Internal Control Evaluation in the Post-Sarbanes-Oxley Audit Environment: Identifying Missing Controls

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SUMMARY: In its initial audit implementation report, the PCAOB (2005a) notes some concern over auditors' difficulty in identifying missing or inadequate internal controls that could lead to material financial misstatement. This concern was codified by the PCAOB in Auditing Standard No. 5, which amplifies the importance of auditors being "able to identify important points at which a necessary control is missing or not designed effectively" (PCAOB 2007, A1-19, ¶38). The purpose of this study is to identify factors that might help or hinder an auditor from identifying missing internal controls. A total of 395 experienced auditors participated in a 2 (internal control matrix: blank or management-provided) by 2 (business process flowchart: absent or present) between-participants experiment. The research findings indicate that auditors who were provided with a blank internal control matrix and a flowchart identified significantly more missing controls relative to the other three treatment conditions, among which there were no differences in the number of identified missing controls. The implication of the current study is as follows: When auditors are evaluating the effectiveness of a client's internal control system for a significant business process (PCAOB 2007), they should be aware that reading the client's documentation before or during the evaluation can inhibit the identification of missing controls; instead, auditors should be provided with a business process flowchart to which they can refer while evaluating the process.

Keywords: internal control design evaluation, Sarbanes-Oxley Act of 2002, business process flowcharts, and part-list interference

Data Availability: Data used in this study are available from the authors upon request.

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INTRODUCTION

Section 404 of the Sarbanes-Oxley Act (U.S. House of Representatives 2002) (SARBOX) mandates that management assess the effectiveness of their internal control system over financial statement reporting, and requires that auditors conduct their own independent audit of internal control effectiveness. The costs of SARBOX compliance have been substantial. One survey of publicly traded companies, disclosed by the PCAOB (2005b), found that for "217 public companies with average revenues of $5 billion, first year Section 404 compliance cost, on average, of $4.36 million and also consumed an average of nearly 27,000 hours" (FEI 2005, 3).

As a result of pressure to reduce costs, SEC registrants and their auditors have been working hard to improve the efficiency of the SARBOX compliance process. For example, in the current post-SARBOX audit climate, auditors are routinely being asked to think critically about the number of key controls that are needed to support the appropriate control objectives and financial statement assertions for a particular process. Hence, when evaluating internal control design, there is hope that auditors will be able to identify redundant controls and ultimately recommend a reduction in the number of key controls that have to be tested in the compliance process.

Unfortunately, in an effort to reduce the number of key controls, auditors may be susceptible to the missing controls phenomenon, which acknowledges the possibility that an auditor will find it difficult to identify missing control activities from a set of client documentation. In the post-SARBOX audit environment, management teams at publicly-traded firms are required to reach their own conclusions about the effectiveness of their internal control systems. As a result, documentation received by an external auditor from their client is likely to

be extensive and sophisticated. Moreover, PCAOB Auditing Standard No. 5 requires the auditor to independently evaluate the effectiveness of a client's internal controls once client documentation has been received (PCAOB 2007). However, it remains unclear how the documentation received by an auditor will impact the auditor's decision-making process when independently evaluating internal control design.

Research in psychology and accounting suggests that certain decision aids (i.e. checklists) that are designed to assist individuals in forming judgments and making decisions may have potentially harmful effects (DeNisi et al. 1989; Ashton 1990). For example, a consistent finding of "fault tree" research is that possible causes of malfunctions not listed by a decision aid may go unnoticed by the problem solver (Dube-Rioux and Russo 1988; Fischhoff et al. 1978; Hirt and Castellan 1988). One explanation that has been proposed for the inaccessibility of information available in memory is "part-list interference" (Hoch 1984). Cognitive interference of this nature can also be triggered by client-prepared documentation, as research in psychology suggests that individuals who receive a subset of items from a list they have previously reviewed will recall a smaller proportion of the remaining items than individuals who do not receive a subset of items (Brown and Hall, 1979; Sloman et al. 1991). In general, part-list interference occurs when information in working memory inhibits the retrieval of additional information stored in long-term memory (Nickerson 1984). In an auditing context, the recent acquisition of audit evidence could potentially interfere with the recall of other related information previously stored in memory. Thus, our first research question is as follow: Does internal control information provided by management impact the auditors' ability to identify missing controls?

To the extent that part-list interference does exist in this circumstance, we suggest that another form of decision aid (i.e., a business process flowchart) might mitigate the problem. Certain types of decision aids have been deemed effective in transferring relevant task knowledge to less experienced auditors (Graham 1993). In particular, flowchart-type decision aids have been shown to act as a type of "hint" that helps auditors to more accurately and comprehensively form mental representations of tasks and problems (Bierstaker et al. 1999). It may be that the knowledge provided by a decision aid of this nature acts a trigger, which allows auditors to access and transfer relevant task knowledge has previously been stored in memory (Thibodeau 2003). The additional relevant knowledge may then be integrated into the auditors' current problem representation, which in turn helps to improve performance. Thus, our second research question is as follows: Does the presence of a visual decision aid, in the form of a business process flowchart, mitigate the cognitive interference effect, to the extent that it exists?

Given the potential cost of failure to identify missing controls, we designed an experiment aimed at examining the possibility of a part-list cognitive interference effect arising from a client-prepared matrix and studying the extent to which a business process flowchart might mitigate such an effect. The between-participants experiment involves a 2 (internal control matrix: blank or management-provided) by 2 (business process flowchart: absent or present) between-participants design. Via a sample of 395 experienced auditors, the research findings do not indicate a cognitive interference effect due to a client-prepared internal control matrix. Also, when a client-prepared matrix is used in conjunction with a business process flowchart, there is no significant improvement in the number of identified missing controls. However, when auditors are provided a blank matrix and a business process flowchart, they recognize

significantly more missing internal controls than the other three treatment conditions. The results are robust across auditors with different levels of experience and internal control knowledge.

The current study addresses concerns raised by the PCAOB regarding missing internal controls by offering a pragmatic solution; that is, when auditors are evaluating the effectiveness of a client's internal control system for a significant process (PCAOB 2007), they should be aware that the client's documentation (designed to support its own assessment of internal control effectiveness) might inhibit the identification of missing controls for that process. Instead, auditors should be provided with a business process flowchart as they complete their own independent evaluation of a client's internal control system. The next section develops the hypotheses. Section three presents the research method, section four analyzes the results, and the final section offers a summary and conclusions.

BACKGROUND AND HYPOTHESES

The Post-SARBOX Audit Environment

After the passage of SARBOX, both the SEC and the PCAOB made it clear that they intend to ensure that society's need for complete and accurate financial statement information is met (Carmichael 2004). As a key step toward doing so, The Public Company Accounting Oversight Board's (PCAOB 2007) Auditing Standard No. 5, *An Audit of Internal Control over Financial Reporting That is Integrated With an Audit of Financial Statements and Related Independence Rule and Conforming Amendments* (AS 5) requires that auditors of publicly traded companies express an opinion on the effectiveness of their client's internal control system over financial reporting each year. This required opinion has increased the importance and significance of an auditor's work on a client's internal control system.

According to the COSO report (COSO 1992), an explicit objective of an internal control system is to produce reliable financial statements, such that if the system is operating effectively, financial statements that emanate from the system will be reported in accordance with Generally Accepted Accounting Principles (GAAP). To determine whether this goal has been accomplished, under AS 5, an auditor is required to identify significant financial statement accounts and disclosures, and identify their relevant assertions on each audit (PCAOB 2007, A1-15, ¶28). To do so, auditors are required to consider both quantitative (e.g., size of the account balance) and qualitative (e.g., susceptibility to misstatement) factors in their evaluation (PCAOB 2007, A1-15, ¶29). In addition, "As part of identifying significant accounts and their relevant assertions, the auditor should determine the likely sources of potential misstatements that would cause the financial statements to be materially misstated" (PCAOB 2007, A1-16, ¶30).

Once relevant financial statement assertions for each significant financial statement account have been identified, an auditor's goal is to ascertain whether the client's internal control system has been properly designed to support the assertions. The linkage of specific internal control activities to the relevant financial statement assertions is a non-trivial step in the audit process. To accomplish this step in an efficient manner, an auditor must carefully identify the key controls that are being relied on to ensure that the management's financial statement assertions are being supported for each process. AS 5 directs auditors to only "test those controls that are important to the auditor's conclusion about whether the company's controls sufficiently address the assessed risk of misstatement to each relevant assertion" (PCAOB 2007, A1-19, ¶39). This step is important because it helps to ensure that the internal control system has been designed to prevent or detect all material misstatements that may occur for each relevant assertion.

The process of identifying key control activities in a client's internal control system occurs concurrently with the evaluation of internal control design, and each of the internal control objectives must be supported by an internal control activity. Importantly, AS 5 recognizes the possibility that "there might be more than one control that addresses the assessed risk of misstatement to a particular relevant assertion," (PCAOB 2007, A1-19, ¶40) and that "one control might address the assessed risk of misstatement to more than one relevant assertion" (PCAOB 2007, A1-19, ¶40).

The Walkthrough Context

As a result of SARBOX, publicly traded companies now provide to auditors more complete and sophisticated information than ever about each business process as the beginning step in demonstrating compliance with Section 404. Consider the walkthrough process, which is acknowledged by AS 5 as being the most effective way for auditors to understand the likely sources of potential misstatements (PCAOB 2007, A1-17, ¶37). The walkthrough process requires the auditor to understand the entire flow of the transaction process (from cradle to grave) and asks the auditor to explicitly brainstorm about how fraud could occur in each process. The auditor's starting point will be the client's set of documentation about each particular business process. Hence, a client is providing the auditor with a substantial amount of internal control related documentation, which is typically used by the auditor as the starting point to evaluate the internal control design of the process.

At present, most large publicly traded companies (the accelerated filers) are about to embark on their fourth year of complying with Section 404 of SARBOX. Given the substantial cost of SARBOX compliance, there is an intense effort to try and reduce compliance costs. An important way to reduce such compliance costs is for auditors to try and help their clients

decrease the number of key controls that need to be tested for operating effectiveness. Such a focus only heightens the possibility of the missing control phenomenon. An auditor is required to reach his/her own independent evaluation about a client's internal control design. However, when audit teams are receiving information about clients, our concern is that such information might cause cognitive interference, which could impede the complete identification of missing controls. Given that the potential negative impact to auditors is substantial if a missing control is not identified, it is important to understand the underlying cognitive processes that are at work and how this potential problem can be mitigated.

The Cognitive Explanation

Detailed internal control information received from the client for each business process provides a schematic framework for the auditor to begin forming his/her problem representation for the internal control design evaluation for that process. While this initial understanding of the process may be a welcome starting point for an auditor, he/she must exercise due professional care to be independent in reaching conclusions about internal control design for each process.

Christ (1993) investigated the nature of problem representations created by auditors in a planning task. She noted that a problem representation first develops when an auditor maps the information about a current task into an existing knowledge structure or schema that has been retrieved from memory. At this point in the cognitive process, the problem representation is heavily influenced by knowledge that is either provided by the client or retrieved from memory by an auditor during the decision making process. Bonner and Pennington (1991) highlight two important mental representations that are fundamental to effective problem solving. First, a correct representation of the real world problem is required. Second, an individual must be able to properly represent the technical requirements of a particular situation. This mental

representation will then serve to guide an auditor's subsequent information search as (s)he is fully aware of the types and amount of information necessary to arrive at a correct judgment. In addition, proper representation will also lead to proper recall of the technical requirements of the task. Unfortunately, it is possible that cognitive interference can hamper the formation of the appropriate mental representation.

For example, part-list interference occurs when information provided to an individual inhibits the subsequent recall of additional information from memory (Alba and Hutchinson 1987; Nickerson 1984). Specifically, a common finding of research in psychology is that participants who were given recall cues recollected a smaller proportion of uncued items than participants who did not receive cues (Sloman et al. 1991; Brown and Hall 1979). Moreover, larger numbers of recall cues provided tends to lead to greater cognitive interference (Roediger 1973; Watkins 1975). One explanation for this finding is that the presentation of cues during recall strengthens the memory representations of these items, and increases their accessibility relative to the remaining uncued items. Recall of the uncued items is thus "blocked" by the readily accessible cues (Rundus 1973).

In the post-SARBOX audit environment, internal control matrices are a common way to document internal controls for a particular process Such matrices typically show the internal control activities down the left-hand side, and present the internal control objectives addressed across the top. In general, matrices provide important documentation to support the auditor's evaluation of internal control design. Since management is now required to evaluate the effectiveness of its own internal control system under SARBOX, it has become quite common for auditors to receive such matrices before conducting their own independent evaluation.

However, management may identify some, but not all key controls in their matrix. Based on prior research on interference, our first hypothesis is as follows:

> **H1**: Auditors who receive a client-prepared internal control matrix will identify fewer missing controls than auditors who receive a blank internal control matrix.

While the first hypothesis essentially replicates prior work in the area of part-list interference, it serves as a control condition for our upcoming test of a potential mitigating factor.

Mitigating the Missing Controls Phenomenon

According to AS 5 (PCAOB 2007, A1-18, ¶34), the auditor should be sure to identify "the points within the company's processes at which a misstatement – including a misstatement due to fraud – could arise that, individually, or in combination with other misstatements, would be material." This requirement dovetails nicely with SAS No. #99, *Consideration of Fraud in a Financial Statement Audit* (AICPA 2002), which requires brainstorming sessions among the audit team to identify potential fraud risks, including the risk that a material misstatement occurs as a result of a missing control in a process. Overall, there are several aspects of AS 5 specifically and Generally Accepted Auditing Standards (GAAS) more generally that are designed to mitigate the risk that a material misstatement occurs as a result of a missing control in a process.

Unfortunately, as elaborated by the PCAOB in its inaugural implementation report issued under rule 4010 of SARBOX (PCAOB 2005a, 3), "some auditors did not ask sufficient probing questions of the company's personnel to gain a complete understanding of the transaction process. Making such inquiries assists the auditor in identifying any points at which a necessary control is missing or inadequate." Hence, there are reasons to believe that the provisions contained within the post-SARBOX technical audit guidance are not having the intended effect

on auditor behavior. We suggest that one means by which auditors might increase their effectiveness in identifying missing or inadequate internal controls is through the use of a visual decision aid (Rose 2002).

Decision Aids

Certain types of decision aids have been seen as an effective manner to directly transfer relevant task knowledge to less experienced auditors and improve performance (Graham 1993). In particular, flowchart-type decision aids have been shown to act as a type of "hint" that helps auditors to more accurately and comprehensively form mental representations of tasks and problems (Bierstaker et al. 1999). It may be that the knowledge provided by a decision aid of this nature acts a trigger, which allows auditors to access and transfer relevant task knowledge has previously been stored in memory (Thibodeau 2003). The additional relevant knowledge that was provided by the decision aid (either transferred directly or triggered from memory) would then be mapped, to some degree, into an auditor's existing problem representation (Christ 1993), which in turn helps to improve performance. The degree in which an auditor actually integrates the knowledge provided by a decision aid into an auditor's existing problem representation is likely to differ depending on the nature of the decision aid.

Empirical evidence on the effectiveness of decision-aids is, however, mixed (Rose 2002). For example, in a review of primarily the psychology literature, Kleinmuntz (1991) suggests that decision aids generally outperform human judges and improve decision making in a wide variety of tasks. While decision aids have been shown to reduce biases and help to overcome an individual's cognitive limitations (Rose and Rose 2003), it has also been shown that the use of a group support system appeared to limit information processing comprehensiveness, increase the time to reach a group decision, and deteriorate decision quality (Arnold et al. 2000). Given the

mixed results, further investigation of the impact of the nature of the decision aid on the extent to which the auditor integrates relevant knowledge provided by a decision aid.

Indeed, prior literature does reveal that the nature of the decision aid may lead to a different potential effect on the problem representation and ultimately decision-making performance. For example, checklist-type decision aids may yield harmful effects, such as interference (Fischoff et al. 1978; Hoch 1984; Frederick 1991) and information fragmentation (Pincus 1989) by preventing the auditor from identifying client risks that are not featured on the checklist or from seeing a particular pattern of information (Asare and Wright 2004). Moreover, by influencing an auditor's existing problem representation, the checklist-type decision aids may be contributing to the "check-the-box" mentality that has been discussed at length by regulators in the post-SARBOX environment (PCAOB 2005).

On the other hand, decision aids also hold great promise for auditors. For example, a computer-based decision aid was clearly shown to help auditors evaluate internal control systems by Bailey et al. (1985) some time ago. In addition, Wright (1995) found that while tabular presentations of accounting data are effective and familiar to auditors, there is an incremental benefit of more costly graphical presentations when a task requires considerable information acquisition and integration in a loan collectibility judgment. It appears that graphs may improve judgments by facilitating understanding of the information and reducing the cognitive effort required to integrate the data into a judgment. It may be that a visual or graphical decision aid helps to facilitate the integration of relevant knowledge into a decision maker's problem representation for the task at hand. For example, practitioners have long known that "not only is a picture worth a thousand words but also it's often the best way to visualize and examine complex subjects. That's why CPAs working with complex spatial subjects should consider

using graphics to help them visualize and explain those subject to others." (Bagranoff and Simkin 2000, 43).

Prior literature shows that "the document flowchart can be used to evaluate the design of the internal control system." (Laudeman 1980, 22). Consider that in an internal control evaluation context, auditors are required to sift through massive amounts of client prepared data. Unlike other decision aids, the business process flowchart may provide the auditor with a schematic template to populate their problem representation. Research in psychology suggests that the process of flowcharting itself can lead to an improved problem representation. When computer programmers use flowcharts to "debug" programs, for example, they may incorporate procedural information into their representations (Bauer and Eddy 1986, Pennington 1987). Similarly, in an auditing context, Purvis (1989) finds that auditors may acquire more procedural information when they use business process flowcharts to document their internal control evaluations. Moreover, Plumlee (1985) suggests that as auditors flowchart an internal control system their representation of the system can be accessed as a single whole unit. This "unitization" of information may aid auditors in comprehensively identifying key controls. Accordingly, we offer a main hypothesis regarding the presence of a business process flowchart, a type of decision aid, during internal control evaluation:

> **H2**: Auditors who receive a business process flowchart will identify more missing controls than those who do not receive a business process flowchart.

While we expect that an auditor will be able to effectively integrate the knowledge provided by a visual decision aid, like a business process flowchart, and improve performance (H2), we also recognize that the degree to which knowledge is integrated into an auditor's existing problem representation is likely to differ depending on the nature of the client prepared documentation that is being reviewed and evaluated. Indeed, the prior literature has shown that

the manner in which information is presented for a task context does impact an individual's judgment process and ultimate decision-making performance. For example, Amer (2005, 1) acknowledges that "graphical displays of information are among the most common decision aid available" to decision makers, and shows that different types of informational displays seem to invoke different types of biases by decision makers (see also Stone et al. 2003; Davis 1989).

In the post-SARBOX audit environment, internal control matrices are a common way to document internal controls for a particular process. As a result, they are likely to continue to be used by management to provide the documentation necessary to support its own evaluation of internal control effectiveness. In addition, auditors are likely to continue receiving such matrices before conducting their own independent evaluation of internal control for a particular process. It is therefore important to understand whether receiving a visual decision aid, like a business process flowchart, will impact an auditor's decision making and judgment performance differently in the presence of a client-prepared internal control matrix.

We anticipate that a business process flowchart might help an auditor to identify missing controls in the presence of a client-prepared internal control matrix, because when information is organized schematically (as in a business process flowchart) cognitive interference is less likely to occur (Frederick 1991). Frederick theorized that a schematic organization of internal control information may create strong temporal linkages among controls, so that interference may be less likely to occur during part-list cueing. Although Frederick did not examine the effect of business process flowcharts on auditor memory, he did indicate that flowcharts are an example of schematically organized information, which leads to the next hypothesis:

> **H3**: Auditors who receive a business process flowchart and a client-prepared internal control matrix will identify more missing controls than auditors who only receive a client-prepared matrix.

Finally, since it is important to understanding how receiving a visual decision aid, like a business process flowchart, will impact an auditor's decision making and judgment performance differently in the presence or absence of a client-prepared internal control matrix, we consider the effect of providing auditors with a blank internal control matrix and a business process flowchart.

The audit judgment literature consistently shows that the format used to document internal control structures auditors' information processing, including information acquisition (Mock and Turner 1981; Purvis 1989). In addition, the audit judgment literature has also shown that documentation format may affect the way auditors encode (Plumlee 1985) and recall (Bierstaker 2003) information. Indeed, Vera-Munoz et al. (2001) provide evidence that task presentation format affects an accountant's information acquisition, problem representation development, and task performance in an assurance services context.

As indicated by H1, the presence of a client-prepared internal control matrix might cause cognitive interference, thereby blocking auditors from identifying some missing internal controls. As suggested by H2, a business process flowchart provides direct relevant knowledge and helps the auditor to access and transfer other relevant task knowledge that is previously stored in memory. Hence, when a blank internal control matrix and business process flowchart are provided to auditors, one would expect the most effective results, as predicted below:

> **H4**: Auditors who receive a business process flowchart and a blank internal control matrix will identify more missing controls than auditors who receive (a) only a client-prepared matrix, (b) only a blank internal control matrix or (c) a client-prepared matrix and a business process flowchart.

RESEARCH METHOD

Participants

Participants in the experiment were 395 experienced auditors who were newly hired by one of the Big 4 CPA firms, and had gained their prior auditing experience at other Big 4 and regional auditing firms. On average the auditors had a mean (standard deviation) of 42.4 (43.5) months of audit experience and 34.5 (46.0) months experience evaluating internal control. Most of the auditors were staff level (39.6%) or seniors (46.6%), with the remainder managers (12.9%) or partners (0.8%).[1]

Experimental Task and Design

The experimental task was administered at six different training sessions over a seven month period. One of the authors was present to oversee the administration of the task at each of the training sessions. Each participant completed the task during one training session. Each of the training sessions was conducted in a room where the participants were free from interruption. Participants were informed that their responses would be kept anonymous and were instructed to work alone. At each session, an author was present to observe that participants worked on their own and did not consult with their colleagues in the completion of the experiment.

The experimental task began with a pretest consisting of ten multiple choice questions that were specifically designed to assess each participant's declarative knowledge about the relationship between internal control activities and internal control objectives. Several hours after the pretest, participants were then asked to complete the primary experimental task, described below.

[1] Due to confidentiality concerns, we were not able to collect data on which CPA firms the participants were employed prior to being hired at the current firm.

Participants were given approximately 15-20 minutes to initially read a set of detailed background information about a hypothetical audit client. The comprehensive nature of the case materials about to be described acknowledges the importance of using case materials that are sufficiently difficult to elicit performance differences among participants (Newell and Simon 1972). The background information materials were designed to provide enough detail to allow participants to evaluate the internal control design of the featured business process. In that regard, the materials described the explicit goal of the business process at a fictitious company: preparing gold spheres for shipment to the company's parent company. The description of the business process included information about the control environment at the company, including the company's efforts at establishing controls at both the entity-wide level and at the detailed business process level.

More specifically, for all participants, the materials included a detailed set of information about the: 1) business processes, including receiving, production, shipping, and the data recording processes; 2) company's management team; 3) company's internal audit function; 4) the company's audit committee; and 5) other relevant personnel at the audit client. In addition, the materials included a static drawing of the machine used in the production process, prepared by management, which provided a list of the control activities. Finally, depending on the participant's experimental condition (described below), the materials also included: 1) either a blank or a client-prepared control matrix; and 2) the presence or absence of a business process flowchart.

Once the initial reading of the materials was complete, the participants were given a demonstration of the production process, using the actual manufacturing machine that was depicted in the drawing. In addition, participants were then shown three separate video clips that

were designed to depict an auditor's interview sessions with the company's: 1) CEO; 2) internal auditor; and 3) machine operator. Thus, the background information was supplemented with a significant amount of additional information that either supported or contradicted the participants initial understanding of the featured business process obtained when they read the background information. Importantly, the additional information was provided to help simulate evidential matter that would be obtained by an auditor while performing a walkthrough of a significant business process, after receiving the initial set of client-prepared information. The additional information was provided to participants over the course of approximately 45-50 minutes.

Next, participants were given explicit instructions about the deliverables that were required, and were ***again*** instructed to work individually. The deliverables to be completed were as follows. First, participants were told that they needed to complete the internal control matrix for the featured business process. Completion of the control matrix was accomplished by making sure that all control activities were properly identified and included on the internal control matrix, and by correctly identifying the internal control objective (e.g., completeness, accuracy and validity) that was addressed by the identified control activity. Importantly, this task was explicitly designed to correspond to an auditor's internal control evaluation of a business process. Second, participants were asked to assess control risk on a scale of 0 (low) to 100 (high) percent. Third, participants were asked to draw conclusions about management's anti-fraud program and list the fraud risk factors that should be discussed with the hypothetical client's audit committee. Fourth, participants were asked to assess fraud risk on a scale of 0 (low) to 100 (high) percent. Finally, all participants were required to complete a demographic questionnaire that was designed to gather data to test the manipulation checks and to include several control variables in the experimental models. In total, participants had approximately 40-45 minutes to

complete the deliverables. In general, the authors noted that participants had enough time to finish the experimental task.[2]

The case materials were purposely seeded with multiple control deficiencies; that is, while management's description of management and process controls would possibly lead an auditor to conclude that the control system is well-designed, after gathering information via the walkthrough, it becomes clear that there serious problems that contribute to the likelihood of misstatement and possible fraud. Some of these problems are quite clear after reading the background information, while other are made clear when inspecting the machine and/or listening to the auditor interviews.

Variables and Analyses

The first independent variable (MATRIX) was operationalized as either receiving a client-prepared or a blank internal control matrix. The use of a client-prepared versus a blank internal control matrix recognizes the well-established finding in the cognitive psychology and auditing literature that a partial list might interfere with an auditor's independent professional judgment (Frederick 1991). The current design therefore allows for an investigation of whether management's documentation about a business process might interfere with an auditor's cognitive processes when evaluating internal control design.

The second independent variable (FLOWCHART) was operationalized as the absence or presence of a business process flowchart in the background information. The absence or presence of relevant knowledge may allow an individual to overcome the cognitive interference effects caused by management documentation. The current design therefore allows for an investigation of whether a business process flowchart, which reflects relevant knowledge, will help an auditor

[2] The current paper focuses only on the control matrix responses provided by participants, as the control risk assessments, fraud factors and fraud risk assessments are unrelated to the independent variables of interest to the current study.

overcome cognitive interference effects. It is important to note that the business process flowchart did not provide participants with any new information; rather, it summarized in graphical form the business processes. Thus, the "no flowchart" participants were exposed to the same business processes thru narratives and videos. It is also important to note that the creator of the flowchart (company management or audit team) was randomized among the participants who received a business process flowchart.[3]

The dependent variable for this study reflects the number of missing internal design controls identified by the participating auditors. In total, there were 20 controls identified by the Big 4 Firm's training function as the *model* answer for the internal control system that was described for the featured business process. The firm professionals that initially designed the materials validated the list of controls, which has been used in firm-wide training for over one year. Of the 20 controls, 15 were properly identified by management and were depicted in the background information received by all participants. However, the remaining five controls were considered to be "missing" from the information received by management. Hence, the dependent variable measure has a range of 0-5, reflecting the number of missing control identified by the participants.

We also included collected data about several potential control variables. Specifically, in the post-experimental questionnaire, we solicit the participants: 1) internal control evaluation experience; 2) prior experience with internal control matrix and business process flowchart formats; and 3) overall audit experience and industry background. In addition, we measured each

[3] Randomization of the flowchart creator, as either company managers or audit team, was performed to preclude a possible experimental confound. Because the flowchart merely depicted the business process to which the participants already had sufficient information, we did not hypothesize or realize ($p > .15$) a significant effect in this regard.

participant's knowledge of internal control objectives using a ten question multiple choice test, which was developed based on knowledge featured in firm training materials.

RESULTS

Manipulation Checks

The first manipulation check asked auditors if the internal control matrix they received contained a list of control activities that was prepared by management. Two (1%) of the 262 participants who received a client prepared matrix failed this manipulation check and the statistical significance of the results was unchanged when these two participants were omitted from the sample, thus they were retained. The second manipulation check asked auditors if they received a business process flowchart. A total of 47 (18%) of the 258 participants who were provided with a business process flowchart failed this manipulation check, probably because they all received a schematic diagram of the business process, which some likely misinterpreted as a business process flowchart. However, the main effect of the flowchart on the identification of missing controls is still significant at conventional levels ($p < 0.05$) when these auditors are removed from the sample. Thus, we retained all 395 participants in the sample for upcoming tests of hypotheses.

Descriptive Statistics

Descriptive statistics for the number of missing controls in each treatment condition are shown in Table 1, panel A. Auditors who received a blank internal control matrix identified a mean (standard deviation) number of missing controls of 0.46 (0.72), relative to 0.30 (0.63) for auditors who received a completed matrix. Auditors who did not receive a business process flowchart identified a mean (standard deviation) number of missing controls of 0.24 (0.51), compared 0.41 (0.73) for auditors who did receive a flowchart.

[Insert Table 1 about here]

Analysis of the normal probability plot and the plot of residuals for each dependent variable revealed a violation of the normality assumption. The kurtosis statistic of 3.061 was larger than twice its standard error of 0.244. To correct this, a square root transformation was used. After this correction, the kurtosis was reduced to 0.001, indicative of a normal distribution (Tabachnik and Fidell 1996). We next examined Levene's test of homogeneity, which was significant ($p = 0.001$), suggesting that the variances were unequal across conditions. ANOVA is somewhat robust to a violation of equal variance if the cell sizes are approximately the same. In our study, cell sizes are not equivalent, as they range from a low of 48 to a high of 173; thus, we compared variances before and after the square-root transformation. After such transformation, Levene's test was still significant ($p = 0.001$), indicating that the parametric assumption of homogeneity was violated. Other data transformations (e.g., log, inverse) were not possible because the dependent variable could have a value of zero. Because we could not simultaneously satisfy the normality and homogeneity assumptions of ANOVA, we rely on non-parametric statistics in the upcoming hypotheses tests using the raw means, rather than transformed means.[4].

Hypotheses Tests

Hypothesis One

The first hypothesis predicts that auditors who receive a blank internal control matrix will identify more missing controls than those who receive a complete matrix. As shown on Table 2, panel A, the results of non-parametric testing (Mann-Whitney U) appears to indicate that this hypothesis is supported ($Z = 2.59$; $p = 0.005$ one tailed), as auditors with a client-prepared matrix

[4] Although we do not rely on parametric tests for the hypotheses, we examined several potential covariates using an ANCOVA model. We felt that this was appropriate since parallel ANOVA tests of the upcoming hypothesis were qualitatively and statistically similar to the non-parametric test results. The auditor's years of audit experience, internal control evaluation experience, and experience with matrices and flowcharts were not significant covariates at conventional levels ($p > 0.10$).

recognized a mean of 0.30 missing controls, relative to a mean of 0.46 missing controls for auditors with an empty matrix (see Table 1). However, as will be evident in the upcoming analyses, there is an interaction between the 'flowchart' and 'matrix' factors; thus, we can not interpret the 'matrix' main effect in a straightforward manner. Further examination of H1 reveals that the blank matrix with no flowchart (.25) and completed matrix and no flowchart (.24) cell means are not significantly different (p = 0.789). Thus, contrary to expectations, we do not have an indication of part-list interference.

[Insert Table 2 about here]

Hypothesis Two

The second hypothesis predicts that auditors who receive a business process flowchart will identify more missing controls than those who do not. As shown on Table 2, panel A, the results of non-parametric testing (Mann-Whitney U) indicate that this hypothesis is also supported (Z = 1.96; p = 0.025 one tailed), as auditors without a flowchart recognized a mean of 0.24 missing controls, relative to a mean of 0.41 missing controls for auditors with a flowchart (see Table 1). As with H1, one must be cautious when interpreting the 'flowchart' main effect due to an interaction between 'matrix' and 'flowchart'. Further analysis of H2, though, continues to reveal a significant 'flowchart' effect, as the flowchart with blank matrix mean (.58) and no flowchart with blank matrix mean (.25) are significantly different (p = .010), thus H2 is supported.

This result suggests that the existence of a relevant visual decision aid, like a business process flowchart, provides an important type of "hint" that helps auditors to more accurately and comprehensively form mental representations of tasks and problems (Bierstaker et al. 1999) by enabling auditors to access and transfer relevant task knowledge has previously been stored in

memory (Thibodeau 2003). The additional relevant knowledge appears to have been effectively mapped into an auditor's existing problem representation (Christ 1993), which in turn helped to improve performance.

Hypothesis Three

The third hypothesis predicts that part-list interference effects related to client internal control documentation will be mitigated by auditor's use of a flowchart. As indicated on Table 2, panel B, the participants did not identify more missing controls when a client-prepared matrix was coupled with a business process flowchart (mean = 0.34), relative to a client-prepared matrix and no flowchart (mean = 0.24) ($p = 0.310$, one-tailed), thereby failing to support H3. One explanation for this may be that the client-prepared matrix did not appear to interfere with auditors' identification of missing controls, so there was no interference for the flowchart to mitigate.

Hypothesis Four

The fourth hypothesis predicts that auditors who receive a blank internal control matrix and a business process flowchart will identify more missing controls than auditors who receive: (a) only a client-prepared internal control matrix; (b) only a blank matrix; or (c) a client-prepared matrix and a flowchart. The results of the planned contrast tests reveal that auditors who receive a blank internal control matrix and a flowchart identify significantly more missing controls (mean = 0.58) than auditors who receive only a client-prepared matrix (mean = 0.24) ($p = 0.002$ one tailed), a blank matrix (mean = 0.25) ($p = 0.010$ one tailed) or a client-prepared matrix and flowchart (mean = 0.34) ($p = 0.003$ one tailed), supporting H4.[5] Figure 1 depicts the nature of the interaction. Based on this analysis, it appears that a business process flowchart enhanced

[5] A parallel ANOVA model (not tabulated) further indicates a significant ($p < .01$) interaction between FLOWCHART and MATRIX.

auditors' performance in identifying controls that were missing from the client prepared documentation. The implications of this finding are discussed in the next section of the paper.

[Insert Figure 1 about here]

SUMMARY AND CONCLUSIONS

The purposes of the current study are to examine the extent to which client-prepared internal control documentation and assessments might cognitively block auditors from identifying missing internal controls, and study the degree to which business process flowcharts can help auditors to recognize missing internal controls in the absence or presence of client-prepared internal control documentation and assessments. The research findings do not indicate a significant part-list interference effect between a blank internal control matrix and client-prepared matrix. However, auditors who received a blank internal control matrix and a business process flowchart identified significantly more missing controls than auditors who received only: (a) a client-prepared internal control matrix; (b) a blank matrix; or (c) a client-prepared matrix and a business process flowchart.

The results of this study are important to both audit theory and audit practice. With respect to theory, prior literature is silent regarding how task-specific client knowledge, reinforced by a visual decision aid, affects task performance. Importantly, the findings of this study indicate that business process flowcharts appear to allow an auditor to access and transfer relevant task knowledge that is previously stored in an auditor's memory (Thibodeau 2003). This additional knowledge may then be integrated into an auditor's problem representation, which in turn helps to improve auditor performance. It may be that the business process flowchart acts as a schematic template that helps an auditor construct his/her problem representation. This implies a schematic linkage among important concepts in an auditor's memory, which has been

demonstrated in the audit judgment literature previously. Hence, it is possible that the "road map" provided by a business process flowchart opens the gateway to a significant amount of relevant knowledge for auditors, although this supposition needs further research.

From a practice perspective, our results are important and relevant. As a result of the tremendous pressure to reduce costs, auditors are routinely being asked to think about how the number of key controls needed to support the relevant financial statement assertions for a process can be reduced. We believe that in an effort to reduce the number of key controls, auditors may be susceptible to the missing controls phenomenon. The reality is that the documentation received by external auditors from their clients about internal controls is extensive and sophisticated. Our results imply that when auditors are evaluating the effectiveness of a client's internal control system for a significant process (PCAOB 2007), they should be aware that the client's documentation (designed to support its own assessment of internal control effectiveness) might inhibit the identification of missing controls for that process. Rather than reading the client's internal control documentation ahead of time, perhaps the auditors' independent evaluation of the client's internal controls should be supplemented only with a business process flowchart.

Research findings from the current study also speak directly to a critical area of concern that was explicitly mentioned by the PCAOB in its Report on the Initial Implementation of Auditing Standard No. 2. Specifically in its report (PCAOB 2005a, 3), the PCAOB noted that "…some auditors did not ask sufficient probing questions of the company's personnel to gain a complete understanding of the transaction process. Making such inquiries assists the auditor in identifying any points at which a necessary control is missing or inadequate." Since the failure to identify a missing control could lead to a material misstatement, auditors should consider taking

action to mitigate this possibility. Our evidence suggests that a business process flowchart may be helpful in this regard.

While the benefits of a business process flowchart appear to be clear, it remains unclear whether the cost of creating such a flowchart is justified by the benefits. It may be that external audit firms should consider the development of a centralized flowchart analysis center for significant processes on an industry specific manner. We believe that the findings of our study suggest that auditing standards recommend or perhaps require the use of business process flowcharts on audits of publicly traded companies for all significant processes.

We acknowledge that some readers might be concerned about the relatively low absolute value of the means across treatment conditions. For instance, of the five missing controls embedded in the case materials, the worse condition (client-prepared matrix by no flowchart) identified 0.24 missing controls, while the best condition (empty matrix by flowchart) identified 0.58 missing controls. However, when interpreting experimental results, one should not draw inferences based on the absolute value of dependent variable responses; rather, the external validity of experiments lies in generalization through theory. In this manner, dependent variable responses should be interpreted in an ordinal, not interval, fashion. The reasons for treating experimental data as ordinal are many; for instance, experimental materials are necessarily limited and concise, many 'real world' variables are controlled in an experimental setting, sample sizes are relatively small when compared to, say, archival stock market studies, and dependent variable measures can be somewhat noisy due to measurement error. In our experiment, the data indicates that auditors with a blank internal control matrix and a business process flowchart identified significantly more missing controls than auditors in the other three conditions. Through theory, we suggest that the presence of a business process flowchart in

absence of client-prepared internal control information appears to act as a schematic template that helps the auditor to appropriately frame the problem representation. It is through this theoretical lens that we attempt to generalize our study findings. In addition, our findings are related to, and reinforced by, research in other audit contexts (i.e., analytical procedures) that suggests auditors develop their own expectations before considering management provided explanations (Bierstaker et al. 1999).

Future research should continue to focus on continuous improvement of the audit process. The PCAOB has recently issued AS 5 (PCAOB 2007) to supersede AS 2 (PCAOB 2004) and all related staff question and answers documents (e.g., 2005c; 2005d). There is little doubt that a desire to reduce compliance costs was the primary motive for the new standard. While we recognize the need for increased audit efficiency, we believe that the professional skepticism and focus on quality that has characterized the audit profession in the post-SARBOX era must remain. In that regard, the profession must strive to continuously improve the audit process in general, and identification of missing controls in particular. While the PCAOB has articulated the goals of the internal control audit process in AS 5, the most effective and efficient means to reach the goals of the process have yet to be established. We believe our research suggests one important and available means by which auditors may improve the effectiveness of their internal control evaluation and documentation process.

Table 1

Descriptive Statistics for Number of Missing Controls

Means (Standard Deviations) {Medians} [Sample Sizes]

	Empty Matrix	**Client-Prepared Matrix**	**Total**
No Flowchart	0.25 (0.48) {0} [48]	0.24 (0.52) {0} [89]	*0.24 (0.51) {0} [137]*
Flowchart	0.58 (0.80) {0} [85]	0.34 (0.68) {0} [173]	*0.41 (0.73) {0} [258]*
Total	*0.46 (0.72) {0} [133]*	*0.30 (0.63) {0} [262]*	***0.35 (0.67) {0} [395]***

Table 2

Results of Hypotheses Tests

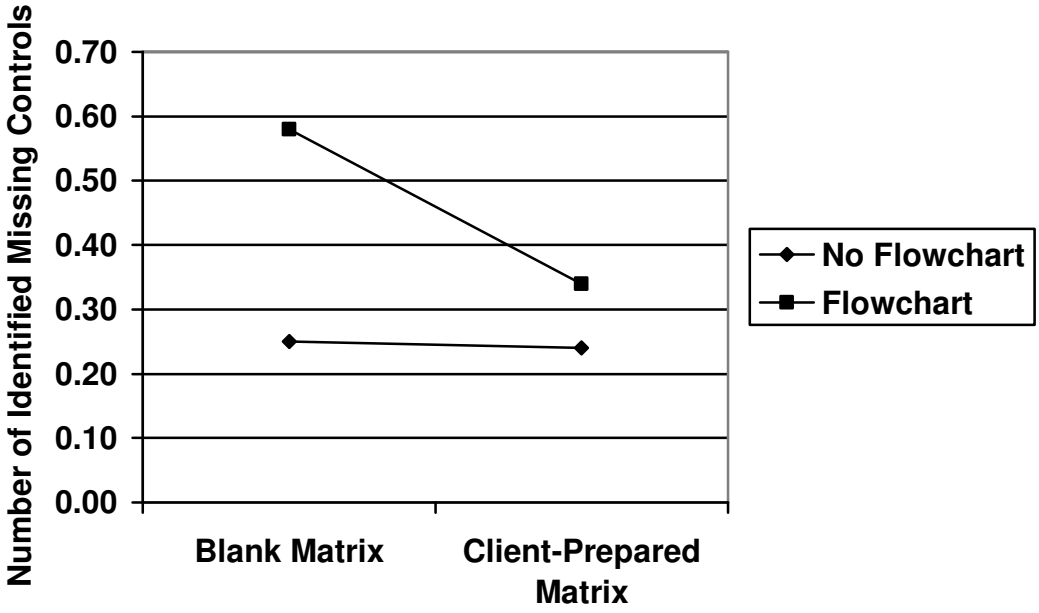
Panel A: Main Effects

Variable		**Z**	**p-value**	
Matrix (Blank or Client-Prepared)		2.59	0.005	**H1**
Flowchart (Absent or Present)		1.96	0.025	**H2**
	d.f.	**Chi-Square**		
Interaction (Matrix by Flowchart)	3	12.02	0.007	

Panel B: Planned Comparisons

Experimental Treatments (Means)	**Mean Difference**	**p-value (one-tailed)**
H3: Flowchart & Client Matrix (0.34) > Client Matrix Only (0.24)	0.10	0.310
H4a: Flowchart & Blank Matrix (0.58) > Client Matrix Only (0.24)	0.34	0.002
H4b: Flowchart & Blank Matrix (0.58) > Blank Matrix Only (0.25)	0.34	0.010
H4c: Flowchart & Blank Matrix (0.58) > Flowchart & Client Matrix (0.34)	0.24	0.003

Figure 1: Interactive Effects



REFERENCES

Alba, J., and J. Hutchinson. 1987. Dimensions of consumer expertise. *Journal of Consumer Research* 13 (March): 411-54.

Amer, T. 2005. Bias Due to Visual Illusion in Graphical Presentation of Accounting Information. *Journal of Information Systems* 19 (1): 1-18

American Institute of Certified Public Accountants (AICPA). 2002. *Professional Standards*. New York: AICPA.

Asare, S., and A. Wright. 2004. The effectiveness of alternative risk assessment and program planning tools in a fraud setting. *Contemporary Accounting Research* 21 (Summer): 325-351.

Ashton, R. 1990. Pressure and performance in accounting decision settings: Paradoxical effects of incentives, feedback, and justification. *The Accounting Review* 65 (January): 148-180.

Arnold, V., S. Sutton, S. Hayne, and C. Smith. 2000. Group decision making: The impact of opportunity cost time pressure and group support systems. *Behavioral Research in Accounting* 12: 69-96.

Bailey, A., G. Duke, J. Gerlach, C. Ko, R. Meservy and A. Whinston. 1985. TICOM and the Analysis of Internal Controls. *The Accounting Review* 60 (April): 186-201.

Bagranoff, N., and M. Simkin. 2000. Picture That. *Journal of Accountancy* 189 (2): 43-46.

Bauer, D., and J. Eddy. 1986. The representation of command language syntax. *Human Factors* 28: 1-10.

Bierstaker, J. L., J. C. Bedard, and S. F. Biggs. 1999. The role of problem representation shifts on auditor decision processes in analytical procedures. *Auditing: A Journal of Practice & Theory* 18 (Spring): 18-36.

Bierstaker, J. L. 2003. Auditor Recall and Evaluation of Internal Control Information: Does Task-Specific Knowledge Mitigate Part-List Interference. *Managerial Auditing Journal* 18: 90-99.

Bierstaker, J. L., and A. Wright. 2004. "Does the Adoption Of A Business Risk Audit Approach Change Internal Control Documentation And Testing Practices?" *International Auditing Journal* 8 (March): 67-78.

Bonner, S. E., and N. Pennington. 1991. Cognitive processes and knowledge as determinants of auditor expertise. *Journal of Accounting Literature* 10: 1-50.

Brown, A. S., and L. A. Hall. 1979. Part-list cueing inhibition in semantic memory structures. *American Journal of Psychology* 92: 351-62.

Carmichael, D.R. 2004. The PCAOB and the social responsibility of the independent auditor. *Accounting Horizons* 18 (June): 127-133.

Christ, M. 1993. Evidence on the nature of audit planning problem representations: An examination of auditor free recalls. *The Accounting Review* 68 (April): 304-322.

Committee of Sponsoring Organizations (COSO) of the Treadway Commission. 1992. *Internal Control - Integrated Framework*. New York: AICPA.

Davis, L. 1989. Report Format and the Decision Maker's Task: An Experimental Investigation. *Accounting, Organizations and Society* 14 (5/6): 495-508.

DeNisi, A. S., T. Robbins, and T. P. Cafferty. 1989. Organization of information used for performance appraisals: Role of diary-keeping. *Journal of Applied Psychology* 74: 124-129.

Dube-Rioux, L., and J. E. Russo. 1988. An availability bias in professional judgment. *Journal of Behavioral Decision Making* 1: 223-37.

Financial Executives International (FEI). 2005. Special Survey on SOX Section 404 Implementation, March 2005, http://www2.fei.org/files/spacer.cfm?file_id=1498.

Fischhoff, B., P. Slovic, and S. Lichtenstein. 1978. Fault trees: Sensitivity of estimated failure probabilities to problem representation. *Journal of Experimental Psychology: Human Perception and Performance* 4 (May): 330-44.

Frederick, D. M. 1991. Auditors' representation and retrieval of internal control knowledge. *The Accounting Review* 66 (April): 240-58.

Graham, L. 1993. Expertise in auditing: Discussion. *Auditing: A Journal of Practice and Theory* 12 (Supplement): 46-50.

Hirt, E. R., and N. J. Castellan. 1988. Probability and category redefinition in the fault tree paradigm. *Journal of Experimental Psychology: Human Perception and Performance* 14: 122-31.

Hoch, S. 1984. Availability and interference in predictive judgment. *Journal of Experimental Psychology: Learning, Memory and Cognition* 10 (October): 649-62.

Kleinmuntz, D.N., 1991. Decision making for professional decision makers. *Psychological Science* 2: 138-141

Laudeman, M. 1980. Document Flowchart for Internal Control. *Journal of Systems Management* 31 (3): 22.

Mock, T. and J. L. Turner. 1981. *Internal Accounting Control Evaluation and Auditor Judgment*. Audit Research Monograph no. 3. New York: AICPA.

Newell, A., and H. Simon. 1972. *Human Problem Solving*. Englewood Cliffs, N.J.: Prentice-Hall.

Nickerson, R. S. 1984. Retrieval inhibition from part-set cueing: A persisting enigma in memory research. *Memory and Cognition* 12 (November): 531-52.

Pennington, N. 1987. Stimulus Structures and Mental Representations in Expert Comprehension of Computer Programs. *Cognitive Psychology* 19: 295-341.

Plumlee, R. D. 1985. The Standard of Objectivity for Internal Auditors: Memory and Bias Effects. *Journal of Accounting Research* 23 (Autumn): 683-699.

Purvis, S. E. C. 1989. The Effect of Audit Documentation Format on Data Collection. *Accounting, Organizations and Society* 14 (5/6): 551-63.

Public Company Accounting Oversight Board (PCAOB). 2004. *An Audit of Internal Control over Financial Reporting Performed in Conjunction with an Audit of Financial Statements*. Auditing Standard No. 2. Washington, D.C.: PCAOB.

_____. 2005a. *Report on the Initial Implementation of Auditing Standard No. 2, An Audit of Internal Control over Financial Reporting Performed in Conjunction with an Audit of Financial Statements*. 30 November, 2005. Washington, D.C.: PCAOB.

_____. 2005b. *Policy Statement Regarding Implementation of Auditing Standard No. 2, An Audit of Internal Control over Financial Reporting Performed in Conjunction with an Audit of Financial Statements*. 16 May 2005. Washington, D.C.: PCAOB.

_____. 2005c. *Staff Questions and Answers: Auditing Internal Control over Financial Reporting*. 21 January 2005. Washington, D.C.: PCAOB.

_____. 2005d. *Staff Questions and Answers: Auditing Internal Control over Financial Reporting*. 16 May 2005. Washington, D.C.: PCAOB.

_____. 2007. *An Audit Of Internal Control Over Financial Reporting That Is Integrated With An Audit Of Financial Statements And Related Independence Rule and Conforming Amendments*. Auditing Standard No. 5. Washington, D.C.: PCAOB.

Pincus, K. V. 1989. The efficacy of a red flags questionnaire for assessing the possibility of fraud. *Accounting, Organizations and Society* 14 (1,2): 153-63.

Roediger, H. L., III. 1973. Inhibition in recall from cueing with recall targets. *Journal of Verbal Learning and Verbal Behavior* 12: 644-57.

Rose, J. 2002. Behavioral Decision Aid Research: Decision aid use and effects. In *Researching Accounting as an Information Systems Discipline*, edited by V. Arnold and S. Sutton, Sarasota, FL: American Accounting Association.

Rose, A.M., and J.M. Rose. 2003. The effects of fraud risk assessment and a risk analysis decision aid on auditors' evaluation of evidence and judgment. *Accounting Forum* 27 (September): 312-38.

Rundus, D. 1973. Negative effects of using list items as recall cues. *Journal of Verbal Learning and Verbal Behavior* 12: 43-50.

U.S. House of Representatives. 2002. The Sarbanes-Oxley Act (SARBOX) of 2002. Public Law 107-204 [H.R. 3763]. Washington D.C. Government Printing Office.

Sloman, S. A., G. H. Bower, and D. Rohrer. 1991. Congruency effects in part-list cueing inhibition. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 17 (September): 974-82.

Stone, E., W. Sieck, B. Bull, and J.F. Yates. 2003. Foreground: Background Salience: Explaining the Effects of Graphical Displays on Risk Avoidance. *Organizational Behavior and Human Decision Processes* 90 (January): 19-36.

Thibodeau, J. 2003. The development and transferability of task knowledge. *Auditing: A Journal of Practice and Theory* 22 (March): 47-67.

Vera-Munoz, S. C., W. R. Kinney, and S. E. Bonner. 2001. The Effects of Domain Experience and Task Presentation Format on Accountants' Information Relevance Assurance. *The Accounting Review* 76 (July): 405-430.

Watkins, M. J. 1975. Inhibition in recall with extralist "cues." *Journal of Verbal Learning and Verbal Behavior* 14: 294-303.

Wright, W. F. Superior loan collectibility judgments given graphical displays. *Auditing: A Journal of Practice and Theory* 14 (Fall): 144-55.