors was not examined in this study, it also represents a good candidate for future research.

**Summary**

Extant KM literature suggests that effective knowledge exchange between experts and novices improves the competitive advantage of organizations; however, a gap in the literature exists that explains what factors promote common knowledge sharing barriers such as lack of time, poor communications skills, and lack of trust. To bridge this gap, this study proposed to answer two research questions.
The first research question asked: What are the potential factors that contribute to the commonly accepted barriers to knowledge sharing? To answer this question, a comprehensive three-stage literature review was performed on 103 KM articles. It examined the knowledge sharing process as a set of knowledge seeking and knowledge contributing behaviors and proposed the theory of information foraging as a model to explain these behaviors. Three major barriers to knowledge sharing were extracted from the literature review: lack of time, poor communication skills, and lack of trust. Three underlying factors that promoted these barriers were also proposed: role conflict, role ambiguity, and locus of control.

Next, a six-stage content analysis study was conducted on the same 103 articles in order to determine whether the proposed contributors were valid. The content analysis study identified a total of 199 references that percolated to three observed major contributors to the knowledge barriers examined during the literature review. These potential contributors included role conflict, role ambiguity, and locus of control.

The second research question of the study was: How do these factors impact employees’ use of ICTs for knowledge seeking and knowledge contributing? To answer this question, a causal knowledge sharing model was developed and seven hypotheses proposed that explained the impact of the contributory factors on employees’ knowledge sharing practices via ICTs.

A survey consisting of 41 questions was developed and validated via a panel of six experts prior to its distribution to 1,368 full-time analysts from a variety of industries that used ICTs at their places of employment. The data of 314 useful responses were analyzed
using confirmatory factor analysis and structural equation modeling techniques to validate the proposed model.

The final results from the analysis confirmed that the proposed contributors impacted employees’ knowledge sharing practices via ICTs. Knowledge seeking and knowledge contributing behaviors were predicted by role conflict, role ambiguity, and locus of control, while ICT was found to moderate the strength of the predictors. In addition, the propositions of three separate theories were found to explain the results of this study.

First, information foraging theory was used to explain role conflict as a predictor to knowledge sharing behaviors where employees select specific ICTs to discover hidden knowledge while minimizing time costs associated with searching for this knowledge. Next, social capital theory was used to explain the knowledge contributing behaviors of employees where individuals used the benefits of their social networks to reciprocate their knowledge with others.

Finally, the social exchange theory explained the mediating role that knowledge seeking played on the relationship between role ambiguity and knowledge contributing behaviors via ICTs. The results suggested that employees contributed knowledge to others through the process of knowledge seeking despite the costs associated with the effort involved.

This study made several contributions to the KM body of knowledge. First, the knowledge gap on factors that contributed to common knowledge sharing barriers was closed. An improved knowledge sharing instrument was proposed to measure the knowledge seeking and contributing behaviors of employees. Furthermore, the study
provided a schematic frame on how to conduct future quantitative studies in the KM literature.

The study also provided specific implications for organizations. Organizations are encouraged to be mindful to the level of role conflict and role ambiguity of their employees, the specific characteristics of the ICTs, and their quantity prior to deploying these systems. As demonstrated by the results, both quantity and functionality of ICTs exhibited specific moderating effects on the predictors and criterions. Moreover, management should be aware of their employees’ internal versus external LOC as each of these types have a different effect on the knowledge seeking practices.

Future research should focus on determining the effects of specific ICT functions and groupings of ICTs on knowledge sharing behaviors. Additionally, optimum number of ICTs versus optimum level of knowledge sharing achieved should also be examined. Finally, it is recommended that the moderating effects of social media systems on the predictor and criterions should be also examined.
## Appendix A

### Literature Review Matrix

<table>
<thead>
<tr>
<th>Authors</th>
<th>Study Type/Sample</th>
<th>Knowledge Behavior Context</th>
<th>Noted Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abrams, Cross, Lesser, and Levin (2003)</td>
<td>Qualitative/N=40</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Al-Ame, Wilensky, Redmell's and Simmons (2011)</td>
<td>Empirical field study/N=44</td>
<td>X</td>
<td>X</td>
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<td>Andrews and Delahaye (2000)</td>
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<td>X</td>
</tr>
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<td>X</td>
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<td>X</td>
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<td>X</td>
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<td>Moli and Mabert (2007)</td>
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<td>Sandhu, Jain, and Ahmad (2011)</td>
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<td>Qualitative N=10</td>
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<td>X</td>
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<td>Staples and Webster (2008)</td>
<td>Survey N=824</td>
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<td>X</td>
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<td>Sui and Contractor (2012)</td>
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<td>Teh and Sun (2012)</td>
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<td>Thomas, Fugate, and Koukova (2011)</td>
<td>Experiment N=126</td>
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<td>X</td>
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<tr>
<td>Tokar, Aloysius, Waller, and Williams (2011)</td>
<td>Experiment N=109</td>
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<td>X</td>
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<td>Authors</td>
<td>Study Type/Sample</td>
<td>Knowledge Behavior Context</td>
<td>Noted Barriers</td>
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<td>-------------------------------------</td>
<td>------------------------------------</td>
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<td>Van der Klerk, Lijkwijk, Rasker, and De Dreu (2009)</td>
<td>Experiment/N=72</td>
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<td>Willem and Buelens (2009)</td>
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<td>Yeh, Lai, and Ho (2006)</td>
<td>Case Study</td>
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<td>Yuan, Rickard, Xia, and Scherer (2011)</td>
<td>Mix methods/N=48</td>
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## Appendix B

### Survey Questions

<table>
<thead>
<tr>
<th>Role Conflict Questions</th>
<th>Very False</th>
<th>Very True</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I have to do things that should be done differently.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>2. I work under incompatible policies and guidelines.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>3. I receive and assignment without the manpower to complete it.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>4. I have to buck a rule or policy in order to carry out an assignment.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>5. I work with two or more groups who operate quite differently.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>6. I receive incompatible requests from two or more people.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>7. I do things that are apt to be accepted by one person and not accepted by others.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>8. I receive an assignment without adequate resources and materials to execute it.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>9. I work on unnecessary things.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Role Ambiguity Questions</th>
<th>Very False</th>
<th>Very True</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel certain about how much authority I have in my position.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>2. I have clearly planned goals for my job.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>3. I am sure I divide my time properly while performing my tasks.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>4. I know my responsibilities in my position.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>5. I know exactly what is expected of me in my position.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
<tr>
<td>6. I receive lucid explanations of what I have to do in my job.</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Work Locus of Control Questions</th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly Agree</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. On most jobs, people can pretty much accomplish whatever they set out to accomplish</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. If you know what you want out of a job, you can find a job that gives it to you</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Getting the job you want is mostly a matter of luck</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Promotions are usually a matter of good fortune</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Promotions are given to employees who perform well on the job</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. It takes a lot of luck to be an outstanding employee on most jobs</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. People who perform their jobs well generally get rewarded</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. The main difference between people who make a lot of money and people who make a little money is luck</td>
<td>1 2 3 4 5 6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### ICTs are email, instant messaging, micro/wiki blogging, online forums, or knowledge repositories

**ICT Knowledge Seeking Questions**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly Agree</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. When I need specific knowledge, I use the ICT system to ask my colleagues about it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2. I use the ICT system to stay informed of what my colleagues know.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3. When I need to learn new knowledge, I use the ICT system to ask my colleagues to teach me what they know.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>4. When a colleague is good at something, I use the ICT system to ask them to teach me how to do it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>5. What type of ICT system do you use to seek knowledge (select more than one if it applies)? Email, Instant Messaging, Micro/Wiki Blogging, Online Forums, Knowledge Repositories</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

6. Please provide the name(s) of the ICT system(s) you use to seek knowledge at work (e.g. Outlook, Lotus Notes, Yammer, Lync, etc.)

### ICTs are email, instant messaging, micro/wiki blogging, online forums, or knowledge repositories

**ICT Knowledge Contributing Questions**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly Agree</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I use the ICT system to tell my colleagues when I’ve learned something new about doing my job.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2. I use the ICT system to keep my colleagues informed of what I am doing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3. I use the ICT system to share knowledge I have with my colleagues.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>4. I regularly use the ICT system to tell my colleagues what I am doing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>5. What type of ICT system do you use to contribute knowledge (select more than one if it applies)? Email, Instant Messaging, Micro/Wiki Blogging, Online Forums, Knowledge Repositories</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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</table>

6. Please provide the name(s) of the ICT system(s) you use to contribute knowledge at work (e.g. Outlook, Lotus Notes, Yammer, Lync, etc.)

### Demographic Question

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is your gender?</td>
<td>-21</td>
<td>21-29</td>
</tr>
<tr>
<td>2. What is your age?</td>
<td>30-34</td>
<td>35-39</td>
</tr>
<tr>
<td>3. What is your education level?</td>
<td>Highschool</td>
<td>College</td>
</tr>
<tr>
<td>4. How many years of work experience in your current position?</td>
<td>1-5 years</td>
<td>6-10 years</td>
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</tbody>
</table>

5. To the best of your knowledge, your company has between: 1-50 employees | 51-500 employees | 501-2,000 employees | 2,001-10,000 employees | >10,000 employees |
Appendix C

Permissions to Use Survey Instruments

To: pspector@usf.edu
Cc: Timothy Ellis

Dr. Paul Spector
Department of Psychology, PCD 4118
University of South Florida
Tampa, FL 33620 USA
pspector@usf.edu

January 13, 2014

Dear Dr. Spector,

My name is Simon Cleveland and I am a doctoral candidate at Nova Southeastern University. Presently, I am engaged in my dissertation research: Rethinking knowledge sharing in organizations: A causal model to predict employees' knowledge seeking and knowledge contributing behaviors via information and communication technologies (ICT) and my dissertation adviser is Dr. Timothy Ellis (copied).

I encountered the research you completed entitled Development of the work locus of control scale (WLC) and would like your written permission to use your WLCS 8-item survey instrument in my research and to include it in the appendix of my dissertation.

Please do not hesitate to contact me if you would like to discuss this matter or would like more information.

Thank you for your kind consideration.

Respectfully,

Simon Cleveland
Doctoral candidate at Nova Southeastern University
2764 Orange Grove Trail
Naples, FL 34110
Sc1674@nova.edu
Dear Simon,

You have my permission to use in your research any of my instruments I have provided on my website, including the WLCS. You can find details about them in the Scales section of my website http://shell.cas.usf.edu/~spector. I allow free use for noncommercial research and teaching purposes in return for sharing of results. This includes student theses and dissertations, as well as other student and nonstudent research projects. Copies of the scale can be reproduced in a thesis or dissertation as long as the copyright notice is included as indicated on the website. Results can be shared by providing an e-copy of a published or unpublished research report (e.g., a dissertation). You also have permission to translate any of my scales into another language under the same conditions in addition to sharing a copy of the translation with me. Be sure to include the copyright statement, as well as credit the person who did the translation with the year.

Thank you for your interest in my scales, and good luck with your research.

Best,

Paul Spector, Distinguished Professor
Department of Psychology
PCD 4118
University of South Florida
Tampa, FL 33620
813-974-0357
pspector@usf.edu
Permission to use Role Conflict and Role Ambiguity Scales

Simon Cleveland
Tue 1/14/2014 11:29 AM

To: permissions@sagepub.com

You forwarded this message on 1/14/2014 11:55 AM.

Dear Sir or Madam,

My name is Simon Cleveland and I am a doctoral candidate at Nova Southeastern University. Presently, I am engaged in my dissertation research: Rethinking knowledge sharing in organizations: A causal model to predict employees’ knowledge seeking and knowledge contributing behaviors via Information and communication technologies (ICT) and my dissertation adviser is Dr. Timothy Ellis.


I have attempted to contact them to request their permission to use the Role Conflict and Role Ambiguity Scales in my research, but without success. I would like your written permission to use Role Conflict and Role Ambiguity Scales instrument in my research and to include it in the appendix of my dissertation.

Please do not hesitate to contact me if you would like to discuss this matter or would like more information.

Thank you for your kind consideration.

Respectfully,

Simon Cleveland
Doctoral candidate at Nova Southeastern University
2764 Orange Grove Trail
Naples, FL 34120
Sc1574@nova.edu
Dear Simon,

Thank you for your request. You can consider this email as permission to reprint the material as detailed below in your upcoming dissertation. Please note that this permission does not cover any 3rd party material that may be found within the work. We do ask that you properly credit the original source. Please contact us for any further usage of the material.

Best regards,

Michelle Binur
Appendix D

IRB Approval

MEMORANDUM

To: Simon Cleveland
From: Ling Wang, Ph.D.
Institutional Review Board
Date: Feb. 11, 2014
Re: Rethinking knowledge sharing in organizations: A model to predict employees’ knowledge seeking and knowledge contributing behaviors via information and communication technologies (ICT)

IRB Approval Number: wang02151404

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review. You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

1) CONSENT: If recruitment procedures include consent forms these must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.

2) ADVERSE REACTIONS: The principal investigator is required to notify the IRB chair and me (954-262-5369 and 954-262-2020 respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, life-threatening situation, death, or loss of confidentiality/privacy of subject. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.


Cc: Protocol File
Appendix E

Expert Panel E-mail Invitation and Validation Form

Dear ________________,

As part of my doctoral dissertation at Nova Southeastern University I am forming a team to gain expert counsel prior to launching a survey to 2,000 Information and Communication Technology (ICT) users. In this study, ICTs are defined as email, instant messaging, micro/wiki blogging, online forums, or knowledge repository systems. The goal of this research is to determine the impact of role stress and locus of control on employees' knowledge sharing behaviors. You are invited to participate because you are considered an ICT expert and user.

For your information, this research has been approved by the Institutional Review Board (IRB) at Nova Southeastern University. The IRB has responsibility to ensure that all academic research conducted at Nova Southeastern University is conducted in an ethical manner respecting the rights of all participants.

All of your work can be done from your home or office and you wouldn’t know who the other expert panel members are. You are invited to validate the attached 10-question survey in order to help determine whether the questions are:

1) Understandable: Did you have to read the item more than once to understand what was asked? Was the meaning of the question clear and straightforward?

2) Loaded: In your opinion was the item worded in a way that there was a single obvious answer for you?

For questions 1 through 8, please add one of the numbers from the scale that best applies to your answer. For questions 9 and 10, you can select more than one answer if it applies.

In the final section, I'd like to know whether the wording of questions 1 through 10 were understandable and/or loaded. Please put an X in either the Yes or No boxes and provide comments on any necessary re-wording or clarification. When finished, please email back the excel file. I will follow up with a phone call if further clarification is necessary.

Thank you for agreeing to participate and I look forward to your feedback.

Respectfully,

Simon Cleveland
sc1674@nova.edu
Doctoral Candidate
Nova Southeastern University
In the survey section below, please add one of the numbers from the scale below that best applies to your answer.

Survey Section

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Slightly Disagree</th>
<th>Neutral</th>
<th>Slightly Agree</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. When I need certain knowledge, I use the ICT system to ask my colleagues about it.
2. I use the ICT system to stay informed of what my colleagues know.
3. When I need to learn something, I use the ICT system to ask my colleagues about their abilities.
4. When a colleague is good at something, I use the ICT system to ask them to teach me how to do it.
5. I use the ICT system to tell my colleagues when I've learned something new.
6. I use the ICT system to keep my colleagues informed of what I am doing.
7. I use the ICT system to share information I have with my colleagues.
8. I regularly use the ICT system to tell my colleagues what I am doing.
9. What type of ICT system do you use to contribute knowledge (select more than one answer if it applies)?

<table>
<thead>
<tr>
<th>Email</th>
<th>Instant messaging</th>
<th>Micro/Wiki</th>
<th>Online forums</th>
<th>Knowledge Repositories</th>
</tr>
</thead>
</table>

10. What type of ICT system do you use to contribute knowledge (select more than one answer if it applies)?

<table>
<thead>
<tr>
<th>Email</th>
<th>Instant messaging</th>
<th>Micro/Wiki</th>
<th>Online forums</th>
<th>Knowledge Repositories</th>
</tr>
</thead>
</table>

In this section, I'd like to know whether the wording of questions 1 through 10 above were understandable and/or loaded. Please put an X in either the Yes or No boxes below and provide comments on the necessary clarification.

<table>
<thead>
<tr>
<th>Question #</th>
<th>Understandable</th>
<th>Loaded</th>
<th>Comments</th>
</tr>
</thead>
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<tr>
<td></td>
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<td>1</td>
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<tr>
<td>2</td>
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</tr>
<tr>
<td>#</td>
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<td>Rating</td>
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</tr>
<tr>
<td>---</td>
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<td>------------</td>
</tr>
<tr>
<td>1.</td>
<td>When I need certain knowledge, I use the ICT system to ask my colleagues about it.</td>
<td>7</td>
<td>Yes</td>
</tr>
<tr>
<td>2.</td>
<td>I use the ICT system to stay informed of what my colleagues know.</td>
<td>7</td>
<td>Yes</td>
</tr>
<tr>
<td>3.</td>
<td>When I need to learn something, I use the ICT system to ask my colleagues about their abilities.</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>4.</td>
<td>When a colleague is good at something, I use the ICT system to ask them to teach me how to do it.</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>5.</td>
<td>I use the ICT system to tell my colleagues when I’ve learned something new.</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>6.</td>
<td>I use the ICT system to keep my colleagues informed of what I am doing.</td>
<td>6</td>
<td>Yes</td>
</tr>
<tr>
<td>7.</td>
<td>I use the ICT system to share information I have with my colleagues.</td>
<td>6</td>
<td>Yes</td>
</tr>
<tr>
<td>8.</td>
<td>I regularly use the ICT system to tell my colleagues what I am doing.</td>
<td>6</td>
<td>Yes</td>
</tr>
<tr>
<td>9.</td>
<td>What type of ICT system do you use to contribute knowledge (select one or more if applicable)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>What type of ICT system do you use to seek knowledge (select one or more if applicable)?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The questions seemed very understandable and were not loaded. However, many of the questions were similar, and I don’t feel they were sufficiently differentiated. For example, the questions:

- #6 - I use the ICT system to keep my colleagues informed of what I am doing.
- #7 - I use the ICT system to share information I have with my colleagues.
- #8 - I regularly use the ICT system to tell my colleagues what I am doing.

Questions 6 and 7 seem identical, with the exception of the word “regularly”. Are you trying to assess the frequency of usage (e.g., regularly versus irregularly)? If so, I would structure the sentences like this:

- #6 - I occasionally use the ICT system to keep my colleagues informed of what I am doing.
- #8 - I regularly use the ICT system to keep my colleagues informed of what I am doing.

Or, an alternative approach would be to combine the questions:

- #6 - I regularly use the ICT system to keep my colleagues informed of what I am doing (1 = never, 5 = occasionally, 7 = regularly).

Also, the only difference I see between questions 6 & 7 is “sharing information” (what I know) versus “sharing activity” (what I am doing). If so, then all three questions should be worded the same with differentiation.

Some organizations have policies that prevent a worker from posting on online forums and knowledge repositories. You may want to ask about this so you can factor out responses where a worker is forbidden from posting to a public forum.

I don’t see the difference between Qs 6 & 7 except for the term “regularly”. I.e., that the only difference (if any) is that the reader know what differentiation you are seeking.
<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Rating</th>
<th>Understandable</th>
<th>Loaded</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>When I need certain knowledge, I use the ICT system to ask my colleagues about it.</td>
<td>6</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In all of the following questions, by selecting “yes”, I mean there was one obvious answer for me, (not that the item was a loaded term – had multiple meanings)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I use the ICT system to stay informed of what my colleagues know.</td>
<td>7</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Had to read the question twice. My colleagues know about what? About the task I am currently doing? General job?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>When I need to learn something, I use the ICT system to ask my colleagues about their abilities.</td>
<td>6</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>About their abilities or about their knowledge/skills?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>When a colleague is good at something, I use the ICT system to ask them to teach me how to do it.</td>
<td>6</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“I’ve learned something new” about what? About doing my job? Doing our job?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I use the ICT system to tell my colleagues when I’ve learned something new.</td>
<td>4</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“I’ve learned something new” about what? About doing my job? Doing our job?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I use the ICT system to keep my colleagues informed of what I am doing.</td>
<td>5</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I use the ICT system to share information I have with my colleagues.</td>
<td>6</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Which information? The one that they should know?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>I regularly use the ICT system to tell my colleagues what I am doing.</td>
<td>5</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>What type of ICT system do you use to contribute knowledge (select more than one answer if it applies)?</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Email, Online Forums, Knowledge Repositories</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>What type of ICT system do you use to seek knowledge (select more than one answer if it applies)?</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

A couple of comments:
- Are questions 9 and 10 intentionally identical?
- The questions about “knowledge” and “information” are a bit general and can benefit from being further specified.
- The generality made the questions difficult to comment. You might specify them within the item
- wording, or even before presenting the items for example by saying: “Please focus on your current job and the specific information and knowledge you require to do it.” Or something like that.
<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Rating</th>
<th>Understood</th>
<th>Loaded</th>
<th>Comments</th>
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<tr>
<td>1</td>
<td>When I need certain knowledge, I use the ICT system to ask my colleagues about it.</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I use the ICT system to stay informed of what my colleagues know.</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>When I need to learn something, I use the ICT system to ask my colleagues about their abilities.</td>
<td>4</td>
<td>X</td>
<td></td>
<td>need to be more specific. Something can be anything</td>
</tr>
<tr>
<td>4</td>
<td>When a colleague is good at something, I use the ICT system to ask them to teach me how to do it.</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I use the ICT system to tell my colleagues when I've learned something new.</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I use the ICT system to keep my colleagues informed of what I am doing.</td>
<td>6</td>
<td></td>
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</tr>
<tr>
<td>7</td>
<td>I use the ICT system to share information I have with my colleagues.</td>
<td>7</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8</td>
<td>I regularly use the ICT system to tell my colleagues what I am doing.</td>
<td>6</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>9</td>
<td>What type of ICT system do you use to contribute knowledge (select more than one answer if it applies)?</td>
<td>Email, Instant Messaging, Online Forums, Knowledge Repositories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>What type of ICT system do you use to seek knowledge (select more than one answer if it applies)?</td>
<td>Email, Instant Messaging, Online Forums, Knowledge Repositories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Question</td>
<td>Rating</td>
<td>Comments</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>When I need certain knowledge, I use the ICT system to ask my colleagues about it.</td>
<td>2</td>
<td>x x</td>
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<td></td>
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<tr>
<td>2.</td>
<td>I use the ICT system to stay informed of what my colleagues know.</td>
<td>5</td>
<td>x x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>When I need to learn something, I use the ICT system to ask my colleagues about their abilities.</td>
<td>2</td>
<td>x x</td>
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</tr>
<tr>
<td>4.</td>
<td>When a colleague is good at something, I use the ICT system to ask them to teach me how to do it.</td>
<td>5</td>
<td>x x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>I use the ICT system to tell my colleagues when I’ve learned something new.</td>
<td>1</td>
<td>x x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>I use the ICT system to keep my colleagues informed of what I am doing.</td>
<td>5</td>
<td>x x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>I use the ICT system to share information I have with my colleagues.</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>I regularly use the ICT system to tell my colleagues what I am doing.</td>
<td>1</td>
<td>x x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**What type of ICT system do you use to contribute knowledge (select more than one answer if it applies)?**
- Email
- Micro/Wiki
- Blogging, Online Forums
- Knowledge Repositories

**What type of ICT system do you use to seek knowledge (select more than one answer if it applies)?**
<table>
<thead>
<tr>
<th>#</th>
<th>Question</th>
<th>Rating</th>
<th>Comments</th>
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<tbody>
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<td>1</td>
<td>When I need certain knowledge, I use the ICT system to ask my colleagues about it.</td>
<td>4</td>
<td>X</td>
</tr>
<tr>
<td>2</td>
<td>I use the ICT system to stay informed of what my colleagues know.</td>
<td>5</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>When I need to learn something, I use the ICT system to ask my colleagues about their abilities.</td>
<td>4</td>
<td>X</td>
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<tr>
<td>4</td>
<td>When a colleague is good at something, I use the ICT system to ask them to teach me how to do it.</td>
<td>4</td>
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<tr>
<td>5</td>
<td>I use the ICT system to tell my colleagues when I've learned something new.</td>
<td>5</td>
<td>X</td>
</tr>
<tr>
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<td>X</td>
</tr>
<tr>
<td>9</td>
<td>What type of ICT system do you use to contribute knowledge (select more than one answer if it applies)?</td>
<td>Email, Online Forums</td>
<td>X</td>
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<td>10</td>
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<td>Email, Instant Messaging, Online Forums</td>
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<td>#</td>
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<tr>
<td>1</td>
<td>When I need certain knowledge, I use the ICT system to ask my colleagues about it.</td>
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</tr>
<tr>
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<tr>
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<tr>
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<td>I regularly use the ICT system to tell my colleagues what I am doing.</td>
<td>6</td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>What type of ICT system do you use to contribute knowledge (select more than one answer if it applies)?</td>
<td>Email, Instant Messaging, Knowledge Repositories</td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>What type of ICT system do you use to seek knowledge (select more than one answer if it applies)?</td>
<td>Email, Online Forums, Knowledge Repositories</td>
<td>X</td>
</tr>
</tbody>
</table>
Appendix F

eMail Survey - Invitation

Dear Colleague,

This invitation highlights the very important research that I, a doctoral candidate, am conducting at Nova Southeastern University. This research will help practitioners and researchers understand the impact of role stress and locus of control on employee’s knowledge sharing behavior.

As professionals, you recognize the increasing importance of knowledge sharing in organizations. Yet we do not fully understand the factors that impact knowledge sharing behaviors via Information and Communication Technologies (ICTs) designed to facilitate real time conversations, information sharing, online meetings, and knowledge repositories (e.g. email, instant messaging, micro/wiki blogging, and online forums).

This invitation includes a link to the questionnaire. All responses will be kept completely confidential. There are 41 questions in the survey and completing it indicates your voluntary participation in the study, which should take no more than 20 minutes to complete. You have the right to participate or to withdraw at any time, without penalty. Please answer all questions candidly. There are no costs to you or payments made for participating in this study. Upon completion of the survey, you may choose to receive an electronic copy of the finding of this research.

The survey can be accessed at the following web browser URL:

http://test.test

Please pass this invitation along to any of your fellow colleagues that use ICTs and may be interested in helping us understand the impact of role stress and locus of control on employee’s knowledge sharing behavior.

Should you have any questions you may contact me at sc1674@nova.edu or by phone at 239-293-3458. As an ICT user, your views are particularly important to the understanding of how role stress and locus of control influence knowledge sharing. Thank you in advance for helping with this very important study.

Simon Cleveland
sc1674@nova.edu
Doctoral Candidate
Nova Southeastern University
Appendix G

Survey Reminders

Dear Sir or Madam,

You recently received an invitation to take part in the very important knowledge management research that I, a doctoral candidate, am conducting at Nova Southeastern University. This research will help practitioners and researchers understand the impact of role stress and locus of control on employee’s knowledge sharing behavior.

The survey should take no more than 20 minutes to complete. This is your opportunity to get involved with real leading edge research where opinion matters and will be used to influence this and the future studies of others.

This invitation includes a link to the questionnaire. All responses will be kept completely confidential. Completing the short survey indicates your voluntary participation in the study, which should take no more than 20 minutes to complete. You have the right to participate or to withdraw at any time, without penalty. Naturally, I hope that you will answer all questions candidly. There are no costs to you or payments made for participating in this study.

The survey can be accessed at the following web browser URL:

http://test.test

Please pass this invitation along to any of your fellow colleagues that use ICTs (e.g. email, instant messaging, micro/wiki blogging, online forums, or knowledge repositories) and may be interested in helping us understand the impact of role stress and locus of control on employee’s knowledge sharing behavior.

Should you have any questions you may contact me at sc1674@nova.edu or by phone at 239-293-3458. As an ICT user, your views are particularly important to the understanding how role stress and locus of control influence knowledge sharing. Thank you in advance for helping with this very important study.

Simon Cleveland
sc1674@nova.edu
Doctoral Candidate
Nova Southeastern University
Appendix H

Prequalification

Do you use any of the following systems at work: Email, Instant Messaging, Micro/wiki blogging, Online forums, or Knowledge repositories?

☐ NO
☐ YES
## Appendix I

### Content Analysis Matrix

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Article Title</th>
<th>Researcher(s)</th>
<th>Domain</th>
<th>Study Type</th>
<th>Category</th>
<th>Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lacking:...</td>
<td>Abrahams, Cross, &amp; Lees (2016)</td>
<td>Trust, Communication</td>
<td>Jacobi</td>
<td>Role Ambiguity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lacking:...</td>
<td>Abrahams, Cross, &amp; Lees (2016)</td>
<td>Trust, Communication</td>
<td>Jacobi</td>
<td>Role Ambiguity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Lacking:...</td>
<td>Abrahams, Cross, &amp; Lees (2016)</td>
<td>Trust, Communication</td>
<td>Jacobi</td>
<td>Role Ambiguity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Lacking:...</td>
<td>Abrahams, Cross, &amp; Lees (2016)</td>
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<td>Jacobi</td>
<td>Role Ambiguity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lacking:...</td>
<td>Abrahams, Cross, &amp; Lees (2016)</td>
<td>Trust, Communication</td>
<td>Jacobi</td>
<td>Role Ambiguity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Lacking:...</td>
<td>Abrahams, Cross, &amp; Lees (2016)</td>
<td>Trust, Communication</td>
<td>Jacobi</td>
<td>Role Ambiguity</td>
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<tr>
<td>7</td>
<td>Lacking:...</td>
<td>Abrahams, Cross, &amp; Lees (2016)</td>
<td>Trust, Communication</td>
<td>Jacobi</td>
<td>Role Ambiguity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Lacking:...</td>
<td>Abrahams, Cross, &amp; Lees (2016)</td>
<td>Trust, Communication</td>
<td>Jacobi</td>
<td>Role Ambiguity</td>
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<tr>
<td>9</td>
<td>Lacking:...</td>
<td>Abrahams, Cross, &amp; Lees (2016)</td>
<td>Trust, Communication</td>
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<td>11</td>
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There has been a tendency for organizations to expect employees in key knowledge-sharing roles, whereas one employer provides knowledge or experience to someone in order to help or to learn from another party.

Phrasing of sharing information or opportunities was an important maintenance behavior that, by some degree, increased on an awareness level. "It's important that we find out as much as possible about this," was used as feedback. The research on the role of opportunity-seeking-knowledge sharing, which indicates that active learning is transferred more through social interaction than through direct instruction, is considered to be necessary for knowledge sharing.

The need to exchange information and opportunities with others, whether through social interaction or through formal institutions, is considered to be necessary for knowledge sharing. This need is linked to the individual's ability to adapt to changing situations and to the flexibility of the individual's knowledge base.

We had an opportunity to practice our knowledge in the context of actually implementing an idea. So what we specifically did is to make a list of the knowledge we were trying to achieve in [field], i.e. to identify the knowledge we needed in the context of the project. We ended up with a list of knowledge that we felt was important in order to successfully implement the idea.
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Reference List


Ahuvia, A. (2001). Traditional, interpretive, and reception based content analyses: Improving the ability of content analysis to address issues of pragmatic and theoretical concern. *Social Indicators Research, 54*(2), 139-172.


