3-13-2017

Applying the Theory of Planned Behavior to Influence Auditors' Knowledge-Sharing Behavior

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Auditors' Knowledge-Sharing Behavior

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Business Administration
with a concentration in Accounting
Lynn Pippenger School of Accountancy
Muma College of Business
University of South Florida

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Data of Approval:
April 3, 2017

Keywords: knowledge management, knowledge management systems, behavioral
interventions, internal control, perceived norms

DEDICATION

To my parents, Yuancui Tian and Dalin Cheng.

ACKNOWLEDGEMENT

Undertaking this PhD has been a truly life-changing experience. It would not have been possible without the support and encouragement I received from a great number of individuals.

I would like to express my deepest gratitude to my committee chair, Dr. Uday Murthy. He has supported me throughout my dissertation with his patience and immense knowledge. I could not image having a better advisor and mentor for my doctoral studies.

I would also like to thank the rest of my dissertation committee members, Dr. Lisa Gaynor, Dr. Patrick Wheeler, and Dr. Terry Sincich. They have always been there to listen and give valuable advice. I am thankful to them for reading and commenting on my dissertation and helping me understand and enrich my ideas.

A special thanks goes to Dr. Varki, who was willing to participate in my final defense at the last moment.

I would like to thank my fellow doctoral students—Rina Limor, Amanuel Fekade, Donald Wengler, Kevin Agnew, Neal Snow, Peter Kipp, Yiyang Zhang, Yibo Zhang, Rebecca Perols, and Stephanie Walton — for their support, feedback, and friendship.

TABLE OF CONTENTS

LIST OF TABLES

iii

LIST OF FIGURES

ABSTRACT

This study adopts the theory of planned behavior to understand and influence auditors'
knowledge-sharing behavior. Ajzen (1991) indicates that persuasive communications, such as
belief-targeted messages, can be used as behavioral interventions to alter intentions and
behaviors. Thus, this study develops and evaluates the effectiveness of behavioral interventions
(belief-targeted messages) in encouraging auditors' knowledge-sharing behavior. This study uses
a 2×2 between-participants design. Arguments targeting behavioral beliefs and arguments
targeting normative beliefs are manipulated. Consistent with expectations, the results of this
study were that (1) auditors exposed to an intervention share more knowledge, compared to
auditors not exposed to any interventions; (2) auditors share the most knowledge when exposed
to an intervention that includes arguments targeting both behavioral and normative beliefs; (3)
the effects of behavioral interventions on knowledge-sharing intention are mediated by auditors'
attitudes and perceived norms related to knowledge sharing; and (4) the influences of attitude
and perceived norms on knowledge-sharing behavior are mediated by the intention to share
knowledge. The findings of this study have implications for literature and practice. It extends the
theory of planned behavior to the auditing setting and examines auditors' knowledge-sharing
behavior with the firm's knowledge management systems (KMS). Knowledge sharing with the
firm's KMS could potentially mitigate knowledge loss for public accounting firms. The findings
of this study provide guidelines to firms regarding how they can encourage knowledge sharing
among auditors.

1. INTRODUCTION

The objective of this study is to understand and influence auditors' knowledge-sharing behavior. Knowledge is considered the most significant asset of an organization, the foundation of an organization's competitive advantage, and the primary driver of an organization's value (Buckley and Carter 2002; Bock, Zmud, Young-Gul and Jae-Nam 2005). Public accounting firms increasingly use systems, referred as "Knowledge Management Systems" (KMS), to capture, store, and disseminate knowledge within the firm (Banker, Chang, and Kao 2002; Huerta et al 2012; Vera-Munoz, Ho and Chow 2006). The first step of KMS implementation is knowledge sharing, which provides a link between the individual and the organization by moving knowledge that resides within individuals to the organizational level (Hendriks 1999; Ipe 2003). Knowledge resides within individuals; therefore, the transfer of knowledge within accounting firms is primarily dependent on auditors' knowledge-sharing behavior (Nonaka and Konno 2005).

There is a large turnover of employees in public accounting firms. When employees, especially experienced employees, leave a firm, the knowledge and expertise they gained would also be lost to the firm. Helen Munter, the director of the Public Company Accounting Oversight Board (PCAOB)'s Division of Registration and Inspections, suggests that the use of auditors without the necessary knowledge and experience on audit engagements could have led to audit deficiencies in recent years: when auditors with more experience leave a firm, less experienced auditors perform the work (Munter 2015). Encouraging auditors to participate in knowledge-sharing behavior could be a potential solution for mitigating knowledge loss for the public

1

accounting firms. When experienced auditors share their expertise with the firm's KMS, less experienced auditors can access the KMS and use the knowledge shared by those with greater experience to improve performance (McCall, Arnold and Sutton 2008). Thus, how to capture and retain experienced auditors' knowledge becomes one of the biggest problems for public accounting firms (Nagle 1999; O'Leary 2002).

Various accounting studies have documented the importance of knowledge sharing. For instance, Vera-Munoz et al. (2006) suggest that knowledge sharing can help increase the effectiveness, efficiency, and the quality of assurance and tax consulting processes (Vera-Munoz et al. 2006;). Archival studies on auditor industry expertise suggest that audit quality improves when accounting firms capture industry expertise through knowledge-sharing activities (Carson 2009; Reichelt and Wang 2010). However, accounting practitioners and scholars have made little progress in understanding auditors' knowledge-sharing behavior (Huber 2001; Mair 2004; Wolfe and Loraas 2008). Most of the prior studies in accounting investigate participants' intentions to share knowledge and draw conclusions based on self-reported data. Therefore, it is necessary to understand actual knowledge-sharing behaviors and propose more practical methods to encourage knowledge sharing among auditors.

Studies on knowledge sharing suggest that economic (extrinsic rewards), social-psychological (reciprocal relationships and sense of self-worth), and sociological (social norms and obligations) factors can influence individuals' willingness to share knowledge (Szulanski 1996; Bock et al. 2005). Prior literature has examined the impact of these factors on knowledge sharing among different professional groups, including physicians in hospital, managers from international organizations, and high school teachers (Rye et al. 2003; Bock et al. 2005; Connelly et al. 2009; Chen et al. 2011). Interestingly, these studies indicate that extrinsic rewards are not

2

effective in promoting knowledge sharing and that time availability does not significantly affect knowledge sharing, either. However, the studies find that reciprocity relationships, attitudes toward knowledge sharing, sharing norms, and organizational culture do influence knowledge sharing. Therefore, this study aims to focus on attitudes and norms related to knowledge sharing.

The first research question of this study is "Can behavioral interventions be used to influence auditors' knowledge-sharing behavior?" This study adopts the Theory of Planned Behavior (TPB) (Ajzen 1991) to understand and potentially influence auditors' knowledge-sharing behavior. TPB is one of the most influential and widely-cited models used to understand intentions and behaviors in social psychology (Armitage and Conner 2001). This study, which relies on TPB, develops and evaluates the effectiveness of behavioral interventions in encouraging auditors' knowledge-sharing behavior. Behavioral interventions, as noted in Ajzen (2010), are plans designed to change or modify behavior. Such interventions can be directed at one or more of its determinants, such as attitudes, perceived norms, or perceived behavioral control. Fishbein and Ajzen (2010) indicate that there are different forms of intervention strategies designed to change behavior: group discussions, workshops, messages, public announcements, and more. Persuasive communication, such as a belief-targeted message, is often used as an intervention to change intention and behavior (Ajzen 1998; Fishbein and Ajzen 2010). The rationale for behavioral interventions within TPB is that modifying the underlying beliefs (behavioral, normative, and control beliefs) can influence attitude, perceived norms, and perceived behavioral control, which in turn will affect intention and ultimately change behavior (Ajzen 2010; Fishbein and Ajzen 2010).

Ajzen (1998) indicates that persuasive communications, such as belief-targeted messages, can be used as behavioral interventions to alter intention and behavior. Belief-targeted messages

3

involve arguments that target the salient beliefs underlying attitudes, perceived norms, and perceived behavioral control (Fishbein and Ajzen 2010). In this study, each intervention—a belief-targeted message—includes arguments targeting behavioral and/or normative beliefs. This study does not develop messages that target control beliefs because previous research has shown that perceived behavioral control does not exert a significant effect on knowledge-sharing behavior (Puccinelli 1998; Connelly et al. 2009). Arguments which target behavioral beliefs focus on discussing the likelihood of positive outcomes for engaging in knowledge-sharing behavior and the importance of such behavior to the accounting firm and the "knowledge sharer" (auditors who share knowledge). Arguments that target normative beliefs emphasize the expectations and actions of "important others"' (people who are important to the knowledge sharer) regarding knowledge sharing. Studies from social influence literature and Ajzen and Fishbein (2010) contend that people experience normative pressure not only when important others think they should perform a given behavior, but also when important others actually perform the behavior themselves. Therefore, in this study, the arguments targeting normative beliefs describe that important others think one should share knowledge and that important others themselves have already shared knowledge.

The second research questions is "Do auditors share more knowledge when exposed to an intervention that includes arguments targeting both behavioral and normative beliefs?" According to Ajzen and Fishbein (1980), when exposed to an intervention, an individual is provided with new information or experiences that may change behavior-related beliefs and, as a result, influence intention and behavior. Therefore, I expect that auditors exposed to behavioral interventions will share more knowledge than auditors not exposed to any intervention. I also expect that the behavioral intervention targeting both behavioral and normative beliefs will be

4

more effective in promoting knowledge-sharing behavior than the intervention targeting behavioral beliefs or normative beliefs individually. The reason behind this is that the effects of behavioral beliefs and normative beliefs on behavior are additive (Ajzen 1991).

The third research questions is "How do behavioral interventions influence auditors' knowledge-sharing behavior?" This study examines the process by which an intervention influences knowledge-sharing intention and behavior. Drawing from the model of TPB, I expect that the effects of behavioral interventions on knowledge-sharing intention are mediated by auditors' attitudes and perceived norms related to knowledge sharing. I also expect that the effects of attitude and subjective norms on knowledge-sharing behavior are mediated by the intention to share knowledge.

To examine the research questions of this study, I employ a 2×2 between-participants design. Participants include 87 auditors who have more than two years of auditing experience. Arguments targeting behavioral beliefs and arguments targeting normative beliefs are varied. Arguments targeting behavioral beliefs are manipulated at two levels: presence and absence. The arguments discuss the benefits of knowledge-sharing behavior and the importance of such behavior to the accounting firm and the knowledge sharer. In the presence condition, arguments targeting behavioral beliefs indicate the advantages of compliance with knowledge-sharing behavior (e.g., "If you share knowledge, you will …"). Arguments targeting normative beliefs are also manipulated at two levels: presence and absence. The arguments emphasize that the important others think that one should share knowledge and that the important others themselves had actually shared knowledge. In the presence condition, arguments targeting normative beliefs indicate an important other (an audit manager) not only think that one should share knowledge, but also the important other had already shared knowledge with the firm's KMS.

This study examines the impact of behavioral interventions on auditors' knowledge-sharing behavior. This study first relies on TPB to develop behavioral interventions (belief-targeted messages) and tests whether the behavioral interventions can effectively influence knowledge-sharing behavior. This study then, adapting the theoretical model of TPB, examines the process by which the behavioral interventions influence intention and behavior. The results of this study are consistent with expectations. I find that participants exposed to an intervention share more knowledge than participants who were not exposed to any intervention. In particular, participants share the most knowledge when exposed to an intervention that includes arguments targeting both behavioral and normative beliefs. Furthermore, the results of this study confirm the theoretical model of TPB and suggest that the effects of behavioral interventions on knowledge-sharing intention are mediated by auditors' attitudes and perceived norms related to knowledge sharing; the influences of attitude and perceived norms on knowledge-sharing behavior are mediated by the intention to share knowledge. The findings of this study suggest that behavioral interventions, such as the belief-targeted messages, can be used as a way to encourage auditors' knowledge-sharing behavior. Specifically, a behavioral intervention that includes arguments targeting both behavioral beliefs and normative beliefs is the most effective in promoting knowledge sharing.

This study contributes to the literature on auditing and accounting information systems. Few empirical studies have examined the knowledge-sharing behavior among auditors. This study is the first to employ TPB and the findings from the social influence literature to develop behavioral interventions aimed at encouraging auditors' knowledge-sharing behavior with KMS and document that such interventions are effective. This study contributes to the literature on TPB, which is a well-established theory used to investigate behavioral intentions and behavior.

However, TPB has rarely been used to understand auditors' judgment and decision making. This study relies on TPB to investigate which of the proposed interventions is the most effective at increasing knowledge sharing. Furthermore, this study contributes to the knowledge sharing and knowledge management literature. No studies in knowledge management have developed or investigated behavioral interventions in promoting knowledge sharing. Prior literature on knowledge sharing mostly focuses on the intention to share knowledge and draws conclusions based on self-reported data. This study examines both knowledge-sharing intention and actual knowledge-sharing behavior.

This study also contributes to practice. Knowledge sharing with the firm's KMS could mitigate knowledge loss for firms. If experienced auditors share more knowledge with the firm's KMS, other auditors can use such knowledge to improve performance. This study provides guidelines and suggests practical methods to encourage knowledge sharing. The results of this study suggest that behavioral interventions can be used to promote knowledge sharing among auditors. Particularly, participants share the most knowledge when exposed to an intervention that includes arguments targeting both behavioral and normative beliefs.

The remainder of the paper is organized as follows. The following section provides a review of the literature and summarizes the theory used in this study. Section Three discusses the hypotheses development and Section Four discusses the participants and experimental design. Section Five presents the results of the experiment. Section Six is the conclusion of this study.

2. BACKGROUND AND PRIOR LITERATURE

2.1 Knowledge Management and Knowledge Management Systems

Alavi and Leiner (2001) define knowledge as information combined with experience, context, interpretation, and reflection. Tiwanan (2003) defines knowledge as "a fluid mix of framed experiences, values, contextual information, expert insight and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information" (p. 5). Jones (2006) suggests that knowledge and decision are highly related: making a decision requires knowledge and the decision itself can become a piece of knowledge. Knowledge is considered the most significant asset of an organization (Buckley and Carter 2002).

Knowledge management was introduced to the business world to assist organizations in creating, storing, sharing, and using knowledge effectively. Dalkir (2005) states that knowledge management is a field that consists of the business perspective, the process and technology perspective, and the cognitive science perspective. Robbins (2003) defines knowledge management as the process of organizing and disseminating organizations' collective wisdom so that the right knowledge gets to the right person at the right time. Chakravarthy et al. (2006) define knowledge management as the accumulation, protection, and leverage of knowledge, whereas Jennex et al. (2009) define knowledge management as managing knowledge to improve individual and organizational performance. O'Leary (2002) defines knowledge management as "those efforts designed to (1) capture knowledge; (2) convert personal knowledge to group-available knowledge; (3) connect people to people, people to knowledge, knowledge to people,

8

and knowledge to knowledge; and (4) measure that knowledge to facilitate management of resources and help understand its evolution" (p. 274). Knowledge conversion refers to knowledge sharing to convert personal knowledge to organizational knowledge. O'Leary (2002) suggests that it is important to understand what forces can lead to knowledge sharing. Although there are different definitions of knowledge management, the philosophy of knowledge management is simple—use knowledge to gain a competitive advantage (Davenport and Prusak 1998).

Robbins (2003) suggests that organizations should create organizational cultures that support sharing and develop mechanisms which encourage employees who have or developed knowledge or expertise to share them with others. Conley and Zheng (2009) suggest the factors that are crucial to knowledge management success. These factors include top management and leadership support, organizational culture, organizational structure, technology infrastructure, strategy, processes, knowledge management team, training and education, measurement, and incentives.

Robbins (2003) points out that knowledge management is important in today's business world for at least three reasons. First, intellectual assets are more important than physical or financial assets in many organizations. When an organization can effectively manage employees' collective experience and wisdom, the organization is more likely to outperform its competitors. Second, when employees leave the organizations, knowledge will be lost to the organization if the organization has not captured the employee's knowledge in some form. Third, Knowledge Management Systems (KMS) can be used to reduce redundancy and organize knowledge more effectively and efficiently.

9

Alavi and Leidner (2001) define KMS as IT-based systems that are designed to support and enhance the organizational processes of knowledge creation, storage, transfer and application. They also suggest that although KMS may not apply to all issues of knowledge management, it can support it in many ways. For example, when employees need to start a new project, they do not need to start from scratch. The firm's KMS can be used to find an expert or a source of knowledge using an online search function, to share knowledge, and to access past projects.

Organizations have implemented KMS to support the creation, storage and application of knowledge within organizations. Researchers have documented that organizational and individual performance will improve when employees have access to knowledge with KMS. For example, Gonzalez et al. (2005) suggest that the knowledge available in KMS allows users to improve performance. McKeen et al. (2006) and Wu (2008) provide evidence that organizations with mature KMS outperform firms with less sophisticated KMS. McCall et al. (2008) show that KMS users outperform users of traditional reference materials. Clearly, knowledge that have been codified and stored within KMS is easily available to the right people at the right time.

2.2 Knowledge Sharing

Knowledge sharing, an important element of KMS implementation, is the behavior of disseminating an individual's acquired knowledge to others within an organization (Ryu et al. 2003). Ipe (2003) states that more knowledge is shared informally within organizations and knowledge sharing depends mostly on social relationship between employees and organization culture. Previous research on knowledge management has indicated that information systems, such as KMS, can be used as an important facilitator for knowledge sharing (Song 2002; Lin and Lee 2004). Knowledge sharing is often different from knowledge transfer and knowledge

10

exchange. Knowledge transfer is concerned with the sharing of knowledge by the knowledge source and the acquisition of knowledge by the recipient. Knowledge transfer is usually used to describe the movement of knowledge between teams, divisions, or organizations, instead of individuals (Szulanski, Cappetta, and Jensen 2004). Knowledge exchange and knowledge sharing have been used interchangeably; however, knowledge exchange often refers to both knowledge sharing and knowledge seeking. In this study, I use the term "knowledge sharing" because this study is concerned with the movement of knowledge from experienced auditors to other members of an accounting firm.

Studies on knowledge sharing have documented that to gain a competitive advantage, organizations need to understand how to transfer expertise and knowledge from experts who have the knowledge to novices who need to know the knowledge (Hinds, Patterson and Pfeffer 2001; Wang and Noe 2010). Knowledge sharing literature has also shown that knowledge sharing is positively related to reduction in production costs, firm innovation projects, faster completion of new product development, team performance, and firm performance (Arthur and Huntley 2005; Collins and Smith 2006; Cummings 2004; Hansen 2002; Wang and Noe 2010). Knowledge sharing literature has also examined the difference between knowledge sharing via KMS and face-to-face interactions (Bordia et al. 2006). The factors influencing the decision to share knowledge in face-to-face versus KMS are different. For example, employees who are high in extraversion are more likely to share knowledge in face-to-face interactions over technology-aided interactions because sharing knowledge in a face-to-face interaction is more relationship-based (Wang and Noe 2010). Unlike face-to-face knowledge sharing, when an individual shares knowledge with the firm's KMS, the KMS will be able to capture, store, and disseminate the knowledge to other members. More members in the firm will be able to access and use such

11

knowledge to improve performance. That is to say, knowledge sharing with KMS enables the movement of knowledge that resides within individuals to the organizational level. Gibbert and Krause (2002) suggest that knowledge sharing cannot be forced but can only be encouraged. Therefore, this study examines whether behavioral interventions can be used to encourage auditors' knowledge-sharing behavior with KMS.

Szulanski (1996) suggests that there are two motivational forces that could influence knowledge sharing: employees' personal belief structures and institutional structures. Personal belief structures refer to one's belief about the benefit and cost related to knowledge sharing. On the one hand, an individual who chooses to share knowledge may lose his or her expertise or value within the firm. On the other hand, any knowledge shared that is judged to be unsound could damage his or her reputation. As a result, one of the major reasons that prevent employees from sharing knowledge is the lack of sufficient extrinsic and intrinsic rewards to compensate employees for the costs of sharing knowledge. Studies on knowledge sharing have examined the effects of personal belief factors, including self-interest, personal gain, reciprocal behaviors, relationship with others, group interest, organizational gain, and organizational culture (Constant et al. 1994; Wasko and Faraj 2000; Bock et al. 2005). Institutional structures refer to an organization's culture related to knowledge sharing. Researchers have documented that employees are more likely to share knowledge when they highly trust other employees and the organization and when knowledge sharing is the norm and accepted practice of the organization (David and Fahey 2000; Hinds and Pfeffer 2003; Bock et al. 2005).

Bock et al. (2005) identify three categories that influence employees' willingness to share knowledge, based on prior literature and the interviews they conducted with chief knowledge officers and chief information officers in five Korean organizations. The first category is the

economic factor, which refers to the anticipated extrinsic rewards. Organizations the authors interviewed indicate that they implemented financial incentives and/or promotions to encourage knowledge sharing among employees. The second category is called social-psychological factor, referring to anticipated reciprocal relationships and the sense of self-worth. Employees' desires to maintain ongoing relationships with other employees can influence knowledge sharing. Next, employees' views on whether they can add value to the organization through knowledge sharing can contribute to their knowledge-sharing behavior. The third category is the sociological factor, which includes fairness, innovativeness, and affiliation. This sociological factor is very similar to the instructional structures from Szulanski (1996) that discuss the importance of social norms, rules, and obligations in terms of knowledge sharing.

Kankanhalli et al. (2005) employ social exchange theory to examine the impact of cost and benefit factors and contextual factors on employees' intention to contribute knowledge to a KMS. They show that knowledge self-efficacy and enjoyment in helping others greatly influence the intention to share knowledge with a KMS. Contextual factors, including trust, sharing norms, and identification, moderate the effect of codification effort, reciprocity, and organizational reward on the intention to contribute knowledge to a KMS. However, the loss of expertise and power does not influence knowledge-sharing intention.

Husted et al. (2012) believe that knowledge sharing usually does not happen voluntarily and requires managers to encourage or promote such behavior. Seheult (2016) reviews the literature on knowledge and organizes the barriers to knowledge sharing into six categories. The first category is personal factors. This refers to personal beliefs that could influence one's willingness to share knowledge. Trust is an important factor that shapes personal beliefs related to knowledge sharing. The second category is technology factors. This often refers to the design

13

of the KMS: whether it is user-friendly. The third category is cultural norms and context, including sharing expectations in the firm, organizational environment. The fourth category is time availability. Employees are typically busy with routine work. Thus, the time available for knowledge-sharing activities can be minimized. The fifth category is personal vulnerability. Knowledge is often viewed as competitive advantage and power. Therefore, employees can be reluctant to share knowledge. The last category is leadership style. Leaders or managers who only focus on the task but not the employees involved in the task and who lack encouragement and enthusiasm could prevent employees from sharing knowledge.

Wang and Noe (2010) review the knowledge sharing literature from several different disciplines. They find that many studies were qualitative studies that used interviews, observations, or document analysis to answer their research questions. These studies measured knowledge sharing using intention measures or self-reported behaviors. Wang and Noe (2010) indicate that few studies capture actual knowledge-sharing behavior using experiments and suggest that there is a need for research that uses direct and objective measures of knowledge-sharing behavior. Thus, this study aims to capture and analyze auditors' actual knowledge-sharing behavior.

2.3 Knowledge Sharing in Accounting and Auditing Literature

Public accounting firms increasingly use KMS to capture, store, and disseminate knowledge within the firm (Banker, Chang, and Kao 2002; Huerta et al 2012; Vera-Munoz, Ho and Chow 2006). Take PricewaterhouseCoopers (PwC) as an example. PwC is a global network of separate firms, operating locally in different countries. PwC increasingly invests in technology and establishes best-practice centers for technical and risk management advice (PwC 2007). The investment in KMS enables PwC firms to work together, by sharing ideas, knowledge,

14

methodologies, and approaches, to provide high-quality services to international and local clients (PwC 2015). Another example is the KMS of EY. EY's KMS, KnowledgeWeb, contains reports that an audit team developed while working for a client. These documents are accessible to other auditors in the accounting firm. Auditors can modify the same basic reports for different clients (Dixon 2000). EY also employs PowerPacks, a software used to organize knowledge-sharing topics. PowerPacks contains collections of documents bundled by topics and chosen to represent the "best of the best" on a given topic, such as the best proposal, the best workplan, or the best presentation.

Prior studies have documented that it is important to promote knowledge sharing in accounting and auditing firms. Vera-Munoz et al. (2006) posit that it is important for accounting firms to manage knowledge, and especially to encourage knowledge sharing. The reasons are: (1) the public and the regulatory environment intensify pressures on accounting firms to improve quality, effectiveness, and efficiency of the audit process. Effective involvement in knowledge-based activities is critical for accounting firms to maintain a competitive advantage, and (2) most engagements involve audit teams, with each auditor performing a certain part of the audit engagement. Auditors are usually assigned to different engagements that vary in terms of complexity and industry; therefore, when a new audit team is formed, knowledge and expertise about the client and industry are not evenly distributed among audit team members. Furthermore, archival studies on auditor industry expertise suggest that the presence and value of knowledge spillover increases when knowledge is captured, stored in a KMS for use, and retrieved by auditors in other offices of the international audit firm. For example, Carson (2009) and Reichelt and Wang (2010) note that knowledge gained by serving clients in one industry in one office can be used to serve clients in the same industry in another office. They suggest that audit quality

15

improves when accounting firms capture industry expertise through knowledge-sharing activities.

A few studies in accounting have examined the factors that could influence knowledge sharing. Some studies investigate the impact of culture on knowledge sharing. For instance, Huerta et al. (2012) investigate the impact of anonymity and culture on intention to share knowledge through KMS. They find that anonymity increases participants' intentions to share failures, but does not influence their intentions to share successes. They also find that participants from collectivist (compared to individualist) cultures are more likely to share failures. Another paper, Chow et al. (2000), examines the influence of culture on intention to share knowledge. They study the interaction effects of culture and contextual factors (nature of the knowledge and interpersonal relationship) and find that participants from China, relative to America, shared knowledge significantly less with a knowledge recipient who is not an in-group member.

Other studies investigate the factors that could encourage knowledge sharing. Taylor (2006) examines whether financial incentives can promote knowledge sharing within groups via Computer-Mediated Communication. She finds that group financial incentives can motivate more knowledge sharing than tournament or piece-rate financial incentives. Wolfe and Lorass (2006) test the effects of incentive, environment, and person on intention to share knowledge. They find that incentive (monetary or non-monetary) sufficiency can significantly influence the intention to share knowledge. They further suggest that accounting firms should carefully monitor the use of non-monetary incentives and make knowledge sharing a part of annual evaluations to motivate knowledge sharing.

16

The terms "information sharing" and "knowledge sharing" are used interchangeably in accounting research. For example, Chow et al. (1999) interviewed middle-level managers in Taiwanese and Australian manufacturing firms to examine the cultural factors that could facilitate or inhibit informal information sharing in the context of face-to-face meetings in Chinese and Anglo-American organizations. They suggest that individual differences, individual assertiveness, and corporation culture can have an impact on informal information sharing in Australian firms, whereas collective interests and hierarchical status influence information sharing in Chinese firms. Schulz et al. (2009) examine cross-culture differences in intention to share information in a situation where an error was made. They suggest that Chinese managers are less likely to share negative information when a supervisor is present than Chilean managers; however, there is no difference in sharing intention once the supervisor is removed.

In summary, accounting researchers have documented the importance of knowledge sharing in accounting firms. Nevertheless, most of these studies are concerned with the influences of culture and incentives on knowledge sharing. Furthermore, these studies examine knowledge-sharing intention and draw conclusions based on self-reported data. This study, which relies on a well-grounded theory, develops behavioral interventions aiming to promote knowledge-sharing behavior. This study also captures and analyzes both the intention to share knowledge and actual knowledge-sharing behavior.

17

3. THEORY AND HYPOTHESES DEVELOPMENT

3.1 The Theory of Planned Behavior
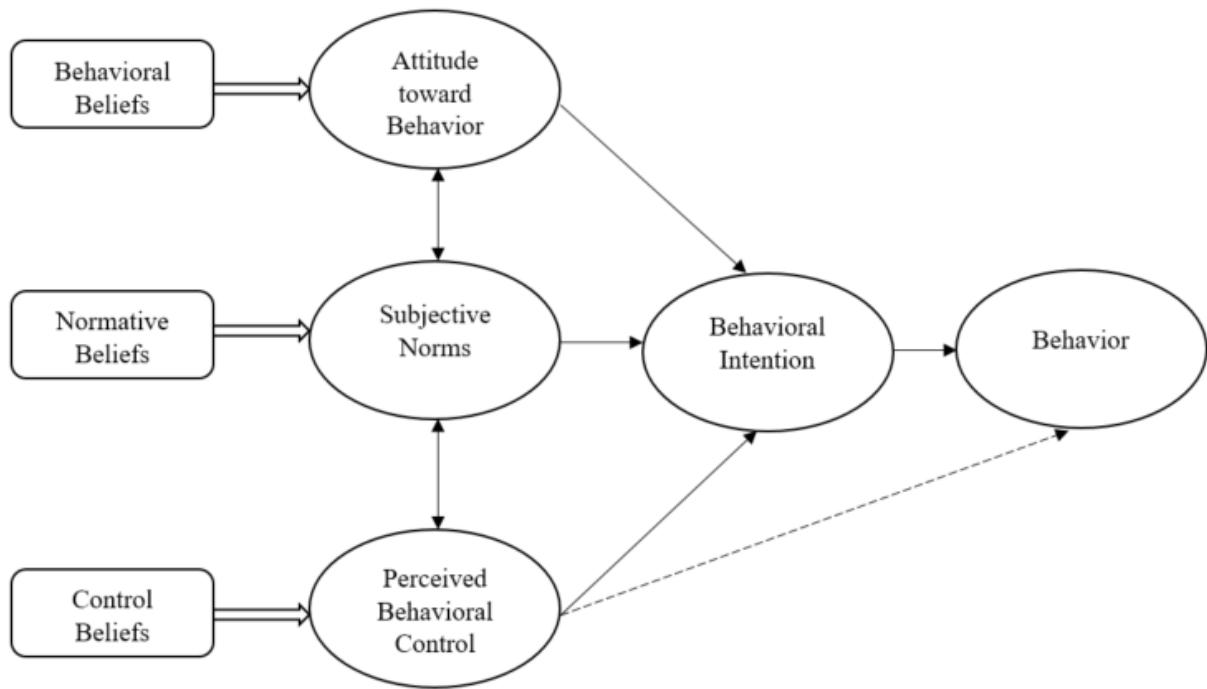
Figure 1. The Theory of Planned Behavior[*]

[*] *The model was adapted from Ajzen (1991).*

TPB (Ajzen 1991) is a generalized theory which has been used to study a wide range of individual behaviors in social psychology (see Figure 1). The theory has been widely applied and has been demonstrated empirically as being effective in predicting intention and behavior (Cooke and French 2008). TPB indicates that intention is determined by three constructs: attitude, subjective norms, and perceived behavioral control. Intention is defined as the readiness to

18

engage in a certain behavior. Intention can predict behavior. That is to say, intention indicates the likelihood that one will perform a given behavior in a certain timeframe. According to TPB (Ajzen 1991), attitude refers to one's positive or negative evaluations of performing a behavior. The more positive the attitude, the stronger the intention to engage in a specific behavior. Subjective norms, or perceived social pressure, refer to an individual's perception that people who are important to him/her (important others) think he/she should perform or not perform a behavior (Ajzen 1991). The stronger the perceived social pressure, the greater the intention to perform a certain behavior. Perceived behavioral control refers to one's perceived ease or difficulty of performing a behavior. The greater the perceived behavioral control, the stronger the intention to perform a given behavior. The theory also suggests that an individual who intends to perform a behavior may lack the control/resources to do so; therefore, TPB posits that perceived behavioral control can directly influence behavior. Table 1 presents the theoretical definition of terms used in this study.
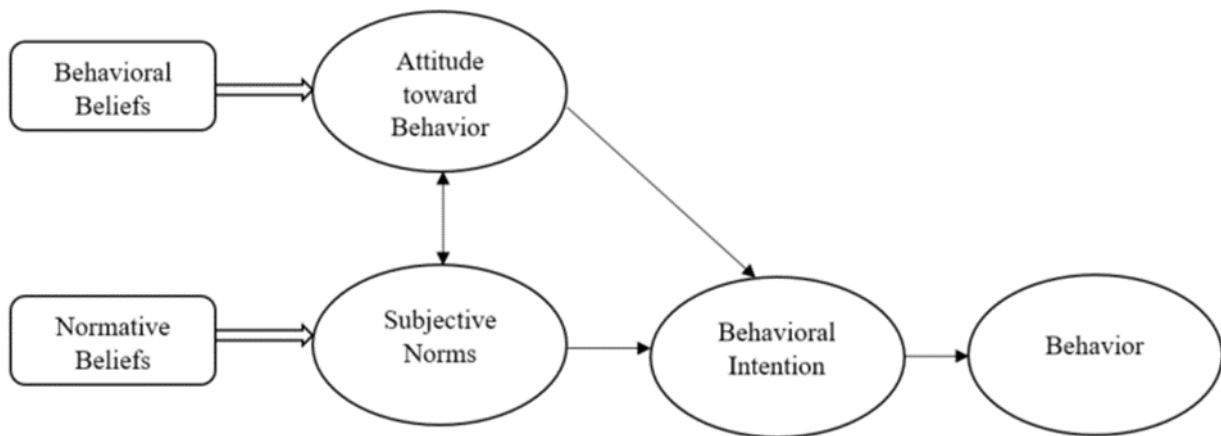
Figure 2. The Theory of Reasoned Action[*]

[*] *The model was adapted from Ajzen (1980).*

TPB is an extension of the Theory of Reasoned Action (TRA; Ajzen and Fishbein 1980). TRA (see Figure 2) includes attitude and subjective norm as the determinants of intention, but not perceived behavioral control. The assumption of TRA is an individual has the volitional control over the specific behavior. Hence, an individual will perform a behavior when he or she intends to do so and will not perform the behavior when he or she does not intend to do so. TPB is similar to the earlier TRA except for one additional component – perceived behavioral control. This component was included in TPB to account for situations when individuals do not have full control over their behaviors.

The two authors of TPB, Ajzen and Fishbein, update the framework of TPB and TRA and present the Reasoned Action Approach (Fishbein and Ajzen 2010). The Reasoned Action Approach encompasses the TPB constructs—behavioral beliefs, normative beliefs, control beliefs, attitudes, subjective norms, perceived behavioral control, intention, and behavior—and background factors. Background factors in the Reasoned Action Approach consist of individual, social, and information factors. Individual factors refer to personality, mood, emotion, and past behavior. Social factors are cultural and demographic variables, including age, gender, education, income, and culture. Information factors refer to knowledge, skills, and media influence. These background factors are expected to influence intention and behavior through their influences on beliefs (Ajzen 2002). There are few differences between TPB and the Reasoned Action Approach. Hence, this study employs the theoretical framework of the well-established TPB and integrates updates from the Reasoned Action Approach when available.

TPB posits that intention and behavior can be altered by changing the beliefs underlying attitude, subjective norms, and perceived behavioral control (Ajzen 1991). The theory indicates that attitude is a multiplicative function of beliefs (behavioral beliefs) that behavior leads to

20

certain outcomes and evaluations of these outcomes. Changing attitude requires changing behavioral beliefs (Fishbein and Ajzen 2010). If an individual believes that the outcome of a behavior is favorable, the attitude towards the behavior will be positive. TPB also suggests that subjective norms and perceived behavioral control are a function of normative beliefs and control beliefs, respectively. Subjective norms are determined by normative expectations of important others and a motivation to comply with the expectations of those important others. In TPB, important others can be an individual's family, friends, colleagues, or superiors at work (Ajzen 1991). Changing subjective norms requires changing what an individual perceives their important others would expect and that individual's desire to comply with those expectations (Fishbein and Ajzen 2010). When an individual perceives that important others think he/she should engage in a behavior, the individual is more likely to do so. Perceived behavioral control is determined by beliefs that can facilitate or impede the behavior, including internal factors (skills and abilities) and external factors (opportunities and barrier). The internal factors of perceived behavioral control are related to the concept of self-efficacy (Ajzen 1991; Bandura et al. 1988). Changing perceived behavioral control requires changing beliefs that barriers can be easily overcome (Fishbein and Ajzen 2010).

3.1.1 Empirical Tests of the Theory of Planned Behavior

TPB has been widely applied to different disciplines to understand individuals' intention and behavior, such as cancer screening, exercise, voting, weight loss, charitable giving, blood donation, food consumption, moral behavior, leisure choice, recycling, attending class, smoking cessation, cheating, and the use of technology (Armitage and Conner 2001; Parker et al. 1992; Rutter 2000; Fortin 2000; George 2002; Robinson and Doverspike 2006; Francis et al. 2004). Most studies use TPB to identify determinants of human social behavior (Armitage and Conner

2001). The methods used in these studies are interviews and surveys. For example, Conner et al. (2002) examine individuals' intentions on healthy eating. They find that all constructs proposed by TPB (attitude, subjective norms, and perceived behavioral control) are influential factors and TPB can predict healthy eating up to six years after the initial study. Murnaghan et al. (2009) show that perceived behavioral control significantly influences teenagers' intentions to abstain from smoking.

Meta-Analyses have confirmed the efficacy of TPB. Armitage and Conner (2001) review 185 studies and find that TPB explains 39 percent and 27 percent of the variance in intention and behavior, respectively. A more recent meta-analysis (McEachan et al. 2011) also confirms the utility of TPB and indicates that TPB model accounts for 23.9 percent of the variance in physical activity. Studies that compare TPB with TRA find that TPB explains more variance in intention than TRA (Madden et al. 1992; Armitage and Conner, 2001). However, TPB is often criticized for ignoring the emotional factors that contribute to behavior. Several studies suggest that TPB assumes that human behavior is rational; therefore, it excludes emotional variables, such as mood, threat, fear, and anxiety (Conner and Armitage 1998; Gibbons et al. 1998). It is well known that human behaviors are not always rational. Ajzen (2002) responds to this criticism by pointing out that emotions are background variables in TPB which are expected to influence intention and behavior through their influences on beliefs and attitudes. Fishbein and Ajzen (2010) also state that TPB does not assume rationality and it encompasses both deliberative and spontaneous judgment and decision making. Therefore, the use of TPB in the auditor knowledge-sharing context is appropriate.

Table 1. Theoretical Definitions of Terms

Term	Definition
Behavioral Beliefs	The beliefs that performing a certain behavior will lead to positive or negative outcomes.
Normative Beliefs	The beliefs that indicates important others approve or disapprove of performing a given behavior.
Control Beliefs	The beliefs represent external and internal factors that are perceived to facilitate or hinder performing a certain behavior.
Attitude	The degree to which a person has a favorable or unfavorable evaluation of a given behavior.
Subjective Norms	A perception of social pressure to perform or not perform a behavior in question. It refers an individual's perception that important others think that the individual should or should not engage in a behavior.
Perceived Norms	A perception of social pressure to perform or not perform a behavior in question. It refers an individual's perception about the expectations and actions of important others regarding the behavior in questions.
Perceived Behavioral Control	The perceived ease or difficulty of performing a certain behavior.
Intention	The likelihood that an individual will perform a behavior.
Behavior	The actual action or behavior performed by an individual.

3.1.2 Theory of Planned Behavior and Behavioral Interventions

A few studies have utilized TPB to develop behavioral interventions aimed at facilitating

behavioral change, including research on smoking, cardiovascular risk, alcohol consumption, and

23

fruit and vegetable consumption (Johnston et al. 2004; Conner et al. 1999; Boger et al 2004). Ajzen and Fishbein (2005) suggest that to effectively alter intentions and behaviors, behavioral intervention should be directed at one or more beliefs underlying attitudes, subjective norms, and perceived behavioral control. There are different forms of behavioral intervention strategies that can be used to change behavior, including group discussions, training sessions, workshops, and messages. Researchers often use message intervention strategies to influence intentions and behaviors. For example, Hoogstraten et al. (1985) develop message interventions to change beliefs about dental treatment and show that such interventions can encourage dental treatment behavior. More specifically, the message targeting behavioral beliefs is the most effective in promoting the behavior of seeking dental treatment.

Furthermore, Darker et al. (2010) employ TPB and successfully develop persuasive messages targeting control beliefs to encourage the intention to walk and actual walking. Chatzisaranitis and Hagger (2005) develop behavioral interventions targeting behavioral beliefs to change physical activity. The intervention is able to change attitudes toward physical activity and the intention to engage in physical activity; however, it does not successfully change behavior. Chatzisarantis, Kamarova, and Wang (2010) extend Chatzisarantis and Hagger's (2005) work by developing behavioral interventions that target behavioral beliefs and control beliefs simultaneously. They find that the intervention targeting both beliefs effectively promotes physical activity intention and such intervention affects intention to engage in physical activity via its influence on attitudes and perceived behavioral control related to physical activity. Bardus (2012) examines whether behavioral interventions, in the email and/or text message format, can affect workplace physical activity and find that interventions can promote more favorable attitudes toward physical activity and actual physical activity in the workplace. These studies use

24

the experimental method to evaluate the effectiveness of interventions in altering intention and behavior. The rationale for interventions within TPB is that modifying beliefs (underlying attitude, subjective norms and perceived behavior control) can influence attitude, subjective norm, and perceived behavioral control, and, in turn, affect intention and behavior (Ajzen 2006). Chatzisarantis and Hagger (2005) posit that the next step in TPB research is to develop and evaluate theory-guided interventions.

Hardeman et al. (2002) review 30 studies which describe behavioral interventions based on TPB. They show that these papers use different intervention techniques, including verbal persuasion, modelling, goal-setting, and planning. They find that only half of the 30 studies rely on TPB to develop behavior intervention; however, all of the studies use the framework of TPB to conduct data analyses. Hardeman et al. (2002) further indicate that half of the studies support the impact of behavioral interventions on altering intention and that some studies find interventions results in positive behavioral changes, especially for those studies that employed TPB to develop the behavioral interventions. Webb et al. (2010) review behavioral intervention studies and report that behavioral interventions based on TPB result in higher effects on behavioral change than interventions based on other theoretical models, such as the Transtheoretical Model and Social Cognitive Theory. Tyson et al. (2014) conduct a meta-analysis and review the behavioral intervention effectiveness on reducing heterosexual risk behavior. They find that TPB is a valuable theory to develop interventions for behavior change.

3.1.3 The Theory of Planned Behavior and Knowledge Sharing

Prior studies have adopted TPB or TRA to understand knowledge sharing among different professional groups. For example, Rye et al. (2003) study knowledge sharing among Korean physicians in hospitals. They find that attitude and subjective norms can influence

25

physicians' knowledge-sharing intention. Subjective norms have a greater impact on intention than attitude; however, perceived behavioral control was found to be the least influential factor on knowledge-sharing intention. Lin and Lee (2004) investigate the applicability of TPB in understanding senior managers' intentions to encourage knowledge sharing. They find that senior managers' attitudes, subjective norms, and perceived behavior control affect their intentions to encourage knowledge sharing.

Bock et al. (2005) employ TRA and augment it with extrinsic motivators, social-psychological forces, and organizational climate factors to understand the factors promoting or hindering knowledge-sharing intention. They survey 154 managers from 27 Korean organizations. Interestingly, they find that extrinsic rewards could inhibit the development of favorable attitudes toward knowledge sharing. Instead, employees' attitude toward knowledge sharing is greatly influenced by anticipated reciprocal relationships related to knowledge sharing. They further show that organizational culture is an important factor that could influence knowledge sharing: the knowledge-sharing culture not only affects the formation of subjective norms regarding knowledge sharing but also directly influences employees' intention to share knowledge.

Connelly et al. (2009) test whether perceived behavioral control can influence knowledge-sharing intention. They argue that perceived behavioral control includes ability, opportunity, and time. They posit that the effect of time on intention should be salient when opportunity is given and ability is controlled in the experiment. That is to say, the more time an individual has, the more sharing she or he should be able to do. However, they are not able to support this argument; they do not find that time availability affects knowledge sharing. Chen (2011) examines high school teachers' knowledge-sharing intention and finds that attitude,

subjective norms, and perceived behavioral control can influence the intention to share knowledge.

To conclude, previous studies which employ TPB use the survey method and analyze knowledge-sharing intention rather than actual knowledge-sharing behavior. In these studies, knowledge-sharing intention is measured as a continuous variable (using Likert Scales): participants' willingness to share knowledge. Knowledge-sharing behavior is often measured as a dichotomous variable: whether participants indicate they would like to share knowledge or not. Essentially, the knowledge-sharing behavior measures is concerned with intention rather than behavior, because the dichotomous variable is a self-reported measure of whether participants would or would not share knowledge, rather than an objective measure of actual knowledge-sharing behavior. This study, using the experiment method, emphasizes auditors' actual knowledge-sharing behavior by asking auditors to input the knowledge they would like to share into a KMS. Therefore, this study is able to analyze the quantity and quality of knowledge actually shared by auditors and thus draw conclusions based on a more objective measure.

3.2 Behavioral Interventions to Influence Auditors' Knowledge-Sharing Behavior

According to Fishbein and Ajzen (2010), there are different forms of intervention strategies designed to change behavior, including group discussions, workshops, messages, and public announcements. When exposed to an intervention, an individual is provided with new information or experiences which may change behavior-related beliefs and, as a result, influence intention and behavior. Persuasive communication, such as a belief-targeted message, is often used as an intervention to change intention and behavior (Ajzen 1998; Fishbein and Ajzen 2010). The main advantage of persuasive communication is that it can be used to reach a large audience at a relatively low cost.

27

To affect auditors' knowledge-sharing behavior, the critical issue is to develop an effective belief-targeted message (the behavioral intervention) that includes arguments targeting behavioral beliefs, normative beliefs, or control beliefs (Ajzen and Fishbein 1980; Bright et al. 1993). This study emphasizes interventions with arguments targeting behavioral and/or normative beliefs. It does not focus on interventions that include arguments targeting control beliefs because previous studies have shown that perceived behavioral control does not exert a significant effect on knowledge sharing (Puccinelli 1998; Connelly et al. 2009).

In summary, this study builds upon previous applications of TPB to develop behavioral interventions in an effort to affect auditors' attitudes, perceived norms, intentions, and behavior regarding knowledge sharing. As suggested by Fishbein and Ajzen (2010), this study uses belief-targeted messages as behavioral interventions to influence auditors' knowledge-sharing intentions and behaviors. Each intervention—a belief-targeted message—includes arguments targeting behavioral and/or normative beliefs.

3.3 Hypothesis 1 and 2: Behavioral Interventions Targeting Behavioral and Normative Beliefs

3.3.1 An Intervention with Arguments Targeting Behavioral Beliefs

Ajzen and Fishbein (1980) suggest that the structure of belief-targeted messages (the behavioral interventions) should include arguments that are in favor of performing a behavior. In TPB, attitude is determined by behavioral beliefs, which are concerned with the outcome and importance of performing a behavior. Thus, in this study, arguments targeting behavioral beliefs discuss the benefits of knowledge-sharing behavior and the importance of such behavior to the accounting firm and the knowledge sharer. These arguments emphasize the positive outcomes to the accounting firm and the knowledge sharer if knowledge is shared. Compared to when there is no intervention, when exposed to an intervention with arguments targeting behavioral beliefs,

28

an individual will have a more positive attitude toward knowledge sharing and, as a result, will have a greater intention to—and will—share more knowledge.

3.3.2 An Intervention with Arguments Targeting Normative Beliefs

In TPB, subjective norms refer to a person's perceptions of important others' expectations for a given behavior. The term "norm" is the perceived social pressure to perform or not perform a behavior (Fishbein and Ajzen 2010). The term "subjective" is used because the perceptions of the individual may or may not reflect what important others truly think ought to be done (Ajzen and Fishbein 1980). Studies on TPB and social influence suggest that there is a need to distinguish between injunctive and descriptive norms (Rivis and Sheeran 2003; Cialdini et al. 1990). The subjective norms within TPB are injunctive norms because injunctive norms are concerned with perceptions regarding whether important others approve or disapprove of performing a behavior. Descriptive norms, on the other hand, refer to perceptions about whether important others actually perform (or do not perform) the behavior in question. Furthermore, the social influence literature suggests that imitating the actions of important others provides a decision-making shortcut for deciding on how to behave in each situation (Cialdini et al. 1990; Kallgren et al. 2000; Reno et al. 1993). When important others perform a behavior, people will assume that performing the same behavior is appropriate under the circumstances. This would be especially true when important others are experts with respect to the behavior in question (Fishbein and Ajzen 2010).

Studies on TPB have examined the influence of descriptive norms on intention and behavior. For example, Rivis and Sheeran (2003) conduct a meta-analysis and find that descriptive norms increase the variance explained in intention by 5 percent above the other TPB components. Ajzen and Fishbein (2010) contend that people also experience normative pressure

when important others themselves perform or do not perform a behavior. They further introduce the term "perceived norms," which includes injunctive norms and descriptive norms and which incorporates both the expectations and the actions of important others, to the latest version of TPB (Ajzen and Fishbein 2010). Thus, the term "perceived norms," instead of "subjective norms," is used in the research model of this study (see Figure 3). Normative beliefs, therefore, consist of both injunctive and descriptive normative beliefs in this study.

To create belief-targeted messages that include arguments targeting normative beliefs, this study emphasizes important others' expectations and actions of knowledge-sharing behavior. According to the studies of TPB and social influence, when exposed to an intervention with arguments targeting both injunctive and descriptive normative beliefs, compared to when there is no intervention, auditors will perceive higher social pressure to share knowledge and, as a result, will have a greater intention to, and actually will, share more knowledge.

3.3.3 An Intervention with Arguments Targeting both Behavioral and Normative Beliefs

TPB also suggests that intention is an additive function of three variables: attitude, perceived norms, and perceived behavioral control. The term "additivity" means that the combined effects of attitude, perceived norms, and perceived behavioral control can create an effect that is greater than the sum of their separately measured individual effects (Fishbein and Ajzen 2010). The implication for this study is that a behavioral intervention with arguments targeting both behavioral and normative beliefs will be more effective in encouraging knowledge-sharing behavior than an intervention with arguments targeting only behavioral beliefs or normative beliefs. The formal hypotheses follows：

> **H1:** Auditors exposed to an intervention with arguments targeting both behavioral and normative beliefs will share the most knowledge, compared to auditors exposed to

30

interventions with arguments targeting behavioral beliefs and normative beliefs individually, or auditors not exposed to any interventions.

H2a: Auditors exposed to an intervention with arguments targeting behavioral beliefs will share more knowledge, compared to auditors not exposed to any interventions.

H2b: Auditors exposed to an intervention with arguments targeting normative beliefs will share more knowledge, compared to auditors not exposed to any interventions.

3.3.4 Research Question: An Intervention with Arguments Targeting Behavioral Beliefs versus an Intervention with Arguments Targeting Normative Beliefs

Unlike the design of this study, prior research, which employs TPB in developing behavioral interventions, mostly focuses on one specific type of beliefs and compares participants' behavior or intention when there is an intervention and when there is no intervention. This study examines auditors' knowledge-sharing behavior when exposed to an intervention which includes arguments targeting behavioral beliefs or normative beliefs individually. There is no theory or prior literature that could help predict whether a behavioral-beliefs-intervention or a normative-beliefs-intervention will be more effective in encouraging knowledge-sharing intention and behavior. Therefore, I propose a research question instead of a hypothesis.

RQ: When exposed to an intervention that includes arguments targeting behavioral beliefs or when exposed to an intervention that includes arguments targeting normative beliefs, will auditors share more knowledge?

31
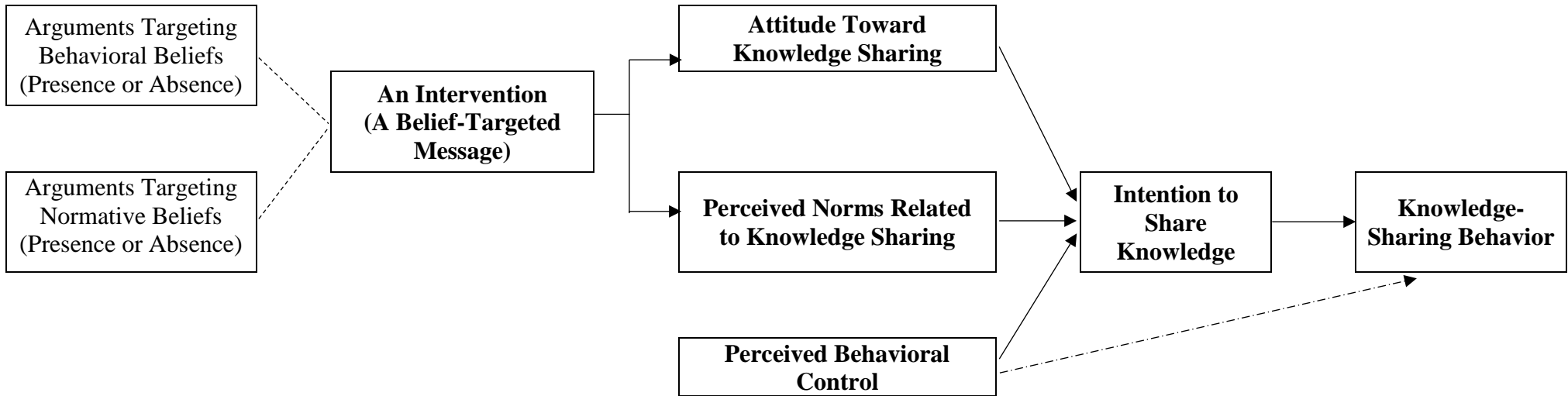
Figure 3: Research Model

3.4 Hypothesis 3 and 4: Interventions, Intention, and Behavior

The previous hypothesis tests whether behavioral interventions can influence auditors' knowledge-sharing behavior. Hypothesis 3 and 4 test how behavioral interventions affect knowledge sharing among auditors by examining the relationship of constructs proposed by TPB. According to Ajzen (1991), intention indicates how hard people are willing to try and how much effort they are going to exert to engage in a given behavior. Behavioral and normative beliefs determine attitude and perceived norms, respectively. Attitudes and perceived norms are the antecedents of intention. Therefore, an intervention with arguments targeting behavioral and/or normative beliefs is expected to influence intention via attitude and/or perceived norms. That is to say, the behavioral intervention with arguments targeting both behavioral and normative beliefs will affect intention through its impact on attitude and perceived norms. However, the behavioral invention with arguments targeting only behavioral (or normative) beliefs will affect intention via its influence on attitude (or perceived norms).

TPB also suggests that knowledge-sharing intention is determined by attitude and perceived norms related to knowledge sharing. Intention is the immediate antecedent of behavior, although perceived behavioral control also must be considered (Fishbein and Ajzen 2010). The stronger the intention, the greater the chance that an auditor will actually share knowledge. These expectations based on TPB lead to the following hypotheses:

H3: The effects of behavioral interventions on knowledge-sharing intention will be mediated by auditors' attitudes and perceived norms related to knowledge sharing.

H4: The impact of attitude and subjective norms on knowledge-sharing behavior will be mediated by the intention to share knowledge.

4. METHOD

4.1 Research Participants

Knowledge needs to be passed on from more experienced auditors to less experienced auditors. Appropriate participants for this study are audit seniors, managers, or partners who have more audit experience. Auditors typically ascend to senior staff level after having two years of work experience; therefore, the participants can be auditors with at least two years of experience.

Participants in this study were 87 auditors from different accounting firms, including Big 4 (71 percent), international (14 percent), and regional firms (15 percent). Forty-six (53 percent) of the participants are male. Forty-three participants (49 percent) are in the age range 31 to 40; thirty-one participants (36 percent) are in the age range 20 to 30; thirteen participants (15 percent) are in the age range 41 to 50; and no one is over 50 years old. Table 2 provides the frequencies and percentage of selected background demographic characteristics.

Auditor participants hold the positions of senior auditors (48 percent), managers (36 percent), or partners (16 percent). Over 80 percent of the participants are CPAs and around 26 percent of the participants have the CISA (Certified Information Systems Auditor) certification. Participants have an average of 9.1 years of auditing experience and are familiar and knowledgeable regarding ICFR (internal control over financial reporting) audits, making my sample appropriate given that these levels of auditors are more experienced auditors. On average, participants took 21 minutes to complete the study. None of these frequencies differ statistically across conditions.

Table 2. The frequencies and percentage of background demographic characteristics

	n	%	ATBB and ATNB	ATBB	ATBB	ATBB
Gender						
Female	41	47.13%	10	8	12	11
Male	46	52.87%	12	14	10	10
Age Groups						
Below 20	0	0.00%				
20--30	31	35.63%	6	8	9	8
31--40	43	49.43%	13	10	9	11
41--50	13	14.94%	3	4	4	2
Above 50	0	0.00%				
Highest Level of Education						
High School	0	0.00%				
Associate Degree	0	0.00%				
Bachelor's Degree	58	66.67%	12	16	19	11
Graduate Degree	29	33.33%	10	6	3	10
Certificates Acquired						
CPA	75	86.21%	16	20	18	21
CISA	23	26.44%	3	7	8	5
CMA	10	11.49%	3	0	2	5
CIA	7	8.05%	2	3	1	1
Others	0	0.00%				
None	8	9.20%	1	1	4	2
Firm Size						
Big 4	62	71.26%	18	10	15	19
International Firm, not Big 4	12	13.79%	1	8	1	2
Regional Firm	13	14.94%	3	4	6	0
Others	0	0.00%				
Position						
Senior Auditor	42	48.28%	10	13	8	11
Audit Manager	31	35.63%	8	7	11	5
Audit Partner	14	16.09%	4	2	3	5
Others	0	0.00%				

4.2 Experimental Task

The setting for the experiment is auditors' sharing decision regarding the knowledge of

ICFR acquired over the course of a financial statement audit. The experimental task requires

35

participants to perform an internal control review task (ICFR audit). Participants read a case describing a highly-computerized disbursement accounting system and its related internal controls. Participants were first asked to identify internal control weaknesses and possible financial statement errors resulting from these weaknesses. Next, they suggested new or improved control procedures that could reduce the internal control weaknesses they identified earlier. This case is a modified version of the published case written by Curtis and Borthick (1999).

This particular task was chosen for two reasons. First, it is an appropriate task for auditors. This case has been used in studies examining auditor performance in internal control reviews (Curtis and Viator 2000; Borthick et al. 2006). Second, practitioners and policy makers have recognized the importance of knowledge sharing for the ICFR audit. ICFR has topped the list of audit deficiencies over the last few years, as indicated in the inspection reports from PCAOB. Helen Munter, the director of PCAOB's Division of Registration and Inspections, states that audit deficiencies in recent years may be caused by auditors not having the necessary knowledge and experience. She points out that when auditors with more experience leave a firm, "less experienced audit staff are performing the work" (Munter 2015). More knowledge sharing with the firm's KMS could potentially mitigate knowledge loss for public accounting firms. If experienced auditors share more knowledge with the firm's KMS, less experienced auditors can access and use such knowledge to improve their performance. Thus, the experimental setting of this study is concerned with the knowledge regarding the ICFR audit.

4.3 Research Design

This study uses a 2×2 between-participants design, manipulating arguments that target behavioral and normative beliefs. Arguments targeting behavioral beliefs are manipulated at two

levels: presence and absence. Arguments targeting behavioral beliefs discuss the benefits of knowledge-sharing behavior and the importance of such behavior to the accounting firm and the knowledge sharer. These arguments emphasize the advantages of compliance with knowledge-sharing behavior (e.g., "if you share knowledge, you will …", see Figure 4).

If you share Knowledge

- You will help improve the audit quality of our audit firm.
- You will help improve our firm's value and competitive advantage.
- You will establish your expertise in some auditing areas.
- You will save your colleagues' time on resolving similar problems and recreating the same basic reports.
- You will develop new ideas and solutions because we often learn from others' experience and expertise.

Figure 4. Arguments targeting behavioral beliefs

Arguments targeting normative beliefs are also manipulated at two levels: presence and absence. Arguments targeting normative beliefs highlight important others' expectations and actions regarding knowledge sharing. These arguments indicate that the important other thinks one should share knowledge and that the important other had already shared knowledge with the firm's KMS (see Figure 5). In an accounting firm, an audit manager can be considered an "important other" to an auditor. Responses to post-experimental questions confirm that auditor participants agree that an audit manager is the "important other."

Pat Smith—the audit manager

"Since we strive to create a knowledge sharing community, it is expected that each auditor shares knowledge with the system."

The audit manager, Pat Smith, has shared two pieces of knowledge with the KMS last month.

Knowledge Management System

« Prev **1** Next »

Pat Smith
the audit manager

The internal control weaknesses in the processing of purchasing transaction

The improved control procedures that can reduce internal control weakness

Figure 5. Arguments targeting normative beliefs

4.4 Experimental Procedures

The experiment is an online experiment. Table 3 presents the experimental procedures of this study. Auditor participants were given a web link to access an online survey through Qualtrics, a web-based survey platform, to complete the experimental task and questionnaire. I required participants to pass a five-question qualification test prior to completing the study. Each participant was asked to indicate his/her position/role in the audit firm, the type of audit firm he/she works for, and years of auditing experience. They also answered two ICFR audit-related questions[1]. Participants were automatically excluded from the study if they failed to correctly answer the two ICFR audit questions.

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[1] Two ICFR-related questions were asked. The first question tests whether participants are familiar with the standard of PCAOB regarding internal controls. For the second question, participants need to correctly identify the best control plan that could be used to prevent the system failure from occurring for the company.

After reading and agreeing to the terms of informed consent, participants completed three

stages of the experiment. During Stage 1, participants worked on an internal control review task.

The task includes a short description of the company's business and a discussion of the control

environment for computer-based processes. Participants were required to identify internal control

weaknesses and possible financial statement errors resulting from those weaknesses and suggest

new or improved control procedures that could reduce the internal control weakness they

identified. Participants were instructed to spend at least eight minutes on the experimental task.

After eight minutes, they could click the Continue button and proceed to the next page when

ready.

In Stage 2, participants were randomly assigned to one of the four experimental

conditions (see Figure 6): arguments targeting both behavioral beliefs and normative beliefs

(ATBB+ATNB), arguments targeting behavioral beliefs (ATBB), arguments targeting normative

beliefs (ATNB), and the no intervention (control) condition. Participants in all conditions were

informed that the audit firm has a KMS that is designed to share work knowledge, access past

projects, and find solutions using the online search function. Participants were instructed to study

the belief-targeted message they received. In the ATBB+ATNB condition, participants read the

arguments targeting both behavioral beliefs and normative beliefs; whereas in the ATNB or

ATBB condition, participants read the arguments targeting behavioral beliefs or normative belief

only. Participants, in the no-intervention condition, did not read any belief-targeted arguments.

Then, participants were asked to answer questions that measure their attitudes toward knowledge

sharing and perceived norms related to knowledge sharing. They then indicated the likelihood

that they would share knowledge of internal control with the firm's KMS. They also indicated

the likelihood that one of their colleagues would share knowledge with the firm's KMS (see the

39

discussion of social desirability bias in control variables section). On the next page, participants could input the knowledge they would like to share. I piped their responses from Stage 1 (the internal control review task) to this page, so that they could review their prior responses and decide what to share.

In Stage 3, participants answered manipulation-check questions, indicated why they decided to or decided not to share knowledge, answered post-experiment questions, and provided demographic information.

		Arguments Targeting Behavioral Beliefs	
		Presence	Absence
Arguments Targeting Behavioral Beliefs	Presence	ATBB+ATNB	ATNB
	Absence	ATBB	No Intervention

Figure 6. Experimental Design

4.5 Dependent Variables

The main dependent variable of this study is knowledge-sharing behavior. Auditor participants were asked to input the knowledge they would like to share. Two coders, who were not aware of the study's hypotheses, analyzed the knowledge shared by participants. These two coders are senior auditors from two different Big 4 accounting firms. The coders evaluated participants' knowledge-sharing behavior based on the quantity and quality of knowledge shared. They assigned a score (knowledge-sharing score) to each participant, with the highest score being 7, indicating the knowledge shared was extremely helpful, and the lowest score 1, implying the knowledge shared was not at all helpful. The coders discussed and resolved any disagreements. The Cohen's Kappa statistic for inter-rater reliability was .91 indicating a high
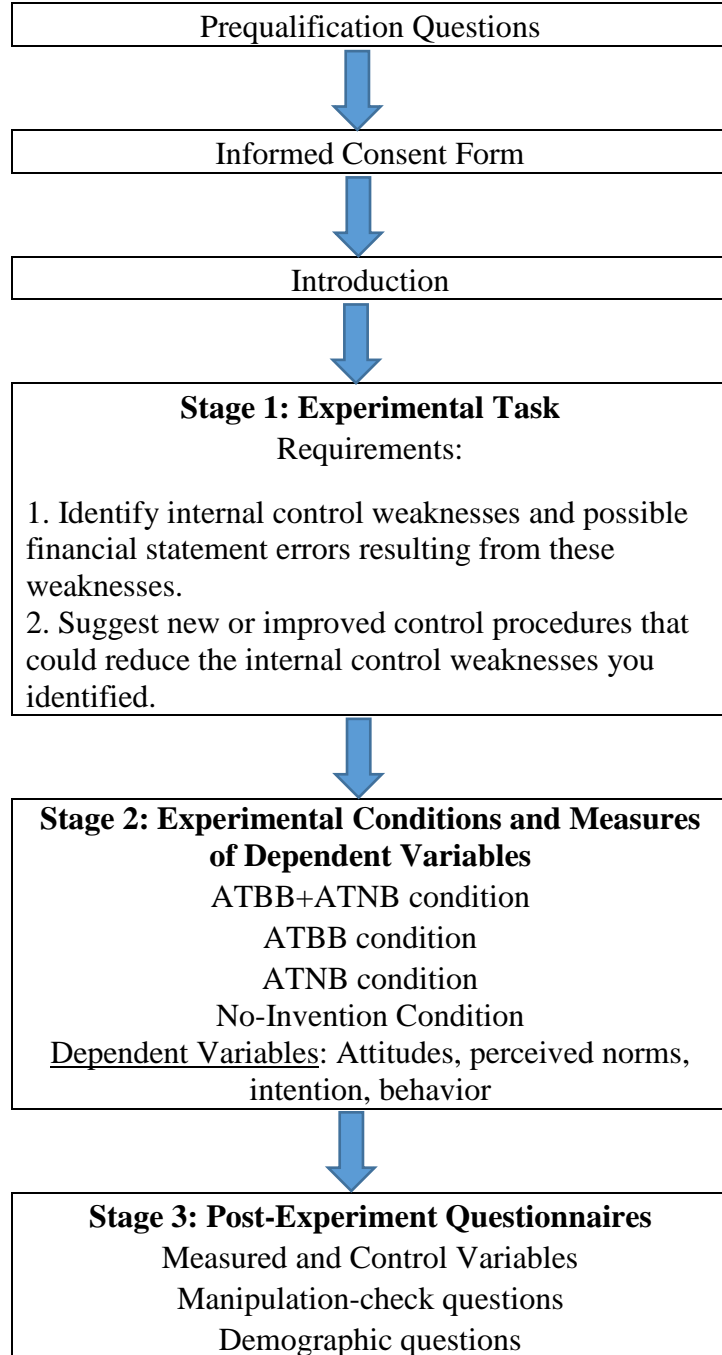
level of agreement (Hallgren 2012). Participants automatically received a score of 0 if they opted not to share knowledge.

Other dependent variables of this study include the three components of TPB: attitude, perceived norms, and intention. They were measured on 7-point scales ranging from "strongly disagree" (1) to "strongly agree" (7). Four questions drawn from Bock et al. (2005) and Fishbein and Ajzen (2010) were used to measure attitudes toward knowledge sharing. An example of the attitude measure is "Sharing knowledge with the firm's KMS is good." The experimental instrument is included in Appendix A. The Cronbach's alpha for the attitude measure was .89, indicating good reliability. Perceived norms were also measured through four questions (Bock et al. 2005; Fishbein and Ajzen 2010). An example is "Most people who are important to me think that I should share knowledge with the firm's KMS." The Cronbach's alpha for the perceived norms measure was .92. Intention to share knowledge was assessed. Participants indicated the likelihood that they would share knowledge on a 11-point scale ranging from "not at all likely" (0) to "extremely likely" (10).

4.6 Measured Variables and Other Control Variables

Perceived behavioral control was measured in order to account for the possible influences of control factors on auditors' knowledge-sharing behavior. This variable was assessed through four questions (Fishbein and Ajzen 2010). An example is "If I really want to, I could share my knowledge." The Cronbach's alpha for this perceived behavioral control measure was .93, indicating good reliability. Ajzen and Fishbein (2010) also suggest that past behavior can be a good predictor of future action, although it is not included in TPB. Thus, past behaviors related to knowledge sharing and help offering were measured on 5-point scales ranging from "not very often" (1) to "very often" (5).

41

Table 3. Experimental Procedure

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┌─────────────────────────────────────────────────┐
│          Prequalification Questions             │
└─────────────────────────────────────────────────┘
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┌─────────────────────────────────────────────────┐
│             Informed Consent Form               │
└─────────────────────────────────────────────────┘
                      ↓
┌─────────────────────────────────────────────────┐
│                 Introduction                    │
└─────────────────────────────────────────────────┘
                      ↓
┌─────────────────────────────────────────────────┐
│          Stage 1: Experimental Task             │
│                 Requirements:                   │
│                                                 │
│ 1. Identify internal control weaknesses and     │
│ possible financial statement errors resulting   │
│ from these weaknesses.                          │
│ 2. Suggest new or improved control procedures   │
│ that could reduce the internal control          │
│ weaknesses you identified.                      │
└─────────────────────────────────────────────────┘
                      ↓
┌─────────────────────────────────────────────────┐
│   Stage 2: Experimental Conditions and Measures │
│             of Dependent Variables              │
│              ATBB+ATNB condition                │
│                 ATBB condition                  │
│                 ATNB condition                  │
│              No-Invention Condition             │
│  Dependent Variables: Attitudes, perceived      │
│           norms, intention, behavior            │
└─────────────────────────────────────────────────┘
                      ↓
┌─────────────────────────────────────────────────┐
│    Stage 3: Post-Experiment Questionnaires      │
│          Measured and Control Variables         │
│           Manipulation-check questions          │
│             Demographic questions               │
└─────────────────────────────────────────────────┘
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I collected other control variables suggested in prior literature as being influential to knowledge-sharing behavior, including individuals' altruism and social desirability response bias. Specifically, participants indicated the likelihood that one of their colleagues would share

42

knowledge under the same circumstances. This self-other comparison procedure was recommended by Heurta et al. (2012) to control for social desirability response bias (Douglas et al. 1996). Participants also indicated their education and professional background. Finally, demographic information, including age, gender, and academic training, was collected.

4.7 Pilot Test

I conducted a pilot test to gather preliminary data and test the validity of the instrument used in this study. Participants for the pilot test were 69 accounting majors who were enrolled in a college-level auditing course. Participants received five course points for successful completion of the entire experiment. Participants were asked to assume the role of a staff auditor and complete the internal control review task. The experimental procedures of the pilot test are similar to the procedures of the actual experiment, except that the pilot test was conducted in a computer lab. On average, student participants took 35 minutes to complete the instrument.

4.7.1 Manipulation Check

Student participants were asked to indicate whether they received any message related to knowledge sharing and choose the message they received during the experiment. Six participants (9 percent) failed the manipulation check questions. To better understand the results of the pilot test, I conducted the data analyses based on the 63 observations.

4.7.2 Results from Pilot Test

I included social desirability bias, altruism and demographic variables, including gender, age, career plan, professional experience, and academic training in the data analyses as potential covariates. None of these variables were significant and there were no changes in the pattern of significance when these variables were included. However, perceived behavioral control can

influence the participants' knowledge-sharing intention and behavior. Therefore, it was included in the data analysis.

Hypothesis 1 predicts that participants share the most knowledge when there is an intervention that includes arguments targeting both behavioral and normative beliefs, compared to when there is an intervention with arguments targeting behavioral beliefs or normative beliefs, or when there is no intervention. Hypothesis 2 states that participants share more knowledge when there is an intervention with arguments targeting behavioral beliefs or normative beliefs, compared to when there is no intervention. I used the planned contrasts technique to test Hypothesis 1 and 2. I first compared the mean knowledge-sharing behavior for the ATBB+ATNB condition to the mean score across the other three conditions (weighted score: 3, -1, -1, -1). I also used pairwise comparison to confirm the result from the planned contrast. Next, I compared the mean knowledge-sharing intention for the ATBB condition and ATNB condition to the mean score for no-intervention condition (weighted score: 0, 0, 1, -1; weighted score: 0, 1, 0, -1). Panel B of Table 4 shows the results of the planned contrasts, which provide support for Hypothesis 1 and 2. Figure 7 provides plots of means by condition.

To answer the research question, I compared the mean knowledge-sharing behavior for the ATBB condition to the mean score for the ATNB. This study did not propose a directional hypothesis for participants' knowledge-sharing behaviors in the ATBB and ATNB condition; therefore, this study used pairwise comparison technique, instead of planned contrast, to test the behavior differences between the ATBB and ATNB condition. However, there is no evidence to show which intervention is more effective in encouraging knowledge-sharing behavior ($t=1.15$, $p=.89$).

44

Table 4

Knowledge-Sharing Behavior (Pilot Test)

Panel A. Sample size, Mean and Standard Deviations for Experimental Conditions

Mean (Standard Deviation)		Arguments Targeting Behavioral Beliefs (ATBB)[a]	
		Presence	Absence
Arguments Targeting Normative Beliefs (ATNB)[b]	Presence	5.97 (1.62) n=16 *Cell 1*	4.43 (1.55) n=15 *Cell 2*
	Absence	4.38 (1.71) n=17 *Cell 3*	3.50 (1.22) n=15 *Cell 4*

Panel B. Planned Contrasts

	Planned Comparison	Weights	t-test	p-value[d]
H1—Knowledge-Sharing Behavior	Cell 1>Cell 2, 3 or 4 ATBB and ANBB highest	3, -1, -1, -1	7.32	.035
H2—Knowledge-Sharing Behavior	Cell 3>Cell 4 ANBB only> No intervention	0, 1, 0, -1	5.28	.044
H2—Knowledge-Sharing Behavior	Cell 2>Cell 4 ATBB only> No intervention	0, 0, 1, -1	4.91	.052

[a] Arguments Targeting Behavioral Beliefs (ATBB) is manipulated at two levels: presence and absence. ATBB emphasize the positive outcomes of compliance with knowledge-sharing behavior.
[b] Arguments Targeting Normative Beliefs (ATNB) is manipulated at two levels: presence and absence. ATNB indicate that the audit manager thinks that one should share knowledge and the audit manager himself had actually shared knowledge.
[c] The dependent variable, knowledge-sharing behavior, was based on the quantity and quality of knowledge shared by participants.
[d] One-tailed p-value.

To test Hypothesis 3 and 4, I followed the approach suggested by Preacher and Hayes (2004) to conduct mediation analysis. Hypothesis 3 states that the effects of interventions on knowledge-sharing intention are mediated by the auditors' attitudes and/or the perceived norms related to knowledge sharing. I conducted three sets of mediation analyses to test how behavioral

interventions influence the knowledge-sharing intention. Hypotheses 4 predicts that the impact of attitudes and perceived norms on knowledge-sharing behavior are mediated by their intentions to share knowledge. The results of the mediation analyses provide support for Hypothesis 3 and 4.

4.7.3 Discussion

The results of the pilot test show that student participants share the most knowledge when exposed to an intervention which includes arguments targeting both behavioral and normative beliefs. This finding confirms the "additivity" implication from TPB. The pilot test further indicates that participants share more knowledge when exposed to an intervention which includes arguments targeting behavioral beliefs or normative beliefs, compared to when there is no intervention. These findings suggest that behavioral interventions developed based on TPB can be used to promote knowledge sharing among participants in the pilot test.
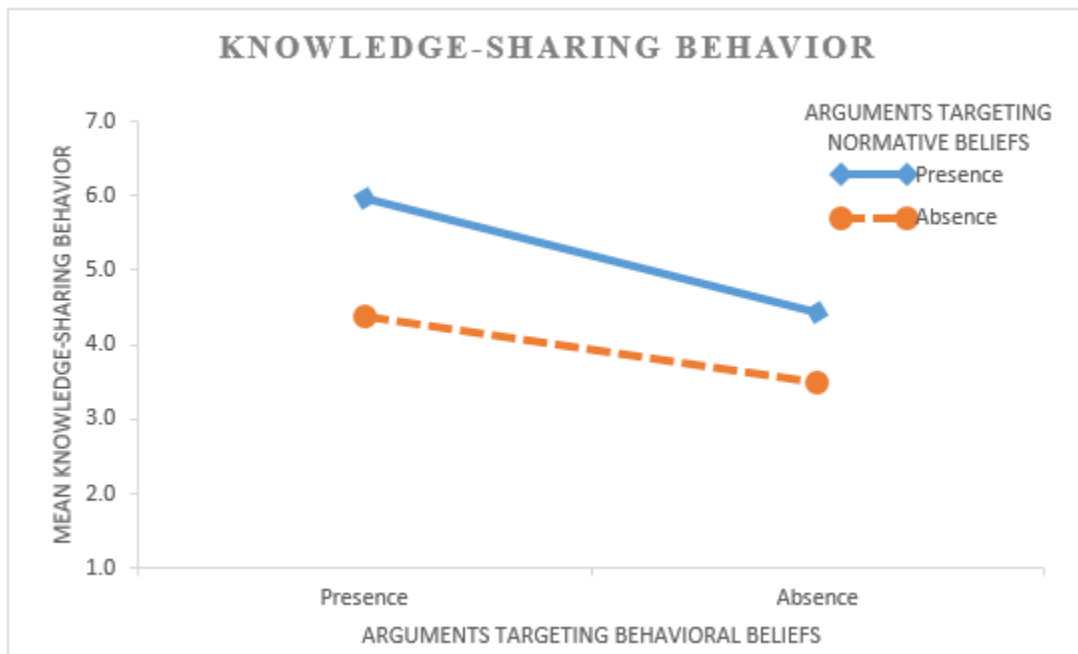

Figure 7. Plots of Means by Condition (Pilot Test)

However, the findings do not provide any evidence regarding which intervention is more effective in promoting knowledge sharing: an intervention with arguments targeting only normative beliefs or an intervention with arguments targeting only behavioral beliefs. The participants of the pilot test are auditing students, who do not necessarily have auditing or work experience. They may not be able to perceive the social pressure from the expectations and actions of an audit manager, although they indicated in the post-experimental questions that the audit manager is the important other in the experimental setting. Thus, it is difficult to argue whether the same pattern will be observed using auditor participants.

The pilot test also tests the research framework of TPB and shows that (1) behavioral interventions influence knowledge-sharing intention via their impacts on attitude and/or perceived norms; (2) the influence of attitude and subjective norms on knowledge-sharing behavior are mediated by the intention to share knowledge. More specifically, the findings of the pilot test show that the behavioral intervention targeting both behavioral and normative beliefs affect knowledge-sharing intention via its influence on attitude and perceived norms. The behavioral intervention targeting only behavioral beliefs influences knowledge-sharing intention through its impact on attitude; whereas the behavioral intervention targeting only normative beliefs influences intention via its influence on perceived norms. These results are consistent with the prediction of this study.

4.7.4 Supplementary Analyses

4.7.4.1 Qualitative analyses.

Qualitative analyses of the participants' answers to the post-experiment questions were conducted. I used open-ended questions to assess the reasons why participants chose to or chose not to share knowledge with the firm's KMS. First, I analyzed the reasons why participants

decided to share knowledge. The analyses show that the belief-targeted message can be an effective way to encourage the knowledge-sharing behavior. This is due to the fact that participants' answers are consistent with the advantages of knowledge sharing mentioned in the belief-targeted message (ATBB condition, ATBB and ATNB condition). Examples are, "Since sharing my knowledge to KMS will be accessible to others in my firm they maybe be able to use the information in other engagements. This can be a great resource for others to collaborate and use"; "To help expand the overall company knowledge"; and "It is important to share knowledge in order to further the quality and ability of the firm."

Second, this study analyzed the reasons why participants decided not to share knowledge. Participants who did not share knowledge indicated that they would rather keep the knowledge to themselves, or that they were not competent enough to share knowledge. Examples include, "I wanted to keep the knowledge confidential"; "I would rather keep it to myself"; and "Incorrect information that may be shared to a main system can cause issues that are hard to correct. I would not share information to a system unless I was 100% certain that the information I was sharing was correct and not subject to changes, because people would come to rely on it."

In summary, the qualitative statements provide evidence that an intervention, such as a belief-targeted message, can be used as a way to encourage knowledge-sharing behavior.

4.7.4.2 Additional analyses.

Post-experiment questions were used to assess participants' view on the behavioral interventions (the belief-target message) in this experiment. First, I examined the extent to which participants agreed or disagreed with the benefits of knowledge-sharing behavior in the belief-targeted message. I found that 90 percent of participants agreed that auditors' knowledge sharing can improve an audit firm's value and competitive advantage; 91 percent of participants agreed

48

that auditors' knowledge sharing can improve the audit quality of an audit firm; 93 percent of participants agreed that auditors' knowledge sharing can establish their expertise in some auditing areas; 93 percent of participants agreed that auditors' knowledge sharing can save colleagues' time on resolving similar problems and recreating the same basic reports; 89 percent of participants agreed that auditors' knowledge sharing result in new ideas and solutions. In summary, participants tended to agree with the statements in the belief-targeted message.

Second, I investigated whether an audit manager is an "important other" who can influence participants' knowledge-sharing behavior. I found that 86 percent of participants agreed that they want to do what their audit manager thinks they should do when it comes to knowledge sharing, while other colleagues (49 percent) did not cause similar reactions, as seen with analyzing close friends (11 percent) and spouses and partners (13 percent).

To conclude, participants are more likely to do what their audit manager thinks they should do. Therefore, it is reasonable to discuss the audit manager's knowledge-sharing expectation and action in the belief-targeted message in the experiment.

4.7.5 Implications of the Pilot Study

Overall, the results of the pilot test were consistent with my expectations. The findings suggest that participants who were exposed to an intervention that includes arguments targeting both behavioral and normative beliefs shared the most knowledge, compared to all other conditions. Participants who were exposed to the intervention that targeted behavioral or normative beliefs shared more knowledge than participants not exposed to any interventions. The pilot test also indicates that behavioral interventions influence auditors' knowledge-sharing intentions via their impacts on attitudes and/or perceived norms. The findings of the pilot test also confirm the efficacy of TPB and show that the impact of attitude and perceived norms on knowledge-sharing behavior are mediated by the intention to share knowledge.

The results of the pilot test are subject to limitations. First, participants completed the internal control task in the same computer lab. In a natural setting, auditors are likely to be geographically dispersed. Second, participants had limited time to complete the task and the questionnaire. With additional time, participants may identify more internal weaknesses and share more knowledge. Third, the participants of the pilot test are auditing students who have limited work experience. Therefore, they may not well perceive the social pressure to share knowledge when they are given the scenario that the auditor manager expects them to share knowledge and the audit manager himself has already shared knowledge, although they seem to agree an audit manager is the important other and they would follow what the audit manager does.

5. RESULTS

5.1 Manipulation Checks

Manipulation checks were conducted to ensure that participants understood the manipulations of arguments targeting behavioral and normative beliefs as intended. Participants were asked to indicate whether they received any messages related to knowledge sharing and choose the message they received during the experiment. Eight participants (9 percent) failed the manipulation check questions. The significance level of the analysis does not change when I exclude participants who failed manipulation check questions; therefore, I report the results from the full sample of 87 auditor participants.

5.2 Main Analyses and Hypotheses Testing

5.2.1 Assumptions for Hypothesis 1 and 2

Hypothesis 1 and 2 were tested using the planned contrast technique. The statistical technique requires three main assumptions: independence of observations, the dependent variable is normally distributed, and equality of variance across conditions. First, the independence of observations requirement was met because no participant took the online survey more than once and participants were randomly assigned to each experimental condition. I have examined the I.P. address of each participant to ensure that no one has taken the experiment twice. Second, the assumption of the normal dependent variable for each treatment was tested by constructing histograms and normal probability plots of the knowledge-sharing score. The

51

distribution seems to be reasonable. Finally, the assumption of equal variance across treatments is not required because this study has a balanced design.

5.2.2 Test of Hypothesis 1 and 2 and Research Question

Perceived behavioral control, altruism, past behavior, and demographic variables, including gender, age, auditing experience, and education background, were analyzed as potential covariates. None of these variables were significant and there were no changes in the pattern of significance when they were included in the model as covariates. Therefore, I did not include these variables in the data analysis.

Furthermore, to account for social desirability bias (Douglas et al. 1996; Heurta et al. 2012), I also asked participants to indicate the likelihood that one of their colleagues would share knowledge under the same circumstances. I substituted colleagues' intention with participants' intention and conducted the data analyses. The results were consistent and the pattern of significance does not change when colleagues' intention measure was used. Hence, this study reports the results based on auditor participants' knowledge-sharing intention.

The planned pairwise comparison technique was used to test Hypothesis 1 and 2. Panel A of Table 5 presents the sample size, mean, and standard deviations for knowledge-sharing behavior measures under each experimental condition. Figure 8 provides plots of means by condition. Hypothesis 1 predicts that participants exposed to an intervention that includes arguments targeting both behavioral and normative beliefs share the most knowledge, compared to participants exposed to interventions with arguments targeting behavioral beliefs and normative beliefs individually, and those participants who are not exposed to any intervention. To test Hypothesis 1, I compared the mean knowledge-sharing scores for the ATBB+ATNB condition and for the ATNB condition (t=3.15, p=.045); the mean knowledge-sharing scores for

the ATBB+ATNB condition and for the ATBB condition (t=5.27, p=.032); and the mean

knowledge-sharing scores for the ATBB+ATNB condition and for the no intervention condition

(t=9.67, p=.014). Panel B of Table 5 shows the results of the pairwise comparisons, which

provide support for Hypothesis 1, indicating that participants share the most knowledge when

exposed to the intervention targeting both behavioral and normative beliefs.

Hypothesis 2a posits that participants share more knowledge when exposed to the

intervention that includes arguments targeting behavioral beliefs, compared to participants who

are not exposed to any intervention. I compared the mean knowledge-sharing score for the

ATBB condition to the mean score for no intervention condition. Panel B of Table 5 shows the

results of the pairwise comparison (t=6.43, p=.029), providing support for Hypothesis 2a.

Hypothesis 2b predicts that participants share more knowledge when exposed to the

intervention that includes arguments targeting normative beliefs, compared to participants who

are not exposed to any intervention. I compared the mean knowledge-sharing score for the

ATNB condition to the mean score for no intervention condition. The result indicates that

participants share more knowledge when exposed to the intervention targeting normative beliefs

(t=7.16, p=.021), providing support for Hypothesis 2b.

Table 5

Knowledge-Sharing Behavior

Panel A. Sample size, Mean and Standard Deviations for Experimental Conditions

Mean (Standard Deviation)		Arguments Targeting Behavioral Beliefs (ATBB)[a]	
		Presence	Absence
Arguments Targeting Normative Beliefs (ATNB)[b]	Presence	5.91 (1.49) n=22 *Cell 1: ATBB+ATNB*	5.01 (1.35) n=22 *Cell 2: ATNB*
	Absence	4.27 (1.37) n=22 *Cell 3: ATBB*	2.21 (1.62) n=21 *Cell 4: No intervention*

Panel B. Pairwise Comparisons

<u>Hypothesis</u>	<u>Comparisons</u>	<u>t-test</u>	<u>p-value</u>[d]
H1 Cell 1 (ATBB+ATNB) highest	Cell 1 vs. Cell 2	3.46	.045
H1 Cell 1 (ATBB+ATNB) highest	Cell 1 vs. Cell 3	5.27	.032
H1 Cell 1 (ATBB+ATNB) highest	Cell 1 vs. Cell 4	9.67	.014
H2a Cell 3 (ATBB) higher	Cell 3 vs. Cell 4	6.43	.029
H2b Cell 2 (ATNB) higher	Cell 2 vs. Cell 4	7.16	.021
RQ	Cell 2 vs. Cell 3	3.18	.046

[a] Arguments Targeting Behavioral Beliefs (ATBB) is manipulated at two levels: presence and absence. ATBB emphasize the positive outcomes of compliance with knowledge-sharing behavior.
[b] Arguments Targeting Normative Beliefs (ATNB) is manipulated at two levels: presence and absence. ATNB indicate that the audit manager thinks that one should share knowledge and the audit manager himself had actually shared knowledge.
[c] The dependent variable, knowledge-sharing behavior, was based on the quantity and quality of knowledge shared by participants.
[d] One-tailed p-value.

54

To answer the research question "When exposed to an intervention that includes arguments targeting behavioral beliefs or when exposed to an intervention that includes arguments targeting normative beliefs, will auditors share more knowledge?" I used the pairwise comparison technique to test which intervention is more effective to promote more knowledge-sharing behavior. I compared the knowledge-sharing scores for the ATBB condition and for the ATNB condition. The result shown in Panel B of Table 5 indicates that auditors share more knowledge when exposed to an intervention that includes arguments targeting normative beliefs ($t=3.18$, $p=.046$).
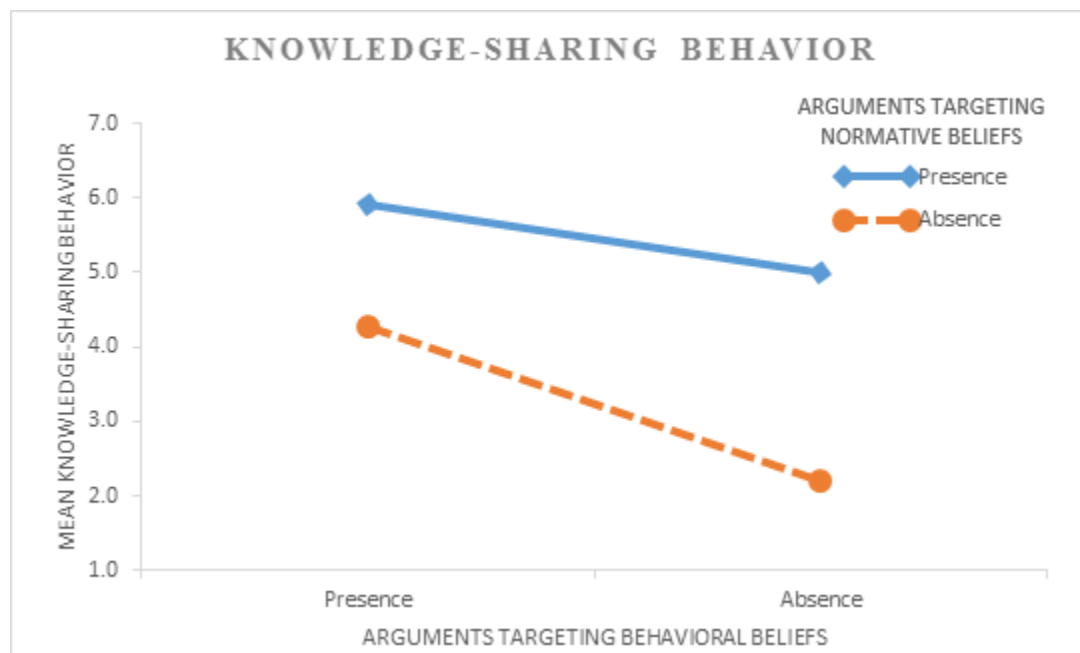
Figure 8. Plots of Means by Condition

5.2.3 Assumptions for Hypothesis 3 and 4

The mediation analysis technique was used to test Hypothesis 3 and 4. Mediation analysis also relies on all the standard assumptions of the general linear regression: linearity, normality,

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homogeneity of error variance, and independence of errors. In order to test the assumptions, I plotted the residuals versus independent variables and the dependent variables of each regression model. There are no discernible patterns observed in the plots. I also produced histograms of residuals to the normality assumptions. The residuals appear to have a normal distribution. The data in this study is not time-series data. Residual correlation usually occurs when researchers use time-series data; therefore, there is no need to test the assumption of independence of errors.

5.2.4 Test of Hypothesis 3 and 4

Hypothesis 3 examines the process by which behavioral interventions influence the knowledge-sharing intention. To test Hypothesis 3, I followed the approach suggested by Preacher (2004) to conduct mediation analysis. First, for the ATBB+ATNB condition, participants were exposed to arguments targeting both behavioral beliefs and normative beliefs; therefore, I expect that the effect of interventions on knowledge-sharing intention is mediated by auditors' attitude and perceived norms related to knowledge sharing. Second, for the ATBB condition, where participants only read the arguments targeting behavioral beliefs, I posit that the influence of the intervention on knowledge-sharing intention is mediated by auditors' attitudes toward knowledge sharing. Third, for ATNB condition, where participants read the arguments targeting normative beliefs, I expect that the impact of the intervention on knowledge-sharing intention is only mediated by auditors' perceived norms regarding knowledge sharing. Multiple regression analyses were conducted to assess each component of the proposed mediation models. I used the bootstrapping method with bias-corrected confidence estimates (Preacher and Hayes 2004). In this study, the 95% confidence interval of the indirect effects was obtained with 5000 bootstrap resamples (Preacher and Hayes 2004; Hayes 2013). The results of the mediation analysis confirm the mediating role of attitude in the relation between the ATBB intervention

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and knowledge-sharing intention (Panel B of Figure 9) and the mediating role of perceived norms in the relation between the ATNB intervention and intention (Panel C of Figure 9). In addition, the results suggest that the effect of ATBB+ATNB intervention on knowledge-sharing intention via its influence on attitude and perceived norms related to knowledge sharing (Panel A of Figure 9). Thus, the results of the analyses provide support for Hypothesis 3. Figure 9 presents the mediation models I used to test Hypothesis 3.

Mediation analyses were also used to test Hypotheses 4: the effects of attitude and perceived norms on knowledge-sharing behavior are mediated by the intention to share knowledge. I used the full sample to conduct the data analyses. The results from the analyses provide support for Hypothesis 4 and indicate that attitudes and perceived norms influence knowledge-sharing behavior through their impacts on knowledge-sharing intention. Figure 10 presents the mediation model I used to test Hypothesis 4.

The results of data analyses show that (1) auditor participants share more knowledge when exposed to a behavioral intervention; (2) auditor participants share the most knowledge when exposed to an intervention that includes arguments targeting both behavioral and normative beliefs; (3) consistent with the model of TPB: (1) the impact of behavioral interventions on knowledge-sharing intention is mediated by auditors' attitudes and/or perceived norms related to knowledge sharing; (2) the influence of attitude and subjective norms on knowledge-sharing behavior are mediated by the intention to share knowledge. Table 6 provides a summary of the results of the tests of the hypotheses.
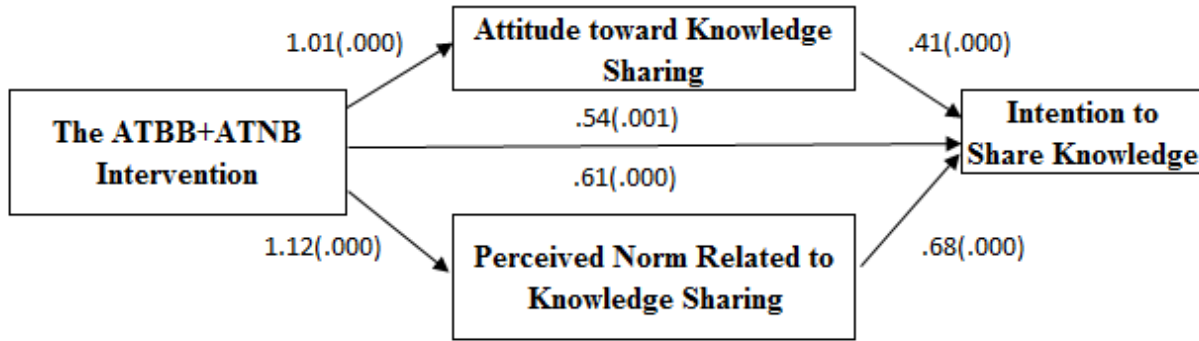
Panel A. The ATBB+ATNB Intervention and Knowledge-Sharing Intention
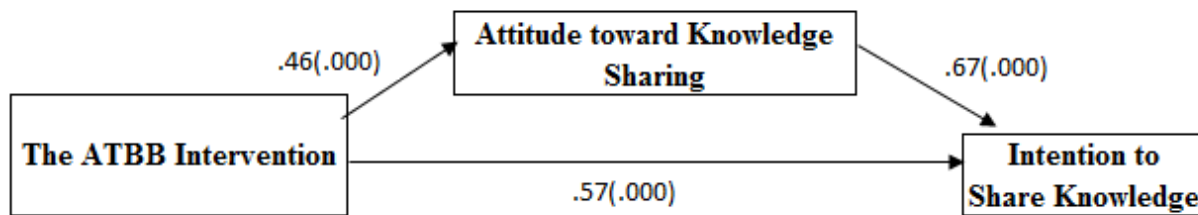
Panel B. The ATBB Intervention and Knowledge-Sharing Intention
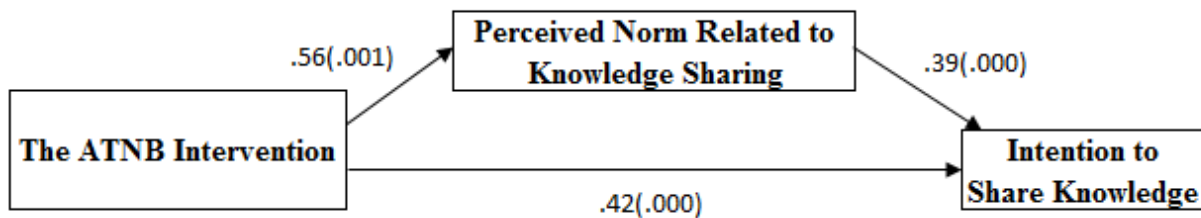
Panel C. The ATNB Intervention and Knowledge-Sharing Intention

Figure 9. Mediation Models for Hypothesis 3 (Standardized Coefficients (p-values))

5.3 Supplementary Analysis

5.3.1 Reasons to Share or Not Share

At the end of the experiment, participants were asked to indicate any reasons why they decided to or decided not to share knowledge with the firm's KMS. First, I analyzed the reasons

58

why participants decided to share knowledge. The analyses show that behavioral interventions can be an effective way to encourage knowledge sharing among auditors. This is because participants' answers are consistent with the belief-targeted message they read. Participants who were exposed to arguments targeting behavioral beliefs indicated that they decided to share knowledge because they agreed that knowledge sharing can be beneficial to the audit firm, can help establish their expertise in some auditing areas, and save their colleagues' time on resolving similar problems and recreating the same basic reports. Participants who were exposed to arguments targeting normative beliefs indicated they shared knowledge because they would do what the audit manager expected them to do and would follow what the audit manager did. The answers from participants in the ATBB+ATNB condition covered both topics: the benefits of knowledge sharing and the expectations and actions of the audit manager.
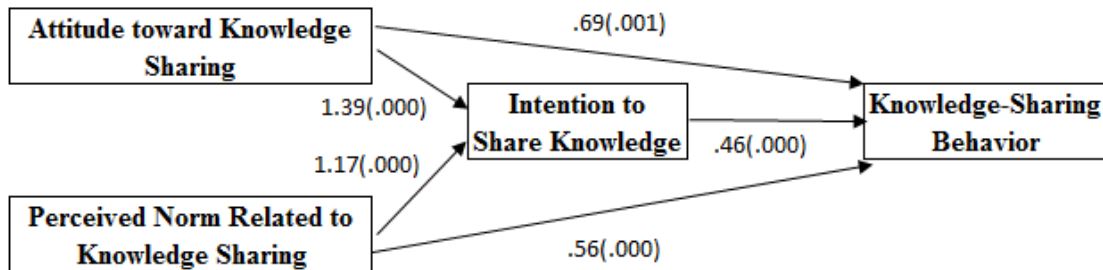

Figure 10. The Mediation Model for Hypothesis 4 (Standardized Coefficients (p-values))

Second, this study analyzed the reasons why participants decided not to share knowledge. All participants (seven participants) who did not share knowledge gave the same answer: they

would rather keep the knowledge to themselves. Out of the seven participants[2], two participants were in the no-intervention condition and five participants decided not to share knowledge after studying the belief-targeted message. I believe this observation can provide tension for this study: people always have the tendency to hoard knowledge (Davenport and Prusak 1998; Bock et al. 2005).

In summary, the post-experimental questions provide evidence that an intervention, such as a belief-targeted message, can be the method to encourage the knowledge-sharing behavior.

Table 6. Summary of Results

Hypotheses	Result
H1: Auditors exposed to an intervention with arguments targeting both behavioral and normative beliefs will share the most knowledge, compared to auditors exposed to interventions with arguments targeting behavioral beliefs and normative beliefs individually, or auditors not exposed to any interventions.	Supported
H2a: Auditors exposed to an intervention with arguments targeting behavioral beliefs will share more knowledge, compared to auditors not exposed to any interventions.	Supported
H2b: Auditors exposed to an intervention with arguments targeting normative beliefs will share more knowledge, compared to auditors not exposed to any interventions.	Supported
RQ: When exposed to an intervention that includes arguments targeting behavioral beliefs or when exposed to an intervention that includes arguments targeting normative beliefs, will auditors share more knowledge?	The intervention that includes arguments targeting normative beliefs is more effective.
H3: The effects of interventions on knowledge-sharing intention will be mediated by the auditors' attitudes and the perceived norms related to knowledge sharing.	Supported
H4: The impact of attitude and perceived norms on knowledge-sharing behavior will be mediated by the intention to share knowledge.	Supported

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[2] Seven participants decided not to share knowledge. Two participants were in the no-intervention condition, one participant in the ATBB+ATNB condition, one participant in the ATNB condition, and two participants in the ATBB condition.

5.3.2 Perceived Behavioral Control and Task Difficulty

According to TPB, perceived behavioral control can directly or indirectly influence behavior. Although perceived behavioral control is not the variable of interest in my study, I measured this variable to account for the possible influences of control factors on auditors' knowledge-sharing behavior. Perceived behavioral control variable was assessed through four questions (Fishbein and Ajzen 2010). Participants indicated their control over sharing knowledge with the firm's KMS. The results from these four questions show that over 88 percent of auditor participants believed they have full control over sharing knowledge with KMS. That is to say, auditor participants in this study are very confident about their knowledge related to the internal control task.

I excluded the perceived behavioral control variable from the data analysis because the results were not significant and there were no changes in the pattern of significance when perceived behavioral control variable is included. This finding indicates that perceived behavioral control does not significantly influence knowledge sharing, which is consistent with the prior literature (Puccinelli 1998; Connelly et al. 2009).

In addition to the perceived behavioral control questions suggested by Fishbein and Ajzen (2010), I also asked participants to indicate the difficulty the experimental task for this experiment and how knowledgeable they were about the internal review control task in the experiment. These two questions were measured on 11-point scales ranging from 0, "not difficult at all" ("not knowledgeable at all"), to 10 "extremely difficult" (extremely knowledgeable). The average score of the task difficulty question is 2.6, indicating that auditor participants did not find the internal control review task very difficult. The average score of the knowledgeable

61

question is 8.3, implying that participants think they have the knowledge to complete the internal control review task in this experiment. These results provide support for the appropriateness of the target population of this study—auditors who are knowledgeable about internal control review.

5.3.3 Time Spent on the Experiment

By adding the timing function to my survey on the Qualtrics website, I am able to record and examine how long each participant spends on each page of the online experimental instrument. During Stage 1 of the experiment, I required participants to spend at least eight minutes on the experimental task (internal control task) by setting up the timer on that page. The timing report shows that participants spent an average of 11.2 minutes on the experimental task page, with a minimum of eight minutes and a maximum of 20.3 minutes. The time spent on the experimental task is as expected and is reasonable.

Next, I examined how long participants spent studying the belief-targeted message they received. On average, participants spent 30 seconds reading the message. Participants who were exposed to arguments targeting both behavioral beliefs and normative beliefs did not spend more time on the belief-targeted message page, although the message in this condition is longer. Participants in the no-intervention condition were not asked to study the belief-targeted message, but they were informed that the audit firm has a KMS that is designed to capture, store, and disseminate knowledge within the audit firm. Thus, they spent less time on this page, with an average of six seconds.

Finally, I investigated how long it took participants to complete the online experiment. Participants spent an average of 22 minutes on the experiment, with a minimum of 13 minutes and a maximum of 31 minutes. The suggested time by the Qualtrics website for my experiment

was 21 minutes; therefore, it is acceptable that the average time participants spent was 22 minutes.

5.3.4 Additional Analyses

Post-experiment questions were also used to assess participants' views on the manipulations of this study. First, I examined the extent to which participants agreed or disagreed with the benefits of knowledge-sharing behavior (ATBB manipulation) in the belief-targeted message. I found that 88 percent of participants agreed that auditors' knowledge sharing can improve an audit firm's value and competitive advantage; 93 percent of participants agreed that auditors' knowledge sharing can improve the audit quality of an audit firm; 88 percent of participants agreed that auditors' knowledge sharing can establish their expertise in some auditing areas; 90 percent of participants agreed that auditors' knowledge sharing can save colleagues' time on resolving similar problems and recreating the same basic reports; 83 percent of participants agreed that auditors' knowledge sharing can result in new ideas and solutions. In summary, participants tended to agree with the statements in the belief-targeted message. The argument participants agreed with the most is "In general, auditors' knowledge sharing can improve the audit quality of an audit firm."

Second, I investigated whether an audit manager is an "important other" who can influence participants' knowledge-sharing behavior. I found that 87 percent of participants agreed that they want to do what their audit manager thinks they should do when it comes to knowledge sharing, and 82 percent of participants agreed that they would do what their spouse or partners think they should do, while other colleagues (53 percent) and close friends (13 percent) did not cause similar reactions.

The post-experimental questions verify that auditors agree with the advantages of knowledge sharing proposed in the belief-targeted message and they are more likely to do what their audit manager thinks they should do. Therefore, it is reasonable to discuss the audit manager's knowledge-sharing expectation and action in the belief-targeted message in the experiment. To conclude, the post-experimental questions provide evidence that the manipulations of this study are realistic and the behavioral interventions may be used as a practical way to encourage knowledge sharing among auditors.

5.3.5 Additional Discussion

I observe some major differences between students' answers and auditors' answers to the experimental instrument of this study. Unlike auditor participants, student participants were not given financial incentives to participate in this study and students completed the pilot test in a computer lab. It is not reasonable to compare the findings from the pilot test to the findings from the actual experiment. However, it is interesting to discuss the differences between students' answers and auditors' answers. First, auditors' answers to the experimental task (internal control review task) are shorter than students' answers. Students received course credit to participate in this experiment, whereas auditors received financial incentives to complete this survey. It is likely that students are motivated to complete the task and exert effort when course credit is given. However, financial incentives may not well motivate auditor participants, or the financial incentives in this study were not considered sufficient to motivate them to exert the same effort as student participants. Second, student participants did not perform worse than auditor participants. The performance here refers to the answers to the internal control review task at the beginning of the experiment. The experimental task of this study is not considered very complicated or difficult (Curtis and Viator 2000; Borthick et al. 2006). One explanation is that all student participants have recently taken an Accounting

64

Information Systems (AIS) course; therefore, they were familiar with control plans and more sensitive to the internal control weakness of this study. Another explanation is that the structure of the task may be similar to the task students work on in the audit or AIS class. However, auditors typically evaluate more complicated internal control tasks and rely on checklists or decision aids to complete the ICFR audit. Third, student participants who did not share knowledge indicated that they did not share because they thought they were not competent to share knowledge, whereas auditors who did not share knowledge simply indicated that they would rather keep the knowledge to themselves.

6. SUMMARY AND DISCUSSION

6.1 Key Findings

The goal of this study is to understand auditors' knowledge-sharing behavior and suggest practical methods to encourage knowledge sharing among auditors. The study relies on TPB, a well-developed theory from social psychology, to design various behavioral interventions aimed at promoting knowledge sharing. The particular behavioral intervention used in this study is belief-targeted messages. This behavioral intervention approach is relatively low cost and recommended by prior studies on behavioral interventions within TPB. TPB posits that behavioral interventions can alter intention and behavior by modifying the underlying beliefs that influence attitude, perceived norms, and perceived behavioral control (Ajzen 1991). Following the knowledge sharing literature, this study emphasizes the beliefs that determine attitude and perceived norms. Thus, arguments targeting behavioral beliefs and arguments targeting normative beliefs are the variables of interest in this study.

To test the hypotheses of this study, I employ a 2×2 between-participants design, manipulating arguments targeting behavioral beliefs and arguments targeting normative beliefs. Arguments targeting behavioral beliefs emphasize the advantages of knowledge-sharing behavior and the importance of such behavior to the individual and to the audit firm. Arguments targeting normative focus on the expectations and actions of important others regarding knowledge sharing. The participants were 87 auditors who have more than two years of auditing experience. These participants were first asked to complete an internal control review task. Participants identified the internal control weaknesses and possible financial statement errors

66

resulting from these weaknesses and suggested improved control procedures that could reduce the internal control weaknesses. The answers to the internal control review task are considered the knowledge of this study. Next, participants were randomly assigned to different experimental conditions. All participants were informed that the audit firm has a KMS that is designed to capture, store, and disseminate knowledge within the firm. Participants viewed arguments targeting both behavioral and normative beliefs in the combined condition, while participants viewed arguments targeting either behavioral or normative beliefs in the ATBB or ATNB condition. Participants were not exposed to any belief-targeted message in the no-intervention condition. Participants then answered a series of questions that measured attitude, perceived norm, and intention related to knowledge sharing. They also could choose to share knowledge to the KMS. Finally, participants answered manipulation-check questions and post-experimental questions and provided demographic information.

This study employs TPB to also examine the impact of behavioral interventions on auditors' knowledge sharing behavior. The first research question is concerned with whether behavioral interventions can be used to influence auditors' knowledge-sharing behavior. The result of this study provides evidence and shows that auditors share more knowledge when exposed to a behavioral intervention, compared to auditors who were not exposed to any interventions.

The second research question of this study is concerned with whether an intervention that includes arguments targeting both behavioral and normative beliefs is the most effective in promoting knowledge sharing. The rationale for this intervention is based on the expectation that the effects of behavioral and normative beliefs on intention and behavior are additive and given that previous studies have shown that attitude and perceived norms are the influential factors that

determine knowledge sharing among professional groups. I proposed two hypotheses related to the second research questions. Hypothesis 1 predicts that auditors exposed to an intervention with arguments targeting both behavioral and normative beliefs will share the most knowledge, compared to auditors exposed to interventions with arguments targeting behavioral beliefs and normative beliefs individually, or auditors not exposed to any interventions. Hypothesis 2 posits that auditors exposed to an intervention with arguments targeting behavioral beliefs and normative beliefs individually will share more knowledge, compared to auditors not exposed to any interventions. The results of the data analyses provide support for these two hypotheses. These results confirm the "additivity" implication of TPB and suggest that attitude and perceived norms are the influential factors that affect the knowledge-sharing behavior, which is consistent with prior literature that show attitude and perceived norms are the important factors that determine knowledge sharing among professional groups (Puccinelli 1998; Connelly et al. 2009).

I proposed a research question to test when auditors share more knowledge (when exposed to arguments targeting normative beliefs versus when exposed to arguments targeting behavioral beliefs). I find that auditors share more knowledge when exposed to arguments targeting normative beliefs. This finding is interesting because it implies that the social pressure auditors perceive could be used to motivate their behavior, including knowledge-sharing behavior. This finding is consistent with the study of Kimmerle et al. (2008), which found that knowledge sharing is affected by the social norms. This finding supports the social influence literature which contends that the expectations and actions of important others are crucial for individuals to shape their own behaviors (Cialdini et al. 1990; Kallgren et al. 2000; Reno et al. 1993).

The third research questions is concerned with how the behavioral interventions influence auditors' knowledge-sharing behavior. I proposed two hypotheses related to the third research questions. Hypothesis 3 predicts that the effects of interventions on knowledge-sharing intention are mediated by the auditors' attitudes and/or the perceived norms related to knowledge sharing. Hypothesis 4 predict that the impact of attitude and perceived norms on knowledge-sharing behavior is mediated by the intention to share knowledge. Using mediation analyses, this study shows that in the combined (ATBB+ATNB) condition where auditors study arguments targeting both behavioral and normative beliefs, the effect of the behavioral intervention on knowledge-sharing intention is mediated by auditors' attitudes and perceived norms related to knowledge sharing. In the ATBB or ATNB condition, where participants were exposed to one set of arguments, the impact of the intervention on intention is mediated either by attitude or perceived norms related to knowledge sharing only. Hypothesis 4 examines the utility of TPB by investigating the indirect impact of attitude and perceived norms on knowledge-sharing behavior. The results of the mediation analysis confirms the efficacy of TPB in the knowledge sharing context and shows that attitude and perceived norms regarding knowledge sharing affect knowledge-sharing behavior via their impacts on knowledge-sharing intentions.

Unlike many behavioral intervention studies, this study not only adapts TPB to develop belief-targeted messages, but also employs TPB to examine the influence of behavioral interventions on intention and behavior. This approach is recommended by Fishbein and Ajzen (2010). Overall, the findings of this study suggest that an intervention, which includes arguments targeting both behavioral and normative beliefs, is an effective intervention that can be used to encourage auditors' knowledge-sharing behavior.

6.2 Contributions

This study contributes to both literature and practice. This study contributes to TPB in several ways. First, this study extends TPB to the auditing setting. This study is the first study which employs TPB in the auditing setting and examines auditors' knowledge-sharing behavior. Second, the authors of TPB updated the theory in their recent book and introduced the term "perceived norms" (Fishbein and Ajzen 2010). They contend that individuals experience social pressure from both the expectations and actions of important others. Few studies have examined perceived norms within TPB and conducted behavioral interventions to examine the efficacy of the updated TPB. Third, this study employed TPB to develop behavioral interventions and evaluate the effectiveness of such interventions through the mechanisms predicted by TPB. Prior studies either use TPB to develop behavioral interventions or use TPB to evaluate non-theory driven interventions. Ajzen and Fishbein (2010) suggest that it is necessary to rely on TPB to develop behavioral interventions and evaluate the effectiveness of the interventions through the TPB-prescribed mechanisms.

This study contributes to the auditing and accounting information systems literature. KMS and knowledge sharing are important and relevant research topics in the accounting information systems field; and auditing practitioners and researchers have well recognized the importance of knowledge sharing in accounting and auditing firms. Nevertheless, there are limited studies that have examined the factors influencing knowledge sharing. Prior studies focus on investigating how culture and financial incentives factors influence knowledge sharing. Such studies typically use auditing students or self-reported data to draw conclusions. This study captures the knowledge sharing among auditor participants and analyzes the quantity and quality of knowledge shared.

70

This study contributes to the literature on KMS and knowledge sharing. Prior studies on KMS and knowledge sharing mostly employ survey or interview method to obtain data. Thus, these studies examine individuals' intention to share knowledge. This study conducts a controlled experiment to examine the impact of behavioral interventions on knowledge-sharing behavior and thus provides a more objective measure of knowledge sharing, compared to other survey studies and self-reported data. Furthermore, knowledge sharing is an important topic to all the professional groups, including teachers, managers, and physicians. The findings from other professional groups may not be well applied to the auditing setting because auditors are a special group of people who can face different standards (vague or precise), who need to use personal judgment in conducting audit work, and who face pressure from the public, clients, and the audit firm. Therefore, this study contributes to knowledge sharing and KMS literature by examining auditors' knowledge-sharing behavior with the audit firm's KMS.

This study contributes to practice and provides important insights for accounting and auditing firms. The results of this study provide guidelines for encouraging knowledge-sharing behavior and suggests that behavioral interventions, such as a belief-targeted message, can be used to promote auditors' knowledge-sharing behavior. The study further indicates that the intervention that includes arguments targeting both behavioral and normative beliefs are the most effective in encouraging knowledge sharing among auditors. The belief-targeted message approach can be used to reach a large audience at a relatively low cost.

Furthermore, knowledge sharing with the firm's KMS could be used to potentially mitigate knowledge loss for accounting and auditing firms. There is a high turnover rate in the accounting profession. When employees, especially those who are more experienced, leave an accounting firm, the knowledge and expertise they gained would be lost to the firm. If firms can

71

effectively promote knowledge sharing with the firm's KMS, where individuals can transfer their knowledge or expertise to the system, other auditors can improve performance by learning from the knowledge shared to the KMS.

6.3 Limitations

The results of this study should be interpreted considering its limitations. First, participants had limited time to complete the experimental task for this study. In a natural setting, auditors could spend more time to decide whether or not to share knowledge and what knowledge to share with the firm's KMS. Thus, future research could employ a field experiment to explore whether the behavioral interventions introduced in this study continue to foster knowledge sharing behavior in a more natural and less time constrained setting.

Second, the knowledge-sharing score is based on the quantity and quality of knowledge shared. Two independent were used to analyze the knowledge shared by participants. These coders were given the instructions to examine the knowledge shared by considering both the quantity and quality of knowledge shared. In reality, firms that adopt KMS may prefer more knowledge sharing in quantity, especially at the early stage of KMS implementation, whereas others may prefer to have higher quality knowledge in KMS.

Third, the results of this study may not be generalizable to other non-auditing settings. The auditing setting is unique in that audit firms face the pressure from the public and clients; also most engagements involve audit teams. Auditors may get used to informally sharing knowledge; so the problem is how to promote knowledge sharing with the firm's KMS. However, this may not be the case for a non-auditing setting.

Finally, the online data collection has limitations. I was not able to observe participants as they proceeded through the experiment. Participants may engage in multiple tasks while

72

completing the online survey. However, this study analyzed how long participants spent on each page to control for effort and time spent on the online survey.

6.4 Future Research

There are many opportunities for future research in knowledge management and knowledge sharing topics in accounting. First, the experimental task of this study is the internal control review task. Hence, the focus is on the knowledge of ICFR audits. There are different audit tasks, structured or unstructured. Internal control review tasks are a more structured task, compared to fair value estimates, for example. Future research should examine the knowledge-sharing behavior regarding unstructured tasks.

Second, future studies should examine the sharing of other types of knowledge. Bock et al. (2015) suggest that individuals' sharing behavior may vary based on what type of knowledge is involved. For example, Polanyi (1996) classifies knowledge as explicit and tacit knowledge. Future studies should differentiate knowledge types and examine whether experienced auditors' knowledge sharing behavior can be influenced by the knowledge type.

Third, future studies should use creative ways to capture and analyze the knowledge shared by participants. The knowledge-sharing score is based on the quantity and quality of knowledge shared; however, future studies could focus on either the quantity or the quality of the knowledge shared. Also, instead of using two independent coders to analyze the knowledge shared, future studies could use qualitative or context analysis tool to analyze the knowledge shared by participants.

Fourth, future studies should examine whether interventions targeting control beliefs can promote knowledge sharing or not. This study develops arguments targeting behavioral and

73

normative beliefs, but not control beliefs. Although prior studies indicate that perceived behavioral control does not significantly influence knowledge sharing, the findings of these studies are based on survey and interview data; no study has examined behavioral interventions targeting control beliefs. Control beliefs refer to the external and internal factors that are perceived to facilitate or hinder performing a certain behavior. A well-designed KMS could be the external factor that makes knowledge sharing easier. Future studies could examine whether the design of the KMS itself could affect knowledge sharing among auditors, either positively or negatively.

Finally, future studies can use TPB to develop behavioral interventions in contexts other than knowledge sharing. TPB is a well-established theory and has been heavily used in many disciplines. However, it is rarely used in the accounting and auditing literature. Accounting research could employ the theory to investigate behavioral interventions and actions in other contexts, such as budget setting in managerial accounting or earnings management in financial accounting.

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77

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APPENDICES

Appendix A: Experimental Instrument

Experimental Task

Thank you for participating in this experiment. You will assume the role of **an auditor in a global audit firm**.

The experiment will begin on the next page. Please read the instructions carefully.

You are an auditor in a global audit firm. During the current audit for Apex Company, you are asked to complete the internal control review task.

Requirements:

- Please identify internal control weaknesses and possible financial statement errors resulting from these weaknesses.
- Please also suggest new or improved control procedures that could reduce the internal control weaknesses you identified.

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About Apex

Apex is a multi-national distributor of electronic parts, headquartered in New York City (NYC). The company sells 24 classes of products, some of which are considered high tech and some of which rely on mature technology. Apex owns warehouses in different locations in the U.S. and one in Bolivia. Apex also has local sales offices in most states and in several foreign countries. The warehouse distribution offices and sales offices (local offices) report to regional offices in seven locations worldwide. A staff of three auditors is responsible for the review and audit of the worldwide operations of Apex.

Both the local and regional offices operate with minimal staffing, typically with one person performing all accounting and administrative functions in each local office and two or three people performing those functions in the regional office. The managers in each office are production oriented, spending most of their time with the sales force or in the warehouse.

General Computing Environment

Each regional office is responsible for the accounting functions for all sales and distribution offices in its area. Each region has its own computer, which performs all accounting-related data entry and some accounting processing. Payroll and Cost Accounting are processed at the regional office with summarized information transmitted to the NYC central computing center (NYCCC) for company wide consolidation. Revenue/Accounts Receivable and purchases/Accounts Payable transactions are entered at the regional offices and transmitted to NYCCC for processing. The data that are transmitted daily for these two applications include all filled customer sales orders (ready to be billed) for the revenue system and all invoices for the purchasing system.

Approximately 70 people work in the Information Systems (IS) department at NYCCC, including the Input-Output Control (IOC) group. The Director of IS reports to the Vice-President for Corporate Information. Company policy requires that users be included in every aspect of the management and budgeting of the IS department.

Users and IS personnel are involved in the selection of all mainframe software purchased from software vendors. Microcomputer software that does not generate data for other departments is selected independently by the user departments.

The Control Environment for Computer-Based Processing

Computer Audit

Because the majority of processing occurs at NYCCC and few controls exist in the regional offices, Apex's three computer auditors spend most of their time at NYCCC. It is the Director of Internal Audit's policy that both internal and external auditors maintain their independence by not becoming involved with system development projects. Therefore, application reviews are performed only for fully implemented systems.

Computer controls at NYCCC have been reviewed and tested by the external auditor's staff. Because computer controls in the regional offices are considered to be extremely weak, the external auditor has not reviewed controls on the regional computers.

Program Change Control

Programming for both NYCCC and regional offices is performed by NYCCC programming personnel. NYCCC users participate in the evaluation and prioritization of change requests and the design and testing of all software modifications. Systems development life cycle (SDLC) procedures are standardized and are bypassed only in emergencies. Company and external computer auditors are offered the opportunity to review the design of internal controls before development continues.

Program changes are tested on the production system by the programmer responsible for making the modification. Users and programming supervisors review test results and sign off on an implementation authorization form. This form is given to the Software Change Control Group, which copies the source program from the programmer's area to the read-only source code library. Software Change Control personnel then compile the program and place it in the secure production library.

The Software Change Control Group is also responsible for scheduling implementation and for sending program changes to the regional offices. A manual is consulted to determine which regional offices should receive a modified or new program. A designated person from the regional office receives a compiled version of the program and loads the program. A specific date is sometimes scheduled for loading program changes.

Mainframe software is tested by IS personnel with the involvement of users. When source code is available, the transfer into the source code library proceeds as described above. When source code is not available, Software Change Control personnel transfer the compiled version from the Cloud provided by the vendor into the

production library. Because of the wide dispersion of regional offices, personnel in each office conduct computer training.

You are an auditor in a global audit firm. During the current audit for Apex Company, you are asked to complete the internal control review task.

Note: You are a staff auditor in a global audit firm. **What you typed here is a part of the electronic working papers.**

1. <u>Please identify internal control weaknesses and possible financial statement errors resulting from these weaknesses.</u>

2. **Please also suggest new or improved control procedures that could reduce the internal control weaknesses you identified.**

The Continue button will appear after 8 minutes. You can then click the Continue button whenever you are ready to go to the next page.

Once you click "Continue", you won't be able to come back to this page.

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Treatment 1

After you complete the audit of internal control for Company Apex, you receive a message from your audit firm. *Please study the message below.*

Once you click "Continue", you won't be able to come back to this page.

Share Your Knowledge with the Knowledge Management System (KMS)

Our audit firm has a Knowledge Management System (KMS). This system is designed to share work knowledge, access past projects, and find solutions using the online search function. The knowledge shared will be available to all auditors.

If you share Knowledge

- You will help improve the audit quality of our audit firm.
- You will help improve our firm's value and competitive advantage.
- You will establish your expertise in some auditing areas.
- You will save your colleagues' time on resolving similar problems and recreating the same basic reports.
- You will develop new ideas and solutions because we often learn from others' experience and expertise.

Pat Smith—the audit manager

"Since we strive to create a knowledge sharing community, it is expected that each auditor shares knowledge with the system."

The audit manager, Pat Smith, has shared two pieces of knowledge with the KMS last month.

Knowledge Management System

« Prev **1** Next »

Pat Smith
the audit manager

The internal control weaknesses in the processing of purchasing transaction
The improved control procedures that can reduce internal control weakness

<PAGE BREAK>

Treatment 2

After you complete the audit of internal control for Company Apex, you receive a message from your audit firm. *Please study the message below.*

Once you click "Continue", you won't be able to come back to this page.

Share Your Knowledge with the Knowledge Management System (KMS)

Our audit firm has a Knowledge Management System (KMS). This system is designed to share work knowledge, access past projects, and find solutions using the online search function. The knowledge shared will be available to all auditors.

Pat Smith—the audit manager

"Since we strive to create a knowledge sharing community, it is expected that each auditor shares knowledge with the system."

The audit manager, Pat Smith, has shared two pieces of knowledge with the KMS last month.

Knowledge Management System

« Prev **1** Next »

Pat Smith
the audit manager

The internal control weaknesses in the processing of purchasing transaction
The improved control procedures that can reduce internal control weakness

<PAGE BREAK>

Treatment 3

After you complete the audit of internal control for Company Apex, you receive a message from your audit firm. *Please study the message below.*

Once you click "Continue", you won't be able to come back to this page.

Share Your Knowledge with the Knowledge Management System (KMS)

Our audit firm has a Knowledge Management System (KMS). This system is designed to share work knowledge, access past projects, and find solutions using the online search function. The knowledge shared will be available to all auditors.

If you share Knowledge,

- You will help improve the audit quality of our audit firm.
- You will help improve our firm's value and competitive advantage.
- You will establish your expertise in some auditing areas.
- You will save your colleagues' time on resolving similar problems and recreating the same basic reports.
- You will develop new ideas and solutions because we often learn from others' experience and expertise.

<PAGE BREAK>

Treatment 4

After you complete the audit of internal control for Company Apex, you receive a message from your audit firm. *Please study the message below.*

Once you click "Continue", you won't be able to come back to this page.

Share Your Knowledge with the Knowledge Management System (KMS)

Our audit firm has a Knowledge Management System (KMS). This system is designed to share work knowledge, access past projects, and find solutions using the online search function. The knowledge shared will be available to all auditors.

<PAGE BREAK>

Questionnaire

1. Please indicate the extent to which you agree or disagree with the following statements.

Knowledge Management Systems (KMS)

	Strongly disagree (1)	disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly Agree (7)
Sharing knowledge with the firm's KMS is good.	◯	◯	◯	◯	◯	◯	◯
Sharing knowledge with the firm's KMS is pleasant.	◯	◯	◯	◯	◯	◯	◯
Sharing knowledge with the firm's KMS is beneficial.	◯	◯	◯	◯	◯	◯	◯
Sharing knowledge with the firm's KMS is interesting.	◯	◯	◯	◯	◯	◯	◯

94

2. Please indicate the extent to which you agree or disagree with the following statements.

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly Agree (7)
Most people who are important to me think that I should share knowledge with the firm's KMS.	○	○	○	○	○	○	○
Most people who are important to me would share their knowledge with the firm's KMS.	○	○	○	○	○	○	○
Most people whose opinions I value would approve of my knowledge sharing with the firm's KMS.	○	○	○	○	○	○	○
Most people whose opinions I value would share their knowledge with the firm's KMS.	○	○	○	○	○	○	○

<PAGE BREAK>

95

The questions in the next few pages will ask your decisions regarding knowledge sharing. Some of the questions may appear to be similar, but they do address somewhat different issues. Please read each question carefully.

Note: Knowledge sharing with the firm's KMS will not breach confidentiality if the client-specific information is not loaded to the KMS.

1. I intend to share my answers to the internal control task and other tips on internal control evaluations to the firm's KMS, so that other colleagues can have access to it.

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10

2. Please indicate how likely it is that one of your colleagues will engage in the behavior. A colleague will share his or her answers to the internal control task and other tips on internal control evaluations to the Knowledge Management System.

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10

<PAGE BREAK>

Below are your answers to the internal control review task.

1. Please identify internal control weaknesses and possible financial statement errors resulting

from these weaknesses. (Answers piped to this page)
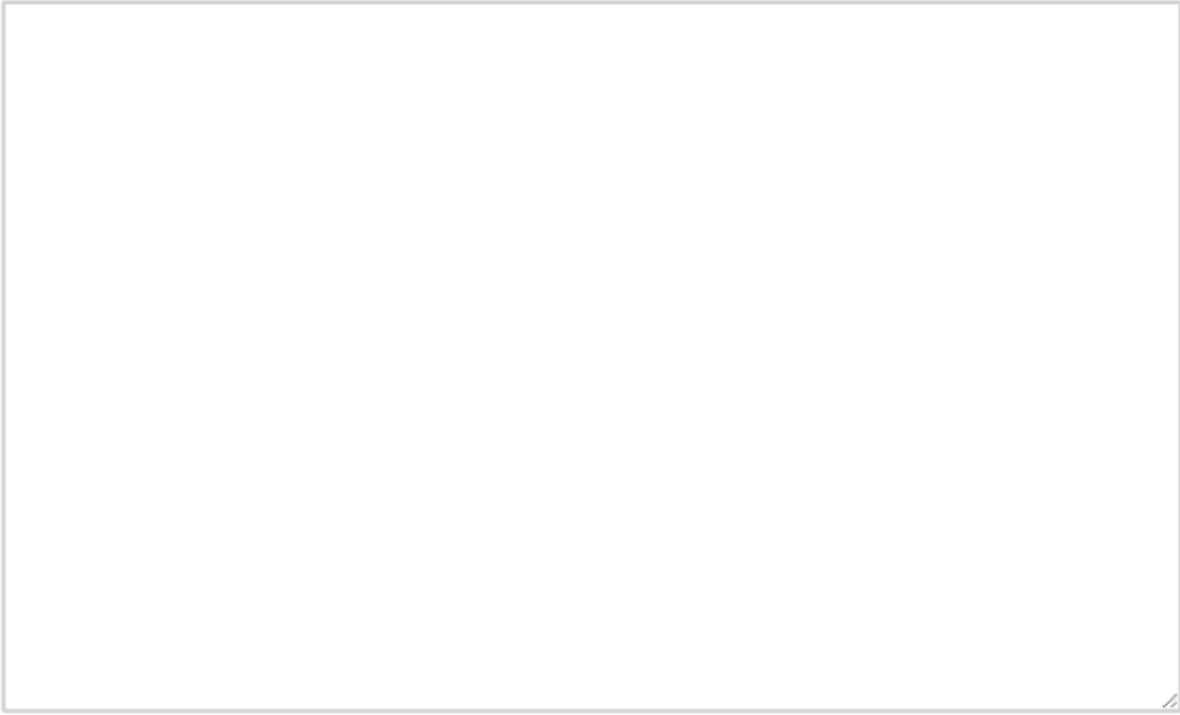
2. Please also suggest new or improved control procedures that could reduce the internal control

weaknesses you identified. (Answers piped to this page)

<u>Your decision to share knowledge</u>

If you would like to share your answers to the internal control task and/or your other tips on internal control evaluations to the firm's Knowledge Management System (KMS), please input the knowledge you would like to share to the box below.

You may choose to share some knowledge, share all the knowledge, or choose not to share.

Note: The knowledge you share here will be transferred to the firm's Knowledge Management System (KMS) and will be available to all auditors in our firm.

<PAGE BREAK>

98

Which of the following message did you receive from the audit firm about Knowledge Sharing?

○ CHOICE ONE
○ CHOICE TWO
○ CHOICE THREE
○ CHOICE FOUR

<PAGE BREAK>

Did you share your knowledge to the firm's Knowledge Management System?

○ Yes
○ No

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Please indicate why you decided to share your knowledge to Knowledge Management System.

You may choose more than one answer.

❑ Knowledge sharing can improve the audit quality of our firm.
❑ Knowledge sharing can improve our firm's value and competitive advantage.
❑ Knowledge sharing can establish my expertise in some auditing areas.
❑ Knowledge sharing can save your colleagues' time on resolving similar problems and recreating the same basic reports
❑ Knowledge sharing can develop new ideas and solutions because we often learn from others' experience and expertise
❑ The audit manager thinks I need to share knowledge. I would do what he/she expects me to do.
❑ The audit manager himself/herself has shared knowledge. I would follow what he/she did.
❑ Others, please indicate: _____

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Please indicate why you decided not to share your knowledge to Knowledge Management

System. You may choose more than one answer.

- ❑ I would rather keep the knowledge to myself.
- ❑ I do not want to lose my knowledge or expertise.
- ❑ I am not competent to share knowledge.
- ❑ Others, please indicate: _____

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Some of the following questions may appear to be similar, but they do address somewhat different issues. Please read each question carefully.

1. Please indicate the extent to which you agree or disagree with the following statements.

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly Agree (7)
In general, auditors' knowledge sharing can improve an audit firm's value and competitive advantage.	❍	❍	❍	❍	❍	❍	❍
In general, auditors' knowledge sharing can improve the audit quality of an audit firm.	❍	❍	❍	❍	❍	❍	❍
In general, an auditor' knowledge sharing can establish his (her) expertise in some auditing areas.	❍	❍	❍	❍	❍	❍	❍
In general, auditors' knowledge sharing can save colleagues' time on resolving similar problems and recreating the same basic reports.	❍	❍	❍	❍	❍	❍	❍
In general, auditors' knowledge sharing can result in new ideas and solutions.	❍	❍	❍	❍	❍	❍	❍

2. Please indicate the extent to which you agree or disagree with the following statements.

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly Agree (7)
When it comes to knowledge sharing, I want to do what my audit manager thinks I should do.	○	○	○	○	○	○	○
When it comes to knowledge sharing, I want to do what my colleagues think I should do.	○	○	○	○	○	○	○
When it comes to knowledge sharing, I want to do what my close friends think I should do.	○	○	○	○	○	○	○
When it comes to knowledge sharing, I want to do what my spouse or partner thinks I should do.	○	○	○	○	○	○	○

3. Please indicate the extent to which you agree or disagree with the following statements.

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly Agree (7)
I am confident that I can share my knowledge.	❍	❍	❍	❍	❍	❍	❍
My knowledge sharing is completely up to me.	❍	❍	❍	❍	❍	❍	❍
If I really want to, I could share my knowledge.	❍	❍	❍	❍	❍	❍	❍
For me to share knowledge is under my control.	❍	❍	❍	❍	❍	❍	❍

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1. The internal control review task in this experiment was: (not difficult at all, extremely

difficult)

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10

2. I am _____ about the internal control review task in this experiment. (Not knowledgeable at all,

extremely knowledgeable)

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10

3. Please indicate how often you engage in each activity or behavior.

	Not Very Often (1)	Not Often (2)	Not Sure (3)	Often (4)	Very Often (5)
I help others at work.	○	○	○	○	○
I share knowledge with my colleagues.	○	○	○	○	○
I share knowledge with my audit team.	○	○	○	○	○

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Demographic Information

1. What is your age?

○ Below 20
○ 20-30
○ 31-40
○ 41-50
○ Above 50

2. What is your gender?

○ Female
○ Male

3. Please check the highest level of education you acquired.

○ High School
○ Associate Degree
○ Bachelor's Degree
○ Graduate Degree

4. Please check the certificate(s) you have acquired. You may choose more than one.

❑ CPA
❑ CISA
❑ CMA
❑ CIA
❑ Others, please specify: _____
❑ none of the above

5. I am a (an) _____.

○ staff auditor
○ senior auditor
○ audit manager
○ audit partner
○ others, please indicate   _____
○ no auditing experience

6. I work in _____.

○ a Big Four accounting firm
○ an international accounting firm, not Big Four firm
○ a regional accounting firm
○ others, please indicate   _____

7. How many years of auditing experience have you had?

○ 0
○ 1
○ 2
○ 3
○ 4
○ 5
○ 6
○ 7
○ 8
○ 9
○ 10
○ 11
○ 12
○ 13
○ 14
○ 15
○ 16
○ 17
○ 18
○ 19
○ 20
○ more than 20

8. I am ____ about the ICFR audit. ICFR (internal control over financial reporting)

- ⭕ 0
- ⭕ 1
- ⭕ 2
- ⭕ 3
- ⭕ 4
- ⭕ 5
- ⭕ 6
- ⭕ 7
- ⭕ 8
- ⭕ 9
- ⭕ 10

9. I am ____ about the ICFR audit.

- ⭕ 0
- ⭕ 1
- ⭕ 2
- ⭕ 3
- ⭕ 4
- ⭕ 5
- ⭕ 6
- ⭕ 7
- ⭕ 8
- ⭕ 9
- ⭕ 10

108

Appendix B: IRB Letter

UNIVERSITY OF SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

February 15, 2017

Xu Cheng
School of Accountancy
4202 E. Fowler Ave., BSN 3512
Tampa, FL 33613

RE: **Exempt Certification**
IRB#:   Pro00029020
Title: Knowledge Sharing--Spring 2017

Dear Ms. Cheng:

On 2/15/2017, the Institutional Review Board (IRB) determined that your research meets criteria for exemption from the federal regulations as outlined by 45CFR46.101(b):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

As the principal investigator for this study, it is your responsibility to ensure that this research is conducted as outlined in your application and consistent with the ethical principles outlined in the Belmont Report and with USF HRPP policies and procedures.

Please note, as per USF HRPP Policy, once the Exempt determination is made, the application is closed in ARC. Any proposed or anticipated changes to the study design that was previously declared exempt from IRB review must be submitted to the IRB as a new study prior to initiation of the change. However, administrative changes, including changes in research personnel, do not warrant an amendment or new application.

Given the determination of exemption, this application is being closed in ARC. This does not limit your ability to conduct your research project.

We appreciate your dedication to the ethical conduct of human subject research at the University

www.manaraa.com

of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board