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Can Financial Statement Auditors Identify Risk Patterns in IT Control Evidence?

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Abstract

Anecdotal evidence suggests that audit clients are automating more internal controls over time. Audit firms customarily respond to their clients' increasing IT (information technology) risks by including more IT audit specialists in their external audit engagements. But, using IT audit specialists on the audit engagement to examine the IT risks that external financial statement auditors can examine may be detrimental in the long-run for audit firms. First, IT audit specialists receive higher compensation than financial statement auditors. So, using IT audit specialists to perform tasks that could be performed by financial statement auditors may increase audit costs and decrease audit firms' profits. Second, using IT audit specialist would deny financial auditors the opportunity to gain the procedural-knowledge required to evaluate automated portions of Internal Control Over Financial Reporting (ICFR). This paper investigates whether financial statement auditors can interpret risk patterns in automated-control evidence. I find that financial statement auditors with procedural-knowledge of automated-controls interpret risk patterns in automated-control evidence, whereas financial statement auditors with no procedural-knowledge of automated-controls do not. My results suggest that audit firms may benefit by allowing their financial statement auditors to gain procedural knowledge of automated-control evidence.

Keywords: *Risk assessment, procedural-knowledge, automated-controls, IT controls, risk of material misstatement, Internal Control Over Financial Reporting, Internal Control Deficiency, financial statement auditors.*

1. INTRODUCTION

Financial statement auditors assess the risk of material misstatement (henceforth "RMM") for their clients' Internal Control Over Financial Reporting (ICFR) (SEC, 2007). Automated-controls are an integral part of ICFR (PCAOB, 2010) but defalcations in automated-controls are seldom interpreted and communicated in external reports issued by financial statement auditors (Taylor et al., 2009). Anecdotal evidence suggests that audit firms should develop new strategies to address their clients' increasing automation of their ICFR (Roland, 2007) and the IT (Information Technology) risk that accompany ICFR (Schroeder and Singleton 2010). As a result, audit firms tend to involve IT audit specialists in financial statement audit engagements to examine automated-controls. But one alternative strategy used by audit firms is to use financial statement auditors to examine IT risks (Wolfe, et al., 2009). In this study, I examine whether financial statement auditors (henceforth "auditors") can interpret risk patterns in automated-control evidence. Specifically, I investigate whether procedural-knowledge of automated-controls and ICFR interact to influence auditors' interpretations of risk patterns in automated-control evidence. Auditors' interpretations of risk can be observed in their RMM assessments.

PCAOB standard (AS 12) and International Standard on Auditing (ISA 315) allow financial auditors to assess ICFR without the assistance of IT audit specialists (PCAOB, 2010; IAASB, 2010). So it is important to understand the implications for audit firms (henceforth "firms) if they were to choose not to use IT specialists to assess ICFR. On one hand, firms have an incentive to use IT audit specialists sparingly because IT audit specialists can be the most costly component of financial statement audit engagements (Ebersbacher, 2008). Therefore, firms may be able to reduce their audit costs when they use auditors, instead of IT audit specialist, to evaluate IT risks for ICFR (henceforth "IT ICFR"). Additionally, firms could may realize further audit cost reductions in the long-run because auditors should improve in their ability to interpret automated-control (IT) risks over time as they gain more and more procedural-knowledge in automated-controls (Anderson et al., 2004). But on the other hand, an IT Internal Control Deficiency (IT ICD) might go undetected if firms were to assign IT risk activities to auditors, instead of specialists (Hunton et al., 2004). Thus, some auditors may be capable of evaluating IT-ICFR but not allowed by their firms to do so. I provide empirical evidence on this issue.

I conduct a quasi-experiment that examines the effects of procedural knowledge and presence of IT ICFR on auditors' interpretations of IT risk patterns. Auditors assess RMM after reading a case that has an IT ICD and evidence that typifies an ICFR where a high degree of reliance can be placed. The auditors then assess RMM based only on the IT ICD. Thus, I manipulate the presence of IT ICFR evidence. Furthermore, I compare auditors with procedural experience in evaluating automated-controls to auditors who have no procedural-knowledge in evaluating automated-controls. I use two robust measures for procedural-knowledge (one or more engagements where they have evaluated automated-control evidence and one or more months of experience in evaluating automated-control evidence).

Consistent with expectations, I find that auditors with procedural-knowledge of automated-controls interpret risk patterns in automated-controls but auditors with no procedural-knowledge in automated-controls do not. More specifically, auditors with procedural-knowledge of automated-controls reduce their RMM assessments of an IT ICD when evidence of IT ICFR is present. Also, auditors with procedural-knowledge increase their RMM assessments of IT ICDs, as they should, when there is no evidence of IT ICFR. Auditors with no procedural-knowledge of IT, on the other hand, do not increase their RMM assessments of IT ICDs when there is no evidence of IT ICFR.

These results suggest that auditors with procedural-knowledge in automated-controls can understand risk patterns in automated-control evidence. Thus, firms may reduce their audit costs if they allow their auditors to gain procedural-knowledge with automated-controls. To my knowledge, this is the first paper to investigate whether auditors can interpret risk patterns in automated-control evidence. The remainder of the paper is organized as follows. Section 2 discusses the previous literature and develops my hypotheses. Section 3 describes the experiment. Section 4 presents the results. Section 5 summarizes the findings and comments on the study's implications.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Risk of Material Misstatement

RMM is the auditor's prediction of the likelihood that an audit client's financial statements are materially misstated (PCAOB, 2010). To assess RMM, auditors interpret risks that are associated with identified ICFR and omitted ICFR. Auditors revise their RMM assessments throughout the entire audit engagement (IAASB, 2010; PCAOB, 2010). When auditors encounter an internal control deficiency (ICD), they should raise their RMM assessments to reflect the increased likelihood that the audit client's financial statements are materially misstated (Bedard and Graham, 2011). Audit failure could occur if auditors fail to recognize the severity of an ICD in ICFR. Likewise, when an audit professional encounters evidence that signal strong ICFR, they should reduce their RMM assessment to reflect the decreased likelihood that the audit client's financial statements are materially misstated. Auditors' failure to recognize strong ICFR could lead to over-auditing and the waste of audit resources.

The difficulty that auditors encounter when they assess RMM has been well documented in the accounting literature (e.g., Peecher et al., 2007). Bell et al. (2005) attribute the complexity of the RMM assessment to the fact that RMM consists of two independent complex risk predictions, inherent risk and control risk. I investigate how auditors assess RMM for IT ICDs when they encounter IT ICFR. Brazel and Agolia (2007) compared the control risk assessments of specialists with 8 months of experience to specialists with 4 years of experience. However, control risk is only one of the two components in RMM (Bell et al., 2005). The other component of RMM, inherent risk, was examined by Taylor (2000). In contrast, I ask the participants in my study to assess RMM so that inherent risk can also be taken into consideration. Hunton et al. (2004) asked CPA participants to rate their concerns for various risk in ERP and non-ERP settings. Their results suggest that auditors' risk concerns do not vary between ERP risks and non-ERP risks. In contrast, I investigate how procedural-knowledge in automated-controls may enable auditors to identify patterns in IT ICFR.

Brazel and Agolia (2007) compare specialists with little procedural experience to specialists with slightly more procedural experience. They found that the specialists with little procedural experience provided significantly lower control risk assessments than the specialists with slightly more procedural-knowledge. In contrast, I compare auditors with absolutely no procedural-knowledge to auditors with some magnitude of procedural experience. Moreover, the participants in my study are all auditors.

Auditors routinely encounter evidence of IT ICFR (Roland, 2007) and may be exposed to IT ICDs during their audit engagements (Schroeder and Singleton 2010). Firms often rely on specialists to examine IT ICDs. However, all IT ICFR are designed and implemented by humans. IT controls replace controls that used to be expedited by humans (Roland, 2007). So, it does not matter to auditors that specific ICFR are expedited by IT because auditors can comprehend the intent and purpose of controls (Wolfe et al., 2009). Thus, auditors should be capable of interpreting risk patterns in ICFR when they assess RMM, even specific ICFR that are expedited by IT. To date, the literature does not address how auditors RMM assessments are influenced by IT ICFR. The results in my study may suggest that auditors will be able to examine IT ICFR if they possess procedural-knowledge in automated-controls. This could reduce the cost of their audits because specialists are more expensive than auditors to use in audit engagements (Ebersbacher, 2008).

2.2. Auditor-Specialization

Auditor-specialization has been studied at the audit firm industry-specialization level (e.g., Reichelt and Wang, 2010), individual auditor industry-specialist level (e.g., Hammersley, 2006), and the individual auditor domain-specialization level (Vera-Munoz et al., 2001). Audit firm level studies use market share to identify auditor-specialization in an industry. Audit firm level studies assume that auditor-specialization is homogenous among their personnel within the firm level unit of analysis. Furthermore, audit firm level studies acknowledge that market share is a noisy measure to use to identify auditor-specialization in an industry (Chi and Chin, 2011). Therefore, audit firm level studies tend to focus on the precision of firm level measures for auditor-specialization. Chi and Chin (2011) argued that auditor-specialization should be captured at the practice office-level. They posit that the market share of the concurring and lead partners is the best means of capturing industry-specialization. However, Chi and Chin cannot consistently distinguish the lead partner from the concurring partner on the audit engagement. So their results are difficult to interpret.

Like Chi and Chin (2011), Reichelt and Wang (2010) also measured auditor-specialization at the practice office-level for each industry. However, Reichelt and Wang emphasized practice office-level market share per city for each firm as their proxy for auditor-specialization. In addition to office-level market share per city, Reichelt and Wang added national market share for each industry to identify auditor-specialization. Reichelt and Wang find that when the firm is jointly the city and national market share leader in a given industry, the firm is more likely to issue going-concern opinions and audit clients are less likely to meet or beat analysts' estimates by a penny. Reichelt and Wang's (2010) results suggest that auditor-specialist may monitor the discretionary accruals of audit clients better than non-auditor-specialists. Balsam et al. (2003) also used market share, among other related measures, to identify auditor-specialization. Similar to Reichelt and Wang (2010), Balsam et al. (2003) find that the clients of auditor specialists reported lower discretionary accruals than the clients of non-auditor-specialist. Kwon, et al. (2007) adds to the results in Reichelt and Wang (2010) and Balsam et al. (2003) by confirming that companies in countries with weak legal systems report lower discretionary accruals when their auditors are auditor-specialists.

Balsam et al. (2003) also document that companies audited by auditor-specialists have higher Earning Response Coefficients (ERC) than companies audited by non-auditor-specialists. Balsam et al.'s results imply that the market considers whether companies are audited by auditor-specialists and take that into account when they estimate stock prices. Lim and Tan (2008) findings contradict Balsam et al. (2003). Lim and Tan (2008) find that companies, audited in the pre-SOX era by auditor-specialists who also received non-audit services from those auditor-specialists, had lower ERCs than companies who were not audited by auditor-specialists. One way investors could observe the effects of auditor-specialization would be to monitor accounting restatements. Romanus et al. (2008) find that auditor-specialization is negatively associated with accounting restatements and that restatements are less likely to involve core accounts. Romanus et al. (2008) also find that the likelihood of restatement increases when companies switch from auditor-specialists to non-auditor-specialists. Likewise, they find that the likelihood of restatement decreases when companies switch from non-auditor-specialists to auditor-specialists.

Lim and Tan (2008) find that auditor-specialists, when they also provide non-audit services, are more likely to issue going-concern opinions. Lim and Tan also find that the audit clients of auditor-specialists are less likely to miss analysts' forecasts when the auditor-specialists also provide non-audit services. Lim and Tan's (2008) results are similar to the results in Reichelt and Wang (2010).

All of the results from the aforementioned audit firm level studies suggest that auditor-specialization is a factor that improves auditor judgment. However, these studies emphasize client market share and aggregate individual auditor judgments at the practicing office and national office level. Therefore, it can be questioned client whether market share, the basis for these studies, is the most appropriate proxy for auditor-specialization. Many experimental studies have analyzed auditor-specialization at the individual auditor level via industry-specialization. Industry-specialist auditors are auditors who are designated by their firms and whose training and practice are in a particular industry (Solomon et al., 1999). Solomon et al. (1999) analyzed the plausibility of the explanations that auditors provided for two dissimilar client industry contexts, healthcare and financial institution industries. The auditors in their study had industry-specialization in one of the two industries. Solomon et al.'s findings are mixed. The auditors who specialized in the healthcare industry were able to benefit from their industry experience and provide more plausible explanations for financial statement errors and non-errors in the healthcare context. The auditors who specialized in the financial institution industry, on the other hand, were not able to benefit from their specialized domain experience.

Hammersley (2006) conducted an experiment where auditors were asked assess to RMM on a 0-100 scale after reading audit cases in their industry-specialization then outside of their industry-specialization. The participants in Hammersley's study were given zero, partial, or full cue-patterns. Auditors work on engagement teams where they may receive incomplete cue patterns while other members on the same engagement team may receive cues that complete the pattern. The results in Hammersley (2006) suggest that industry-specialists can interpret and fill partial cue patterns. The results in Hammersley (2006) also suggest that non-industry-specialists cannot interpret full cue patterns. Additionally, Owhoso et al. (2002) reports that seniors detect more mechanical errors and managers detect more conceptual errors for industry-specialized audit engagement teams. Experimental studies have not always found that industry-specialization has produced positive audit outcomes. Maroney (2007) compare the time spent by industry-specialists and non-industry-specialists at each of the three decision-making process stages (pre-information search, information search, and decision processing). Maroney (2007) find that industry-specialists are not consistently more efficient than non-industry-specialists. In addition, the results provided by Taylor (2000) suggest that specific accounts influence auditors' inherent risk assessments more than auditor's industry-specialization that matches the client's business operation. However, Moroney (2007) does conclude that industry-specialists outperform non-specialists when they both perform unfamiliar tasks.

Audit firms also endorse the acquisition of domain-specialization for business purposes by assigning auditors to areas of specialization such as management accounting or auditing. Whereas, the previously discussed auditor-specializations compared auditors who differ based on their client industries. As auditors acquire domain-specialization, they improve their ability to transfer knowledge from previously solved problems to new, unstructured problems that are related to their domain (Vera-Munoz et al., 2001). Vera-Munoz et al. (2001) found that management accountants used their domain knowledge of opportunity costs to outperform financial auditors when both groups were asked to identify opportunity costs. Management accountants and financial auditors both have declarative knowledge in identifying opportunity costs. But, management accountants would more than likely possess experience in evaluating or determining opportunity costs. Meanwhile, auditors, on the other hand, would most likely lack the experience in evaluating or determining opportunity costs.

Previous auditor-specialization research has focused on differences in audit firm industry-specialization, individual auditor industry-specialization, and domain-specialization. However, little attention has been given to the procedural-knowledge differences that exist on audit engagement teams. For example, if the management accountants in Vera-Munoz et al. (2001) were specialist working with auditors on an audit engagement team, they both may have declarative-knowledge, knowledge of what or why (Balconi et al., 2007), of opportunity costs. But, management accountants would more than likely possess procedural-knowledge in evaluating or determining opportunity costs. While auditors, on the other hand, would lack the procedural-knowledge necessary to evaluate or determine opportunity costs. Brown and Solomon (1991) conclude in their study that auditors process information configurally and suggest that auditors utilize procedural-knowledge to their benefit. Therefore, procedural-knowledge may be a more precise explanation for the conclusions reached in all of the aforementioned studies. In this study, I examine the effects of procedural-knowledge and the presence of IT ICFR on auditors' interpretations of risk patterns in automated-control evidence.

2.3 Hypotheses

Procedural-knowledge is represented in units called production rules (Anderson, 1996). Production rules are learned by practice so that memory becomes stronger over time (Anderson et al., 2004). For example, McCall et al. (2008) use learning how to ride a bicycle to describe production rules. They describe knowledge of the names of the bicycle parts as declarative-knowledge. But, they refer to the production rules of how to ride a bicycle as procedural-knowledge and that the production rules can be improved over time only by riding the bicycle. Rickard (2004) also shares an observation on how procedural-knowledge works. He notes that small children use their fingers to count initially and with practice they bypass using their fingers when they count. Children progress to more direct retrieval after a period of practice. So, auditors with procedural-knowledge in automated-controls might interpret IT ICFR evidence risk patterns variation better than auditors without procedural-knowledge in automated-controls.

Auditors possess declarative-knowledge of ICFR. In other words, they understand the purpose of ICFR (Wolfe et al., 2009). So, at a minimum, auditors are on equal footing during the initial stage of the RMM assessment regardless of whether they possess procedural-knowledge of automated-controls or not (Anderson 1993). But it is not clear if the practice that auditors (who lack procedural-knowledge in automated-controls) receive examining general ICFR will transfer into their RMM assessments. When auditors are given the opportunity to perform audit procedures on IT ICFR, they encode the skills they perform (Smedley and Sutton, 2004). These encoded skills become useful in subsequent IT ICFR audit contexts because the encoded skills form the basis of their compiled production rules (Anderson et al., 2004; Anderson, 1993). The practice that auditors receive in examining IT ICFR should strengthen their ability to maintain the production rules in their working memory. Moreover, performing ICFR audit procedures should enable auditors to gather feedback about their performance that subsequently strengthens their ability encode IT ICFR evidence patterns. Previous research describes individual response to feedback as an adaptive survival response (Nairne et al., 2007; Rothkopf et al., 2002). Therefore, auditors with procedural-knowledge of automated-controls should be able to interpret risk patterns in IT ICFR evidence when they assess RMM (Anderson, 1996).

The literature cited above suggests that auditors with procedural-knowledge of automated-controls maintain production rules in their working memory that will enable them to interpret IT risk patterns in evidence. Auditors acquire production rules via practice. In contrast, auditors without procedural-knowledge of automated-controls will not possess the production rules that are needed to interpret IT ICFR evidence patterns. Thus, auditors with procedural-knowledge of automated-controls should be able to interpret risk patterns. Based on the studies cited above, I predict that the RMM assessments made by auditors with no procedural-knowledge of automated-controls will not be impacted by the presence of IT ICFR while the RMM assessments made by auditors with procedural-knowledge of automated-controls will be impacted by the presence of IT ICFR. More specifically, auditors with procedural-knowledge of automated-controls will assess RMM to be low when they encounter an IT ICD with IT ICFR. In addition, auditors will assess RMM to be high when they encounter only an IT ICD. In contrast, auditors with no procedural-knowledge of automated-controls will assess RMM to be low when they encounter an IT ICD with IT ICFR. But, their RMM assessments will not significantly increase when they encounter only an IT ICD.

3. RESEARCH METHOD

3.1. Participants

Fifty auditors from each of the Big Four accounting firms volunteered and participated in this study. Descriptive data on the participants in the study is provided in Panel A of table 1 and Panel A of table 2. At the time that data was collected for this study, twenty-nine participants had performed audit procedures on automated-controls in at least one engagement (table 1). Two participants worked on automated-control engagements for less than one month at the time of their participation in this study. So, twenty-seven participants had procedural-knowledge based on the number of months participants spent on automated-control engagements (table 2). I use the participants' self-reported number of automated-control engagements or the number of months spent on automated-control engagements to capture participants' procedural-knowledge. Panel A of table 1 reveals that the participants with procedural-knowledge evaluated automated-control evidence in a range of 1 to 20 audit engagements. The participants with no procedural-knowledge did not self-report any engagements experience where they evaluated automated-control evidence.

However, the participants with no procedural-knowledge had between 2 and 225 months of total audit experience while the participants with procedural-knowledge had a smaller range of overall audit experience, 3 to 180. Moreover, the no procedural-knowledge participants had a wider range of internal control walkthroughs, 0 – 75, than the procedural-knowledge participants, 0 - 50. Both groups responded similarly to the six adapted Certified Information System Auditor (CISA) exam multiple choice questions. The range answered correctly was 0 - 4 for the procedural knowledge participants and 1 - 4 for the no procedural-knowledge participants. The number of IT training courses ranged between 0 and 14 IT courses for the auditors with procedural-knowledge while number of IT training courses for the auditors with no procedural-knowledge IT training ranged between 0 and 9 IT courses. Panel A of table 2 reveals the same descriptive information as Panel A of table 1, except that two participants were reclassified from the procedural-knowledge group to the no procedural-knowledge group. Both of these participants self-reported that they worked on automated-control engagements for less than one month at the time they participated in this experiment.

3.2. Case Material

Participants' RMM assessments were collected via a computer program that was designed according to the Tailored Design Method (Dilman, 2007). The program controlled for order effects by randomizing the presentation order of the evidence cues and the program also controlled the order in which the participants completed the tasks in the experiment (Favere-Marchesi, 2006). The program prevented the changing of responses once participants had already answered a question and proceeded to the next webpage. Participants were not subject to any time pressure.

Before participants were granted access to the program, auditors read an overview that summarized the purpose for the study. The auditors then acknowledged that they were interested in the outcome of the study and volunteered to participate (the participant response rate was 91 percent). Then each participant was assigned a password and a personal identification number (PIN). Participants used their password to enter the experiment. After reading the general instructions, participants entered their PIN and provided their formal consent to participate in the study. Participants were given four IT ICFR cues and an IT ICD. Participants were asked to assess RMM, 0 (no risk of misstatement) to 100 (definite misstatement), after reading the four IT ICFR cues and an IT ICD condition. Participants were then presented with the ICD and asked to re-assess RMM, 0 to 100. The participants concluded the experiment by responding to six multiple choice questions on automated-controls that were adapted from the Certified Information System Auditor (CISA) exam in Gleim and Hillison (2006). Participants also provided demographic information during an exit interview.

All participants completed the experiment in 2008, well after Congress passed Sarbanes-Oxley. The ICD and the IT ICFR cues were evaluated in 2011 by a five-member professional panel of Big Four practitioners. The professional panel consisted of a partner in risk assurance services, an IT audit director, a senior manager in IT audit advisory services, an audit/assurance services partner, and a senior manager in audit/assurance services. The panel members were employed by three of the four Big Four audit firms. The panel unanimously agreed that the IT ICD used in this study would most likely signal a potential material misstatement in financial statements, ceteris paribus. Therefore, the IT ICD should influence the auditors to increase their RMM assessments. The panel also agreed unanimously that the IT ICFR cues used in this study do indicate evidence of Internal Control Over Financial Reporting. Thus, the IT ICFR evidence should influence auditors to reduce their assessments RMM of the IT ICD. The panel also unanimously concluded that they would have formed the same opinions of the ICD and ICFR in 2008 (the data collection period for participants) as they did in 2011. The ICD and IT ICFR evidence used in this experiment is provided in the appendix.

4. ANALYSIS AND RESULTS

Participants' responses were analyzed in 2 x 2 ANOVAs with the presence of IT ICFR (IT ICFR with ICD then ICD only) and level of procedural-knowledge (procedural-knowledge or no procedural-knowledge) as the two independent variables. The dependent variable, auditors' ability to interpret risk patterns in automated-control evidence is captured in auditors' RMM assessments. The auditors were asked to assess RMM between 0 and 100. Panel B of table 1 presents the mean and standard deviation for the RMM assessments of auditors with procedural-knowledge of automated-controls and auditors with no procedural-knowledge of automated-controls.

Panel A shows that when auditors with procedural-knowledge of automated-controls were presented with the IT ICD and ICFR evidence, their RMM assessments were lower (mean 35.45, s.d. 23.33) than when they assessed RMM for the ICD (mean 57.93, s.d. 27.11). However, when participants with no procedural-knowledge of automated-controls were presented with the IT ICD and ICFR evidence, their RMM assessments (mean 47.33, s.d. 23.99) did not vary from when they assessed RMM for the ICD (mean 45.00, s.d. 27.75). As hypothesized, the ANOVA reveals a significant presence of ICFR and procedural-knowledge interaction (F = 5.740, p = .019). Panel C of table 1 reports the results of planned comparisons for purposes of testing the hypothesis. The results of planned contrast are as predicted: (1) there is a significant effect of the presence of ICFR on the RMM assessments of auditors with procedural-knowledge of automated-controls (t = 5.214; p = <.0001), and (2) there is no significant effect of ICFR on the RMM assessments of auditors who lack procedural-knowledge (t = .336; p = .3702).

Panel B of table 2 presents the mean and standard deviation for the RMM assessments of auditors with procedural-knowledge of automated-controls and auditors with no procedural-knowledge of automated-controls. Panel A shows that when auditors with procedural-knowledge of automated-controls were presented with the IT ICD and ICFR evidence, their RMM assessments were lower (mean 37.52, s.d. 24.77) than when they assessed RMM for the ICD (mean 60.00, s.d. 28.25). However, when participants with no procedural-knowledge of automated-controls were presented with the IT ICD and ICFR evidence, their RMM assessments (mean 43.87, s.d. 23.37) did not vary from when they assessed RMM for the ICD (mean 43.70, s.d. 25.19). As hypothesized, the ANOVA reveals a significant presence of ICFR and procedural-knowledge interaction (F = 4.882, p = .030). Panel C of table 1 reports the results of planned comparisons for purposes of testing the hypothesis. The results of planned contrast are as predicted: (1) there is a significant effect of the presence of ICFR on the RMM assessments of auditors with procedural-knowledge of automated-controls (t = 4.993; p = <.0001), and (2) there is no significant effect of ICFR on the RMM assessments of auditors who lack procedural-knowledge (t = .026; p = .1691).

These results indicate that auditors with procedural-knowledge in automated-controls can interpret risk patterns in IT evidence and revise their RMM assessments accordingly. In contrast, auditors with no procedural-knowledge in automated-controls cannot interpret risk patterns in IT evidence. The auditors with no procedural-knowledge in automated-controls did not increase their RMM assessments when they were presented with an ICD. In fact, their RMMs slightly decreased. The ANOVAs were also analyzed using the following as covariates: total experience, number of internal control walkthroughs, number of correct CISA exam questions, number of IT training courses, and industry experience. None of these covariates were significant in the ANOVAs.

5. CONCLUSIONS

This study is motivated by the fact that automated-control risks are an integral part of ICFR but auditors seldom interpret their risk patterns. Audit firms need to develop new approaches to investigate the risks posed by IT. One strategy that firms may find successful would be to use financial statement auditors to examine IT risks (Wolfe, et al., 2009). Over half of the financial statement auditors who volunteered to participate self-report that they have examined automated controls. In this study, I examine whether financial statement auditors can interpret risk patterns in automated-control evidence. Specifically, I investigate whether procedural-knowledge of automated-controls and automated-control evidence risk patterns jointly influence financial auditors' risk assessments. I find that financial statement auditors with procedural-knowledge of automated-controls do report lower RMM assessments of an Internal Control Deficiency (ICD) when Internal Control Over Financial Reporting (ICFR) is present and higher RMM assessments when no ICFR is present. I also find that auditors with no procedural-knowledge of automated-controls do not vary their RMM assessments of an Internal Control Deficiency (ICD) when Internal Control Over Financial Reporting (ICFR) is present versus when no ICFR is present.

The implication of these results is that audit firms may be able to reduce their audit costs if they continue to allow financial statement auditors to gain procedural-knowledge of automated-controls. Using IT audit specialists can be the costliest component in an audit engagement. But of course, the findings of this study must be tempered. IT audit specialists add value to the audit because of their special technological skills. Thus, financial statement auditors cannot replace IT audit specialists in every aspect. Financial statement audits should only be allowed to examine the automated-controls that they are capable of interpreting. Furthermore, financial statement auditors should not be expected to be capable of performing all of the procedures that IT audit specialist perform.

However, this study is limited because I do not investigate, nor do I specify, the various types of automated-controls that financial statement auditors are capable of interpreting. I also do not attempt to determine the types of procedures, related to automated-controls, that financial statement auditors are capable of performing. I leave these issues for future research.

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Appendix

Internal Control Deficiency

"ABC Banking Corp. implemented an ERP module for electronic funds transfer that receives data from a legacy system that does not transfer hash totals, control totals, and record counts."

Internal Control Over Financial Reporting Evidence

"During the current year under audit, ABC Bank Corp. modified their PIN system to restrict personnel access to the Human Resource system via the company's Intranet after three failed login attempts."

"ABC Bank Corp. uses IT to initiate orders for the purchase and delivery of supplies based on predetermined decision rules of what to order and in what quantities based on system-generated decisions. No other documentation of orders placed or supplies received is produced or maintained, other than through the IT system. Changes to this process are documented."

"ABC Bank Corp. uses automated fraud prevention technology to monitor and data warehouse accountholder card usage and activation in the current year under audit. They also used the technology to monitor closed accounts, dormant accounts, and deceased accounts in the current year under audit."

"New packaged software applications were installed this year to manage the travel expense files for ABC Banking Corp.'s Retail Banking Operation managers. Their IT staff has formal training and experience using this new software."

Table 1: Procedural-Knowledge Based on the Number of Automated-Control Engagements

Panel A: Participant Demographics

	Procedural-Knowledge	No Procedural-Knowledge
N	29	21
# of Automated-Control Engagements	1 – 20	0
Months of Total Audit Experience	3 – 180	2 - 225
Internal Control Walkthroughs	0 – 50	0 - 75
# of Adapted CISA Exam Questions Answered Correctly (out of 6)	0 – 4	1 - 4
Total of IT Training Courses	0 – 14	0 - 9

Panel B: Mean RMM[a] Assessments by Condition (standard deviations in parentheses)

	Level of Procedural-Knowledge[b]	
Presence[c] of IT ICFR[d]	Procedural-Knowledge	No Procedural-Knowledge
IT ICD[e] only	Cell 1 57.93 (27.11)	Cell 2 45.00 (27.75)
IT ICD & IT ICFR	Cell 3 35.45 (23.33)	Cell 4 47.33 (23.99)

Panel C: Planned Comparisons

	t-statistic	p-value
IT ICD vs. IT ICD & IT ICFR by auditors with procedural-knowledge (cell 2 vs cell 4, Panel A)	5.214	<.0001
IT ICD vs. IT ICD & IT ICFR by auditors with no procedural-knowledge (cell 1 vs cell 3, Panel A)	.336	.3702

[a] Risk of Material Misstatement: Assessment of the likelihood that the financial statements are materially misstated
[b] Auditors with procedural-knowledge participated in 1 or more automated-control engagements
[c] Auditors made RMM assessments with IT ICD & IT ICFR then with the IT ICD alone
[d] Intern Control Over Financial Reporting
[e] Internal Control Deficiency

Table 2: Procedural-Knowledge Based on the Months of Automated-Control Engagements

Panel A: Participant Demographics

	Procedural-Knowledge	No Procedural-Knowledge
N	27	23
# of Months on Automated-Control Engagements	1 – 120	0
Months of Total Audit Experience	3 – 180	2 - 225
Internal Control Walkthroughs	0 – 50	0 - 75
# of Adapted CISA Exam Questions Answered Correctly (out of 6)	0 – 4	1 - 4
Total of IT Training Courses	0 – 14	0 - 9

Panel B: Mean RMM[a] Assessments by Condition (standard deviations in parentheses)

	Level of Procedural-Knowledge[b]	
Presence[c] of IT ICFR[d]	Procedural-Knowledge	No Procedural-Knowledge
IT ICD[e] only	Cell 1 60.00 (28.25)	Cell 2 43.70 (25.19)
IT ICD & IT ICFR	Cell 3 37.52 (24.77)	Cell 4 43.87 (23.37)

Panel C: Planned Comparisons

	t-statistic	p-value
IT ICD vs. IT ICD & IT ICFR by auditors with procedural-knowledge (cell 2 vs cell 4, Panel A)	4.993	<.0001
IT ICD vs. IT ICD & IT ICFR by auditors with no procedural-knowledge (cell 1 vs cell 3, Panel A)	.026	.1691

[a] Risk of Material Misstatement: Assessment of the likelihood that the financial statements are materially misstated
[b] Auditors with procedural-knowledge participated for at least 1 month on an automated-control engagement
[c] Auditors made RMM assessments with IT ICD & IT ICFR then with the IT ICD alone
[d] Intern Control Over Financial Reporting
[e] Internal Control Deficiency